Underwriting Price in the Insurance Domain

A Ph.D. Dissertation Proposal for the Individual Interdisciplinary Program

by

Charles Grant

March 2005
ABSTRACT

Commodity price risk stands as a primary concern to many businesses, both on the input and output sides of the equation. Adverse commodity price movements can render a previously stellar firm illiquid or insolvent in a very short period of time. The stakes are high. Consequently, a myriad of hedging strategies have been implemented by firms to tame the effects of ever-volatile price, ranging from use of futures and options trading, to forward contracts, to cash purchase-and-hold strategies, to self-insurance through internal capital reserves.

Traditionally, commodity price hedging has been seen as the domain of derivative traders, dealers and over-the-counter shops active in commodity exchanges. The insurance industry has not been active in this market. The primary hypothesis here is that the insurance industry is well positioned to offer price coverage as well, perhaps at some advantage, since they are already in the property and casualty business. Transactions costs would be minimal with price cover simply being added as a rider on existing policies. There may also be a supplemental benefit if it is found that the offering of price insurance increases overall price hedging and firms with less price stress prove to be less likely to make property and casualty claims (intuitively, it is expected to be so). Support from reinsurers would also be more accessible as part of an overall package of coverage with a critical premium mass.

Insurance is in the business of risk. The insurer absorbs defined risk from an entity in return for receipt of a premium, and then manages the risk through a combination of pricing, product design and transfer of liability. Capital reserves and reinsurance insulate an insurer from insolvency should claims exceed premiums for a time, but, in the long run, no size of reserves can overcome inadequate risk management practices. Legal risks under contract and insurance law are also ever-present and always in need of a mitigating eye.

Insurers generally view commodity price volatility as an uninsurable risk and a risk that cannot be reduced with volume and diversification and, perhaps, cannot be legally included as a part of their regulated mandate. They have not included price in their book of business. The hypotheses here are that their views are unfounded and unexploited opportunity presents itself.

HYPOTHESES

The primary hypothesis is that, contrary to prevalent thinking in risk management circles, underwriting price is in the insurance domain. Supporting sub-hypotheses include:

i. Commodity price risk is insurable.

ii. Commodity price risk can be managed by insurers with volume and diversification.
iii. Effective legalities for writing price offerings can be developed, including wordings for policies, legal structures, capital surpluses and general satisfaction of regulatory requirements.

iv. Insurers can add price coverage to existing property and casualty policies with minimal transactions costs and with the potential benefit of reduced property and casualty claims from non-price-stressed firms.

v. Reinsurers will be supportive of price risk offerings if they are offered as part of a package of cover with critical premium mass.

vi. At the right price, firms will buy the price insurance product.

OBJECTIVES

The following set of objectives addresses the stated primary hypothesis and sub-hypotheses, utilizing an interdisciplinary approach.

1. Design a price insurance model that meets the criteria of an insurable risk that can be managed by insurers with volume and diversification. (Interdisciplinary)

2. Develop an actuarial pricing model for the price insurance offering. (Actuarial Science)

3. Determine the legal considerations of price insurance as they relate to insurance law, contract law and regulatory requirements. (Law)

4. Estimate demand and supply functions and market clearing prices for the proposed price insurance product. (Economics)

APPROACH

The study requires an interdisciplinary approach drawing on the disciplines of economics (Department of Agribusiness and Agricultural Economics), actuarial science (Warren Center for Actuarial Studies and Research), and law (Faculty of Law).

APPLICATION

The Western Canadian hog industry is well-suited as an industry to study as a test of the proposed set of hypotheses, and for this reason it will be a part of the study here. The characteristics that make it particularly well-suited include: (1) Lean hogs are an actively traded and volatile commodity with a futures market on the Chicago Mercantile Exchange. (2) Hog producers face price risk and deal with it in a myriad of ways, normally with some type of hedge portfolio, including self-insurance. (3) The liquidity and solvency of hog production units are heavily dependent on the lean hog market price. (4) Hog production units already purchase property-casualty coverage so price coverage could simply be added as a rider to minimize transactions costs.
PROPOSAL

The proposed Ph.D. dissertation would involve a advisor from the Department of Agribusiness and Agricultural Economics along with a committee member from each of the Department of Actuarial Science and Research and the Faculty of Law. This interdisciplinary approach would satisfy the requirements of an Individual Interdisciplinary Program administered by the Faculty of Graduate Studies.

BACKGROUND

Underwriting Price

Within the system of insurance, it is hypothesized that a method can be found to allow price to be profitably underwritten along with traditional property and liability lines of coverage. It is further hypothesized that price coverage, at the right price, would see a strong uptake by those firms who face liquidity and solvency risk due to price volatility. As background to the study, an outline of the traditional insurance system is provided here as well as an outline of the commodity business.

The Insurance Business

Insurance Ceding

Insurers work in a system where risks originating at the individual level are ceded to primary insurers through insurance contracts, and then are further diversified through reinsurance mechanisms (see Lewis and Murdock, 1996). Since the reinsurer can more effectively diversify risks than the primary insurer, the ceding of risks to reinsurers reduces the cost of primary insurance.

