



AMERICAN ACADEMY *of* ACTUARIES

May 1, 2002

Mr. Arnold L. Dutcher
Chairman, Securitization Working Group
National Association of Insurance Commissioners
2301 McGee, Suite 800
Kansas City, Missouri 64108-2604

Re: Comments Regarding Hedge Effectiveness

Dear Mr. Dutcher:

On behalf of the Casualty Practice Council of the American Academy of Actuaries¹ (the "Academy"), I appreciate the opportunity to provide comments on the Interested Parties' paper on *Index Based Insurance Derivatives* (the "Interested Parties' paper"). This letter focuses on the measurement of hedge effectiveness and the treatment of over-recovery from index-based derivative contracts used by insurance companies to hedge insurance underwriting risk.

The Academy's Index Securitization Task Force previously presented a White Paper, supplemental research on hedge effectiveness, and several letters commenting on hedge effectiveness and aggregating derivative transactions. This letter should be considered an addendum to those work products.

Measurement of Hedge Effectiveness

The paper presented by the Interested Parties recommends that the criteria adopted in Issue Paper No. 144 be adopted for determining hedge effectiveness. The next paragraph further defines highly effective to have:

"the same meaning as the notion of high correlation as utilized in FAS No. 80: *Accounting for Futures Contracts* (FAS 80). As a result, highly effective describes a fair value hedging relationship where the change in the fair value of the derivative hedging instrument is within 80 to 125 percent of the opposite change in the fair value of the hedged item attributable to the hedged risk. It shall also apply when an R-squared of .80 or higher is achieved when using a regression analysis technique."

In the initial Academy work product presented to the NAIC in October 1999, the Task Force reviewed the above measures - identified as "coverage ratio" and "correlation." Sections of the Academy paper describing these are attached to this letter.

¹ The American Academy of Actuaries is the public policy organization for actuaries practicing in all specialties within the United States. A major purpose of the Academy is to act as the public information organization for the profession. The Academy is non-partisan and assists the public policy process through the presentation of clear and objective actuarial analysis. The Academy regularly prepares testimony for Congress, provides information to federal elected officials, comments on proposed federal regulations, and works closely with state officials on issues related to insurance. The Academy also develops and upholds actuarial standards of conduct, qualification and practice and the Code of Professional Conduct for all actuaries practicing in the United States.

In the paper, the Academy indicated that correlation was a poor measure for determining hedge effectiveness, because an indication of high correlation may be misleading. A high correlation statistic (>80%) means that the variables move together, in a consistent pattern, but not necessarily in a one-to-one relationship. Correlation also does not identify if the company has purchased a sufficient quantity of the derivative to hedge the entire exposure. It tells you if the derivative moved in the same direction as the exposure. Correlation can also be significantly affected by inclusion (or exclusion) of data points. This is further explained in the attached pages from the Task Force's white paper.

In the initial paper, the "coverage ratio" was initially viewed as a possible statistic, but after additional research, it was shown to be a poor statistic for measuring hedge effectiveness. In the original research on "coverage ratios," we looked at the case of using derivatives to hedge ground-up losses. In this case, there are very few "zero/zero" scenarios². At a "coverage ratio" using a 95 percent criteria, no insurers could support hedge effectiveness whether zero/zero scenarios are included or not. When we tested hedges against the 25-year event (96 percent probability of zero), almost all companies can support hedge effectiveness when the zero/zero events are included, and none can show effectiveness when we exclude the zero/zero scenarios. This statistic is highly sensitive to the attachment point and treatment of the "zero/zero" scenarios.

It is important to recognize that the effectiveness measures that have been used for determining whether a hedging relationship exists under FAS 80 can be appropriate in certain circumstances. For example, the risk of exchange rate variations or commodity price changes are customarily transferred by using swaps, options, futures, and forward contracts that often are designed to "lock in" the current market expectation of the future value of the variable under consideration. Translated into insurance terms, such a structure would be analogous to a high frequency working layer reinsurance program where all parties expect a certain level of losses to be ceded to the program in most scenarios. The likely applications of index-based insurance derivatives would include supplementing or replacing catastrophe reinsurance, which by its nature is unlikely to be triggered in any one year, but which could produce a very large recovery if there is a loss. It is not surprising that the statistical tests for evaluating the effectiveness of a low-frequency, high-severity transaction would be different from those needed to evaluate a transaction with a strike price that is at the money or near to expected value.

