



Insurance Futures: Examining the Context for Trading Insurance Risk

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Abstract

Catastrophic insurance futures are being traded, albeit thinly, at the Chicago Board of Trade. This paper examines the broad context for trading insurance risk. The term “insurance risk” is examined to provide a basis for understanding the concept of tradable insurance risk. The motivation for trading insurance risks, specifically to increase the capacity to cover risks, is discussed. Models for transforming insurance risk to a tradable form are considered, leading to a brief comment on the development of an insurance-specific index. The perspectives of market participants such as an insurer, reinsurer, investor, and speculator are offered. Two examples of trading insurance risk are described.

Introduction

The fundamental principles of insurance include the transfer of risk, the diversification of risk, and the pooling of risks. These elements contribute to our understanding of the risks that can be covered and how insurance companies can cover these risks.

With the innovations in the capital markets and the forces of change surrounding the insurance industry, this is an appropriate juncture to examine the context for trading insurance risk. Can insurance risk be traded? Can this trading activity provide a means for increasing capital to cover insurance risks? If so, how will the insurance industry participate in this activity? Only a few of the issues raised by these questions are examined in this paper.

Most of the literature surrounding the trading of insurance risk has focused on the mathematical development of the risk pricing models. It is hoped that this paper, which is entirely nonmathematical, will stimulate discussion of why, rather than how, insurance risks should be traded.

Insurance Risk

A first step in the examination of trading insurance risk is to examine the concept of an *insurance risk*. Specifically, the terms “risk” and “insurance” can have broad interpretations and, apart from strict legal constraints, the concepts of *sharing risk* and *providing insurance* need not be confined to the insurance markets alone.

Broadly, a risk can be defined simply as an event whose occurrence triggers a loss. In most jurisdictions, the type of loss (and, therefore, the type of risk) that can be covered by insurance companies, and cannot be provided by others, is defined by law. A loss exposure is the set of circumstances that presents the possibility of a loss, whether or not the loss actually takes place. The event triggering the loss can be a one-time event, such as a death resulting in a claim on a life insurance policy. Alternatively, there can be several events of varying degrees of loss occurring within a preset time period, as in automobile insurance, for example.

Just as broadly, insurance can be defined simply as the act of sharing the risk of loss. More precisely, all or part of the *financial consequence* of the loss is shared. The financial consequence of a loss provides a means of quantifying the risk. There are certain risks

where the "value" of the loss cannot be defined. An example is the value of a life. However, by concentrating on the financial consequence (however broadly defined) of the loss of that life, an insurance contract can be formed.

Another definition of insurance* is: "Insurance is a device for the reduction of uncertainty of one party, called the insured, through the transfer of particular risks to another party, called the insurer, who offers a restoration, at least in part, of economic losses suffered by the insured."

Based on these broad definitions of risk and insurance, "insurance risk" can be defined as those loss exposures that are covered (or insured) by insurance companies. This is a retrospective view since it considers only those types of risks that have been covered by insurance companies at any time in the past. The definition can include a prospective view as well if it includes risks that are coverable (or insurable) by insurance companies.

Without allowing for any new developments in the insurance and capital markets, how does an insurance company decide whether a risk is insurable? There are several criteria which are discussed extensively in the actuarial and insurance literature. One can presume rather simplistically that all risks that are insurable are currently being insured by insurance companies and that those risks that are not insurable are not being insured. But that cannot be the whole truth.

There are several cases of risks that one might consider insurable based on objective criteria, where coverage is not available in the insurance market. For example, certain types of catastrophic risks may not be covered to the extent desired by the insured in some locations. There are two fundamental reasons for this:

1. the price (premium) to cover the risks, and
2. the sources of capital available to cover the risks.

One aspect of risk transfer that has not been discussed so far is the price or premium at which the risk will be ceded by the insured and accepted by the insurer. The premium makes *all* risks insurable. This is not as absurd as it may sound. All risks are insurable in the context that the premium sets a threshold below which the risk is self-insured and above which it is insured by another party. This is demonstrated clearly in the captive insurance market and in the reinsurance market. In the captive insurance market, for example, an industrial company sets up a captive which will

cover the risks of its sponsor. It may decide to retain all the risk or reinsure part of it.

The price of risk transfer does not exist in isolation. It depends on the sources of capital available to share the risk. If the capital sources are small in relation to the risks, then the demand for capital is greater than supply and some risks will remain uncovered. Expanding the capital available to cover insurance risks should, therefore, provide the capacity to bring premiums to levels where a transfer of risk becomes economically feasible.