Insurer Risk Profile

Insurers provide insurance to policy holders and in so doing assume risks of several types – actuarial, systematic, credit, liquidity, operational, and legal (see Santomero and Babbel, 1997).

Actuarial risk is the risk of an insurer underpricing policies and, thereby, receiving too little for the risks it has agreed to absorb. The issuance of underpriced policies to raise funds is a sorry proposition that renders the firm unprofitable in the longer run. Underpricing normally occurs when an insurer aggressively seeks market share and the underwriter gets caught with “the aroma of the premium masking the smell of the claims.”
Systematic risk is the risk of changes to the insurer’s asset and liability valuations due to changes in market factors like interest and inflation rates. Systematic risk can be hedged but cannot be diversified away. It is sometimes referred to as undiversifiable risk.

Credit risk is the risk of deviation of an investment portfolio’s performance from that expected. Insurers hold reserves called surpluses to cover their liabilities and satisfy regulator requirements (maximum $3 in premiums written per $1 of surplus). These surpluses are invested to yield earnings and are subject to the uncertainties of any investment, including the risk of default by borrowers.

Liquidity risk is the risk of a funding crisis that may occur around an unexpected cluster of claims resulting from some unforeseen event or series of events. A large claim or write down of assets, a loss of confidence causing massive policy withdrawals, or a legal crisis could precipitate such an occurrence. Insurers generally maintain sufficient liquidity to weather such a storm. The alternative is the forced selling of illiquid assets at concessionary prices and the suffering of serious financial losses.

Operational risk is the risk of mismanagement of the process of collecting premiums, settling claims, processing data, and complying with regulatory conditions. Generally, operational problems of this sort are small probability events but the exposure to the risk of serious and costly errors is always there.

Legal risks are ever present in the business of financial contracting where misrepresentations, misunderstandings and disputes can end up in costly out-of-court or in-court settlements. In-house or outsourced legal counsel is retained to mitigate this risk.

Pricing of Policies

Typically, a large part of insurer debt is raised by issuing insurance policies, rather than by writing paper in the capital markets. Policies are written in exchange for a premium payment. The pricing of the policies reflects a combination of expected losses and yields an insurer can earn on the funds between policy inception and either termination or payment of benefits. A prominent goal of the insurer is to get this price right since paying too high a price to raise funds is an important risk, capable of rendering the firm insolvent over time.

Clusters of Claims

Periodic clusters of correlated claims present a liquidity risk to the insurer. How will they be financed? What if big claims come early prior to the insurer building sufficient reserves? Will the insurer be able to source capital to finance the upper layers of catastrophic risk in order to be positioned with liquidity when high losses are incurred? Will the insurer be able to recover the claims paid through ex poste collection of
premiums or will the insureds decide to terminate their policies ‘while they are ahead’ after the first major pay-out?

**Catastrophe Risk**

Private insurers have a difficult time providing coverage for catastrophe risk (see Jaffee and Russel, 1997). The threat of a cluster of correlated claims simply poses too large a liquidity risk to allow them to safely write the coverage. Often, catastrophes are listed as exclusions on commercial policies and fall under the class of ‘uninsurable risk.’

There are three factors that lead to a risk being deemed ‘uninsurable’ – adverse selection, moral hazard, and the sheer size of the risk. Adverse selection is the tendency of higher than average risk firms to seek insurance at average rates. Moral hazard is dishonesty in the insured that increases the chance of a loss. The sheer size of the risk simply relates to the difficulty in holding enough capital reserves to cover correlated, clustered claims.

The task of catastrophe insurers is to search for substantial sources of capital to finance the upper layers of catastrophic risk. But the task is not an easy one. Generally, insurance companies are comfortable with loss ratios that are reasonably smooth and predictable. Losses are paid out of ongoing premiums collected. They make things work with an interspatial spread of risk. With catastrophe insurance, however, the pattern of losses is highly variable – most often next to nothing but once in a while massive. The need is for an intertemporal spread of risk. Unlike other lines of insurance, catastrophe insurance requires access to large pools of liquid capital at all times just in case the big loss strikes. Insurers generally look to reinsurers to provide those upper layers of catastrophic risk but, to get them on side, agreeable terms need to be negotiated and solid relationships established.

**Reinsurance**

Reinsurance is used by insurers to increase their underwriting capacity, stabilize profits and provide protection against a catastrophic loss. Reinsurers have large blocks of capital and are diversified internationally so have capacity to carry risk that insurers can not carry. Arrangements for reinsurance generally fall under one of the following three treaties: (1) quota-share treaty – the ceding insurer and reinsurer agree to share premiums and losses based on some proportion; (2) surplus-share treaty – the reinsurer accepts a portion of the risk in excess of the ceding insurer’s retention limit and the insurer and reinsurer share premiums and losses based on the fraction of total insurance retained by each party; (3) excess-of-loss treaty – the reinsurer accepts the full risk of catastrophic losses in excess of the ceding insurer’s retention limit.
Reinsurers often participate in insurer’s risk under a subscription approach where each of several reinsurers carries a share of the risk for a share of the premium. The securing and negotiating of reinsurance agreements will be an integral part of the process of putting together a pork price assurance program. Capital reserves held by the insurer will allow a level of self-retention of risk but, beyond the retention, reinsurance will be necessary to satisfy actuaries and regulators and to keep the insurer solvent during times of clustered claims.