In summary, we believe that the measures recommended by the interested parties' paper for evaluating hedge effectiveness are not suitable for situations, like catastrophes, where the triggering event is unlikely to occur in any one year.

Use of correlation and coverage ratios to determine hedge effectiveness may produce false positives and result in a false sense of security by the company that the hedge is effective. Use of these criteria could also discourage insurers from entering into transactions that could allow an insurer to transfer portions of its underwriting risk to entities better able to manage or absorb such risk. We believe that regulators should consider more rigorous statistics for evaluating hedge effectiveness for index based insurance transactions.

² The "zero/zero" scenario refers to the modeled event where the derivative result and the company result produce zero loss and zero recovery. It is expected that the use of catastrophe option derivatives will be to fill in gaps or supplement capacity and as a result are expected to attach at high levels. When modeling such derivatives it is expected that in many cases the derivative result and company result will produce zero loss and zero recovery. In fact, depending on the structure of the derivative, this scenario may be the single most likely outcome. These events, when included in the coverage ratio, may result in supporting hedge effectiveness, and when excluded, may indicate that the hedge is ineffective.

Over-Recovery from Index Based Derivative Contracts

The interested parties' paper proposes that over-recoveries be reported as investment income. In a previous letter to the Securitization Working Group, the Academy's Index Securitization Task Force disagreed with this treatment and made the following recommendation in its March 2000 letter:

"We ... believe that hedges created from index-based insurance derivative transactions should be treated similarly to other more traditional risk management transactions (primarily reinsurance). This leads us to recommend that the results from all index-based insurance derivative transactions should be aggregated and reported as part of underwriting income provided that (i) the transactions are part of a single, specific hedging strategy, (ii) the hedging strategy has met the documentation requirements in the [Interested Parties' paper], and (iii) the hedge meets the requisite criteria for effectiveness. This treatment, will allow insurance companies to consider a broad range of risk management tools without undue concern regarding the accounting treatment of such tools, provided that the transactions meet the hedge effectiveness criteria.

This recommendation is not consistent with the [Interested Parties' paper's] recommendation, which would apply an asymmetric treatment to over-recoveries and under-recoveries."

We continue to support this position and believe that asymmetrical accounting treatment is inconsistent with a requirement to demonstrate hedge effectiveness, particularly with a broadened definition of measuring hedge effectiveness. The additional tests for effectiveness may not identify transactions that are likely to produce excess results.

The asymmetrical treatment, combined with a less rigorous test of effectiveness, may encourage a company to purchase excess derivatives, knowing that any excess will be treated as investment income. If this accounting is permitted, then the requirement to test for hedge effectiveness is academic and an unnecessary activity.

We would be happy to answer any questions that the Working Group has regarding this letter or prior Academy work products at your meeting in Philadelphia. Please contact Greg Vass, Senior Casualty Policy Analyst, at (202) 223-8196, if we may be of assistance to you.

Sincerely,

Frederick O. Kist, FCAS, MAAA, Chairperson
Index Securitization Task Force
American Academy of Actuaries

The following pages have been reproduced from the Index Securitization Task Force White paper presented to the NAIC Securitization Working Group on October 4, 1999.

Coverage Ratio

One measure that can be used to test the relationship of the hedged loss to recovery is the coverage ratio. The coverage ratio is defined as the amount recovered from the derivative transaction divided by the subject loss. This test could be stated as:

$$\text{Prob } \{a < \text{coverage ratio} < b\} > p_1 \text{ and Prob } \{c < \text{coverage ratio} < d\} > p_2 \\ \text{given that the subject loss } \geq e * E \text{ [subject loss] or } e * E \text{ [surplus]}$$

This measure requires that the coverage ratio be within some range, a through b, with more than probability p_1 , and within another range, c through d, with more than probability p_2 . If appropriate, the test could also be limited by looking at only subject loss amounts greater than some multiple e of the expected hedged loss or surplus, whichever is less. The purpose of such a limitation is to prevent small events from heavily influencing the results. Small events, such as those with subject losses of less than 25% of the expected loss related to the hedged exposure, generally have very little impact on the financial results of the insurer. The range endpoints of a, b, c, and d can be chosen to minimize the likelihood that the derivative will be used as an investment rather than as a hedge.