Allowing, now, for new developments in the insurance and capital markets, how does an insurance company decide whether a risk is insurable? It can stay with its conventional criteria for defining insurability, some of which may be artifacts of idiosyncratic rules and regulations, or it can expand its criteria. One way to expand the definition of insurability is to consider whether there are entities, insurance companies or otherwise, who will be willing to participate in the risk. This does have a price dimension to it as well, but the distinction here is that the search for capital may lead to other risk takers who are willing to participate in risks not conventionally covered by the insurance industry.

As an example of risk taking, consider a bank that sells an interest rate cap. In exchange for a premium, the bank takes the risk in exchange for a premium that it will have to make payments at several points in time over the life of the cap if interest rates rise above the strike level. Presumably the buyer of the cap is hedging its exposure to rising interest rates. This sounds like insurance, except that the principle of insurable interest is not necessarily present. A key difference in the way the bank and an insurer manage this risk is that the bank will make a conscious decision about the value of this risk that it wishes to retain. It could keep none of the risk simply by entering into offsetting transactions in the cash and futures markets, or it could keep all of the risk. Therefore, the bank is not necessarily a risk taker; it is a risk manager.

There are two questions that arise from this discussion.

1. How can more capital (capacity) be attracted to share in insurance risks?
2. How can the risks covered by insurance companies be expanded?

The rest of this paper will consider the first of these questions. In doing so, some aspects concerning the second question may arise. This discussion has brought

*Irving Pfeffer, *Insurance and Economic Theory* (Homewood, Ill.: Richard D. Irwin, 1956), p. 53

us to the point where it is relevant to consider the meaning of tradable insurance risk.

Tradable Insurance Risk

When an insured buys an insurance policy from an insurer, insurance risk is being traded. When an insurer cedes some risk to a reinsurer, insurance risk is being traded. When a reinsurer retrocedes some risk to a retrocessionaire, insurance risk is being traded. If all this trading is taking place, why is there a need to discuss the concept of tradable insurance risk? The reason is that the trading is taking place within the insurance market only.

There may be entities in the broader capital markets willing to share in insurance risks. This statement raises several issues which are addressed in this section.

1. Are these entities currently providing capital to cover insurance risks?
2. If they are not, what are the obstacles?
3. How would they prefer to provide capital, i.e., what is the form of risk sharing?
4. What is the nature of the risks they are willing to share?

In answer to the first question, some entities do provide capital to cover insurance risks, but there are many that do not. The insurance market does not exist in isolation. It is part of a broader capital market. Insurance companies and reinsurers have capital that allow them to provide the capacity to cover insurable risks. This capital is primarily in the form of equity in the insurance operating companies and, where permitted by regulation, debt capital (although debt is often at a holding company with the proceeds downstreamed to the operating entity).

The answer to the second question lies in the form of investment that an entity can make in an insurance enterprise. Some investors have restrictions dictated by investment policy or regulation, on the types of investments that they can make. With some exceptions, the majority of the capital provided to the insurance industry is in the form of direct equity, either at the insurance operating company or at a holding company. Opportunities for fixed-income investors in this sector are limited. In addition, for those investors who want to leverage their investment, there is no real derivatives market in insurance risk apart from the Catastrophic Futures (CAT) market at the Chicago Board of Trade (CBOT). In order to increase the capacity to cover insurance risks, the form of risk sharing has to be

expanded to better serve the needs of these types of investors.

When capital is provided to an insurance company, it participates in more than just the pure insurance risk; it also shares in the fortunes of the insurance company as a business enterprise. Is it possible, or even desirable, to separate the two? It may be if the objective is to attract new participants to provide capital. Unless the form of risk sharing is modified, only the same investment vehicles (equity and some debt) and the same participants will be present.

In order to increase the fixed income and derivative vehicles for investing in insurance risk, it is necessary to consider the general nature of the risk in which investors will be willing to participate. Broadly, it should be the opposite of the risk in an equity investment. The investor should be able to calculate a fair value of the investment reasonably efficiently. The risk should be finite and subject the investor to the pure insurance risk only; otherwise, it is an equity investment. The risk definition should be such that the trading of insurance risk can take place in the secondary capital markets, in contrast to the secondary insurance markets of reinsurance and retrocession.

It is probably difficult to isolate the pure insurance risk without also including the skill of the insurance company's personnel who underwrite and manage the risk. The price (premium) to cover the risk includes the cost of managing the business. This cost may be an average over several lines of business and over several time periods. The actual allocation of cost when assessing profitability of a policy may be different from that assumed in the pricing. At best, therefore, the isolation is a matter of degree.