Syndicate Insurance

One place to look for upper layer catastrophe cover is Lloyd’s of London and its syndicates. Lloyd’s is not an insurance company per se but provides facilities for its members selling insurance. The insurance is written by the syndicates that belong to Lloyd’s. Syndicates are financially backed by members, called Names, who hold large sums of capital and have unlimited liability with respect to insurance written. They are true risk takers.

Insurance Entities

In terms of legal organization and ownership, insurers can be classified as stock insurers, mutual insurers, or reciprocal exchanges. A stock insurer is a corporation owned by stockholders who participate in the profits and losses of the insurer. A board of directors is elected to appoint executive officers to manage the affairs of the business. A mutual insurer is a corporation owned by the policyholders. The policyholders elect the board of directors who appoint executives to manage the corporation. A mutual insurer can pay a premium or give a rate reduction in advance. A reciprocal exchange is an unincorporated mutual. Insurance is exchanged among its members; each member of the reciprocal insures the other members and the other members insure them. A reciprocal is managed by an attorney-in-fact. The attorney-in-fact is a corporation that is authorized to seek new members, pay losses, collect premiums, handle reinsurance arrangements, invest the funds, and perform administrative duties.

Methods of Selling

Insurance is generally sold through one of the following four marketing streams – independent agencies, exclusive agencies, direct writers, or direct response. An independent agent is a firm that represents several unrelated insurers, is compensated by commission for sales, and owns the renewal rights of policies. An exclusive agent represents only one insurer, is compensated by commission for sales, and does not own the renewal rights of policies. A direct writer is an employee of an insurer and is
compensated with a wage or wage plus commission for sales. A direct response insurer sells directly to the public by television, radio, newspapers or Internet without commissions for sales and with full ownership of renewal rights.

The Commodity Business

Hogs

The hog business is a commodity business like many others. Ebbs and flows in the levels of input prices and output prices widen and narrow producer margins and are frequently the primary determinant of firm profitability. In the hog business, on the output price side, is the per unit value of terminal pork produced; on the input price side are the per unit costs of barley, feed wheat, corn, soybean meal, lysine, premix and energies like natural gas, heating oil, crude oil and electricity. Exchange rate is an issue since sources and destinations of many of the outputs and inputs are the United States marketplace. For hog finishers only, the cost of weanlings is also an input price concern. Traditionally, hog producers have largely faced this risk with a program of self-retention but more recently have looked to forward contracts, futures contracts and options contracts as means of price risk mitigation.

Gold

A study of the gold mining industry (see Callahan, 2002) reveals a myriad of hedging approaches in that industry and no real convergence on a system of choice. The study concludes that hedging practices may act to smooth earnings but they do not necessarily increase shareholder wealth. In fact, some investors place a premium on volatility in the sector, looking for a risky investment as part of their overall portfolio.

Agricultural Commodities

Many studies of agricultural commodity production assess strategies to satisfy the dual, and perhaps competing, objectives of reducing price volatility and adding profit. An evaluation of cotton put options as a price management tool (see Bennet, 2003), concludes, “…put options purchased four cents in-the-money between 21 and 31 May provided the highest net price received by Texas cotton producers.” Clearly, the objective of adding profit is part of their price management equation. A study of hedging strategies for Quebec hog producers (see Gervais and Doyon, 2004) describes the search for put options offered at actuarially advantageous terms. Again, the objective of adding profit is clear.
Other studies of agricultural commodity production focus solely on the goal of minimizing downside risk. A study of price risk in canola (see Wallace, 2003) compares the financial risk of a contracted position against an un-contracted position and estimates the cost of a worst case scenario. A study of price risk management in the wool industry (see Mitchell, 2003) suggests the management of price risk is important to ensure producers do not end up producing goods at a loss.

**Oil and Gas**

A study of the hedging practices of oil and gas producers (see Haushalter, 2000) concludes, there are, to date, no widely accepted explanations for risk management as a corporate policy. Discussions in the literature and in the trade are not conclusive about what determines the extent to which a company hedges, how a firm’s value is impacted by risk management, and to what degree a firm’s hedging strategy relates to other management decisions. The study reports that, in a data set representing the oil and gas industry, the fraction of production hedged is positively correlated to both the size of the firm in terms of total assets and the debt to asset ratio (leverage) of the firm, suggesting that there are significant economies of scale in hedging and that increased leverage and financial risk encourages hedging. The study also reports a negative correlation between the fraction of production hedged and the basis risk associated with the hedging instruments. Basis risk is the degree to which cash prices of a commodity are uncorrelated with futures prices of the same commodity. The larger the basis risk, the less effective is the hedging program and the less likely it is to be utilized.

**REFERENCES**