An illustration of this type of test might be:

$$\text{Prob } \{0.80 < \text{coverage ratio} < 1.20\} > 0.80 \text{ and Prob } \{0.50 < \text{coverage ratio} < 1.50\} > 0.95 \\ \text{given subject loss } \geq 0.25 * E \text{ [subject loss]}$$

If only the first half of the test were used, the amount of the recovery could be less than 80% of the hedged loss in as many as 20% of the possible results. Alternately, the recovery could be 2 or 3 times the hedged loss in as many as 20% of the possible results. The former situation could leave the insurer without a sufficient recovery, whereas the latter situation could provide the insurer with an excessive recovery. We, therefore, suggest adding the second half of the test to put additional bounds on the ratio of the recovery to the hedged loss.

The concept of coverage ratio can be illustrated graphically. In Figure 4, the vertical axis represents the insurer's recovery; the horizontal axis represents the insurer's loss from the exposure being hedged. Each possible event can be represented by a point on a graph. If the axes are scaled identically, which they are in all the illustrations herein, the points will fall along a diagonal line, which is shown in Figure 4. Events, such as A, B and C, whose points on the graph are close to the solid line, would have a coverage ratio close to 1. Events, such as D, whose points on the graph are well above the solid line, have a recovery that greatly exceeds the loss. Events, such as E, whose points on the graph are well below the solid line, have a recovery that is significantly less than the loss.