In addition, one of the fundamental principles of insurance is the pooling of risks to minimize the variance of operating results over time. Isolating the pure insurance risk and taking it out of the insurance company's intertemporal setting may *increase* the capital necessary to cover the risk. This defeats the purpose.

The last two paragraphs point to some of the difficulties of isolating pure insurance risk. However, it may still be necessary to make the separation in order to develop a market for trading insurance risk outside the traditional group of investors. One possible framework to consider when making the separation of pure insurance risk from enterprise risk is that of a *hedgeable risk*. If a risk is "hedgeable," then there is a basis for price discovery. That, in turn, forms the basis for active trading. This is considered in the next section.

Transformation of Insurance Risk to Tradable Form

In order to convert an insurance risk into a tradable form, it is useful to consider the replication argument that forms the basis for developing the fair value of other investment vehicles. Essentially, if a risk can be hedged exactly (i.e., it is a hedgeable risk) and the price of the hedge vehicles can be observed, then the price of that risk is determined and is equal to the price of the hedge vehicles.

There are two risk transformation models that motivate the development of hedging insurance risk. The first is the derivatives model, and the second is the asset-backed securitization (ABS) model. The rest of this paper will focus on the derivatives model.

The derivatives model can be used where there is an *explicit index* available that is highly correlated with the insured risk. The insured risk can be characterized by the type of index used for hedging it. There are two types of insured risk:

1. *Insurance-specific*: Index generally *not* used by other noninsurance entities.
2. *Noninsurance-specific*: Index generally used by other entities for purposes other than managing insurance risk.

At present, there are many indices, but only one that is insurance-specific, i.e., the ISODATA index which forms the basis of the CAT futures contract at the CBOT. More indices are expected to be developed as interest in this subject increases.

Insurance risks are also correlated with some of the noninsurance-specific indices. In particular, life insurance policies have significant exposure to interest rate risk directly through the investment component of the insurance benefit and indirectly through the lapse behavior of policyholders. Hedging this risk using interest rate derivatives is already being done actively.

There are two risk transfer vehicles that can be used under this model.

1. *Naked derivatives*: These are futures, options, swaps, caps, floors, and other such instruments that are based on the performance of a measure underlying an index. Generally, counterparty risk of varying degrees exists with these instruments.
2. *Embedded derivatives*: These are structured notes or bonds that have the index-based naked derivatives embedded in the bond structure, not unlike the call feature of callable bonds or the prepayment feature

of mortgage-backed securities. These bonds are generally of a quality acceptable to an investor.

The ABS Model can be used where no explicit index is available. Instead, an *implicit index* results from separating a pool of liabilities and paying investors a return based on the performance of the pool. To the extent that the investments in the pool are fixed income in nature, they can be called liability-backed securities (LBS). They can also be classified as structured notes or bonds. The specific elements of LBS will not be considered in this discussion.

Development of an Explicit Insurance-Specific Index

As mentioned above, the ISODATA index used for trading the CAT futures contract at the CBOT is the only insurance-specific index available for trading at present. Other bodies do report loss estimates, e.g., Property Claims Services (PCS) and Swiss Re's SIGMA, and these can be used to create customized reinsurance contracts.

Although the CBOT contract is a start in the right direction, it is by no means the final form. Both the index and the contract design have met with some criticism, which is only to be expected as the various market participants make their preferences known. Focusing on the index design alone, it is worthwhile asking whether an index based on industry loss experience (the ISODATA index) is necessarily the only way to proceed.

From an insurance industry perspective, the closer the index is to the loss experience, the better the ability to hedge the loss exposure of insurers. On the other hand, it does place a noninsurance industry expert, i.e., an investor, at a disadvantage. The investor is handicapped when translating weather information into loss experience. Over time, as both the investor and insurer understand the market better and as the contract and index evolve, this may not turn out to be such a big issue.

An alternative to a loss experience-based index would be to have an index based on some independently verifiable measure of a physical phenomenon that is highly correlated to loss experience. For example, in a flood prone area, the water level at any instant at a given location could form the basis for an index. Both the insurer and the investor have an equal chance of modeling the behavior of the water level since they

would both have access to scientists specializing in making such predictions. With such an index, only the insurer need worry about correlating the water level to a loss exposure and thereby developing a hedge strategy.

Other models combining these two extremes are also under consideration. As interest in this topic increases, it is likely that additional indices will be developed. At present, the London International Financial Futures Exchange (LIFFE) and several insurance intermediaries are racing to develop their own insurance-specific indices.

Participants in Traded Insurance Risk

Whether insurance risk is traded over-the-counter (OTC) or through an exchange, it is useful to consider the types of participants in the market. Simplistically, there are two types of participants: hedgers and risk takers. Hedgers are exposed to insurance risk and want to transfer some portion of it to the risk takers.

In order to better understand the market participants, it may be useful to discuss the stage at which *exact* hedging is desirable. (If a hedge is not exact, the hedger retains some basis risk.) There are three stages to consider: the insured, the insurer, and the reinsurers. The distinctions between these three levels are size of capital base and diversification of risk exposure.

Generally, the insured has the smallest capital base and the least diversification of risk exposure. Risk transfer to the next level is, therefore, desirable in the most complete form. This is accomplished through an insurance contract. The insurer has more capital than the insured and better risk diversification, but generally is not as well off as the reinsurers. With the exception of the very large, financially sound insurers, the risk transfer to the reinsurer should also be as complete as possible. The only way to do so is through a customized reinsurance contract.

The reinsurer, by virtue of its capital and the significant diversification of risks on its books, is in the strongest position to withstand the basis risk in any hedge that does not perfectly replicate the insurance risk. The term "hedgeable risk" can, therefore, be viewed in the context of a reinsurer wishing to retrocede part of its insurance risk to the capital markets; the risk is hedgeable if it can be transformed fully or partially from a pure insurance risk to a traded risk.

The risk takers can be categorized as investors and speculators. There is not necessarily a clear distinction between the two, but it is useful to consider them separately within the context of additional capital to be attracted to the insurance market. Both are necessary to develop an active market in traded insurance risks; the investors provide the additional capital that is the object of the exercise, and the speculators operate to enhance the efficiency of the market.

The investors run the range of participants in the fixed-income markets. They include pension funds, mutual funds, insurance companies, and other corporate investors. Until the traded insurance risks market develops sufficient liquidity, it is unlikely to attract retail investors and would, therefore, be a market for institutional investors. These institutional investors have significant capital to deploy. The attraction of this market to these investors is the potential of high-quality investments providing a spread over alternative investments, as well as risk diversification to the extent that the insured risk is not correlated with other investment risks.

The practical question then remains: how is capacity increased with these participants? The answer lies in the value of the risks that can be passed on to the investors. As reinsurers lay off their risk to investors, they free up some of their capital to cover other risks. Ultimately, if the reinsurers are able to pass all hedgeable risks to the investors, they will retain a portfolio of unhedgeable risks (or at least the portion of risk that they do not want to hedge.) The next section describes some possible applications.

Examples of Trading Insurance Risk

A. CAT risk cover hedged by CBOT CAT contract:

1. Reinsurance Need: A medium-sized insurer writes significant property insurance, with concentrations in Florida and New York. The reinsurer has a good relationship with this customer but is not willing to cover the CAT risk entirely.
2. Solution: Reinsurer can provide reinsurance as before, but lays off a portion of its risk via the CBOT CAT market. The effectiveness of the hedge will depend on the correlation of the reinsured CAT loss relative to the CBOT CAT loss. The reinsurer will be retaining the basis risk of the hedge.

B. Double-Trigger CAT Cover:

1. Reinsurance Need: A strong, well-capitalized insurer wishes to purchase CAT reinsurance at a cheaper cost than available through conventional programs. It believes that it can cover its CAT claims if bond markets remain stable or rise. The concern is that it may have to liquidate bonds when interest rates are high and a CAT claim has to be paid.
2. Solution: Provide a double trigger CAT cover which provides a sliding scale of cover up to some maximum limit. The premium for the coverage should be less than the cost of the underlying interest rate derivative (cap) alone and the cost of the CAT cover alone. Assuming that the CAT risk is not hedgeable using an explicit derivative, then only the interest rate risk would be hedged. The hedge would be based on assessing the probability of a CAT loss in the loss exposure period and combining that with an interest rate derivative. The hedge would be adequate if it were to cover the expected long-run

experience on a large group of similar policies. With a small number of transactions and short-term covers, there may be a significant basis risk. The basis risk can be mitigated somewhat by building in a hedging strategy that increases in a nonlinear form as interest rates rise.

Conclusion

The market for trading insurance risks is in its early days. Many elements of this market are evolving. In particular, a thorough evaluation of risk transformation models may indicate that there are several alternatives to insurance futures that are worth considering. It may well be that these alternatives have to develop in tandem so that the traded risks market has greater breadth and depth. As these alternatives develop, so too will the market participants. And with them, the capital available to cover the risks that are insurable must grow.