Figure 4

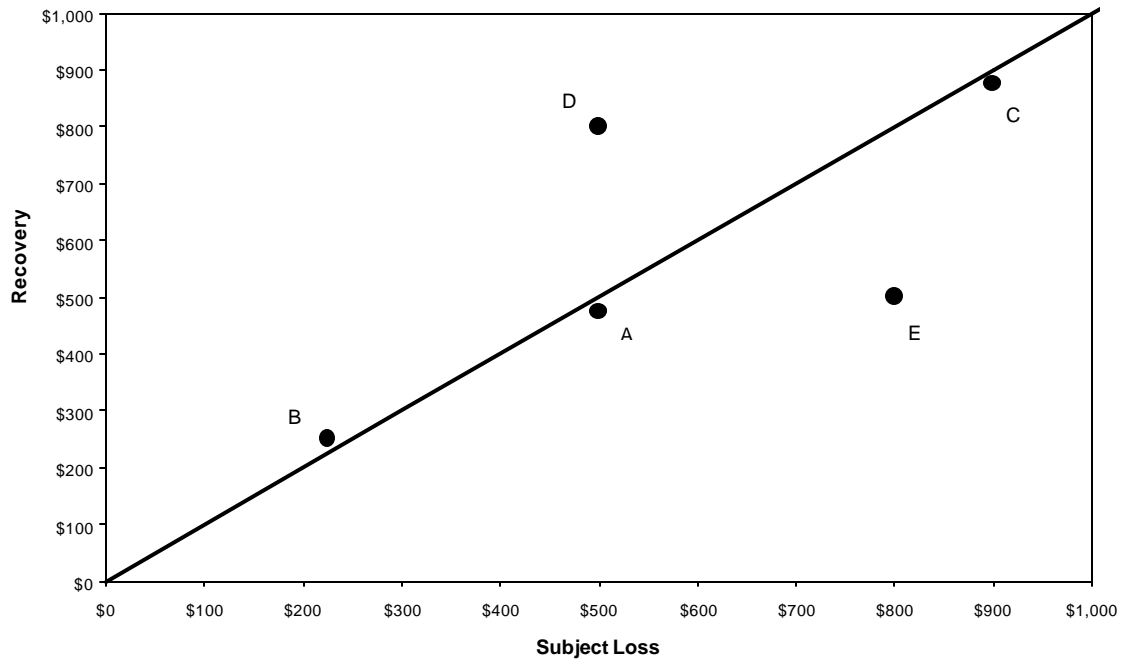
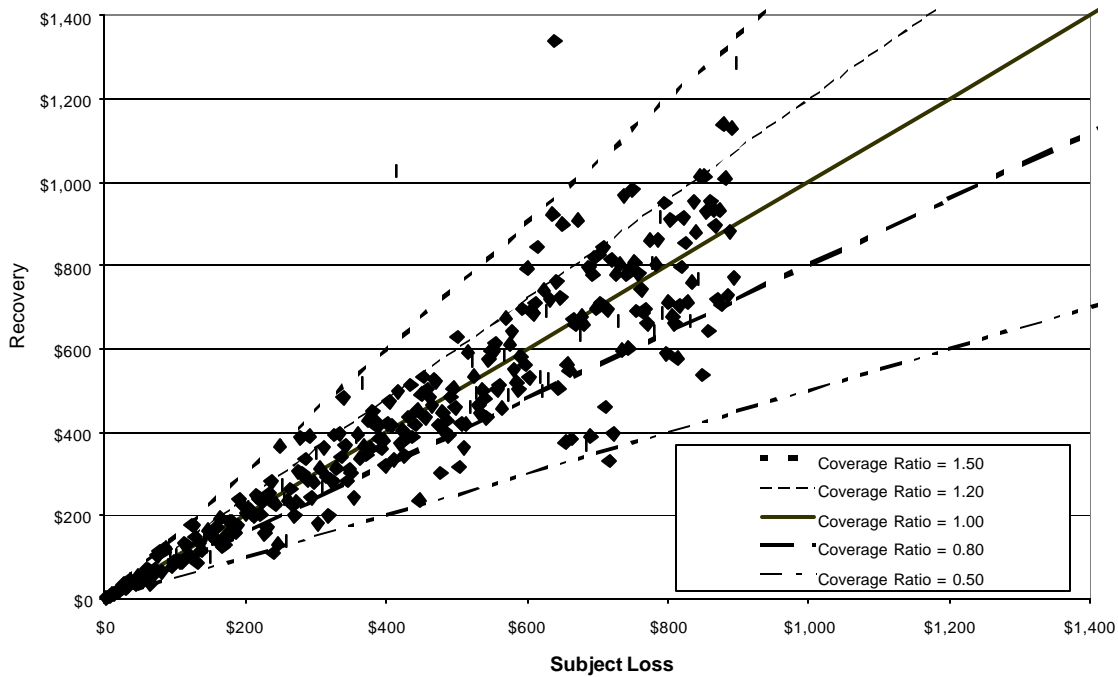


Figure 5 presents an illustration of a situation that passes the test above. In addition to the diagonal line, there are also lines representing coverage ratios of 50%, 80%, 120% and 150%. As can be seen, most of the points fall between the 80% and 120% lines and almost all of the points fall between the 50% and 150% lines.

Figure 5



As specified in the above illustration, this test would require that, for losses at least one-fourth the size of the expected loss (in other words, the smaller loss possibilities are being excluded),

- more than 80% of the scenarios involve a coverage ratio between 0.80 and 1.20
- and
- more than 95% of the scenarios involve a coverage ratio between 0.50 and 1.50

This sample test attempts to ensure that there is, in the vast majority of possible scenarios, a close relationship between the underlying hedged loss and the recovery from the hedging transaction.

This measure has the benefit of being intuitively appealing. It directly measures the extent to which the subject losses are offset by hedge recoveries. If the focus of testing is to determine whether the hedge will act like reinsurance by providing recoveries that are closely related to the subject losses, this measure is appropriate. If, however, the focus of testing is to determine whether risk has been reduced, this measure is too strict. That is, there does not need to be a one-to-one correspondence between subject losses and hedge recoveries for the insurer's risk to be reduced.

Correlation

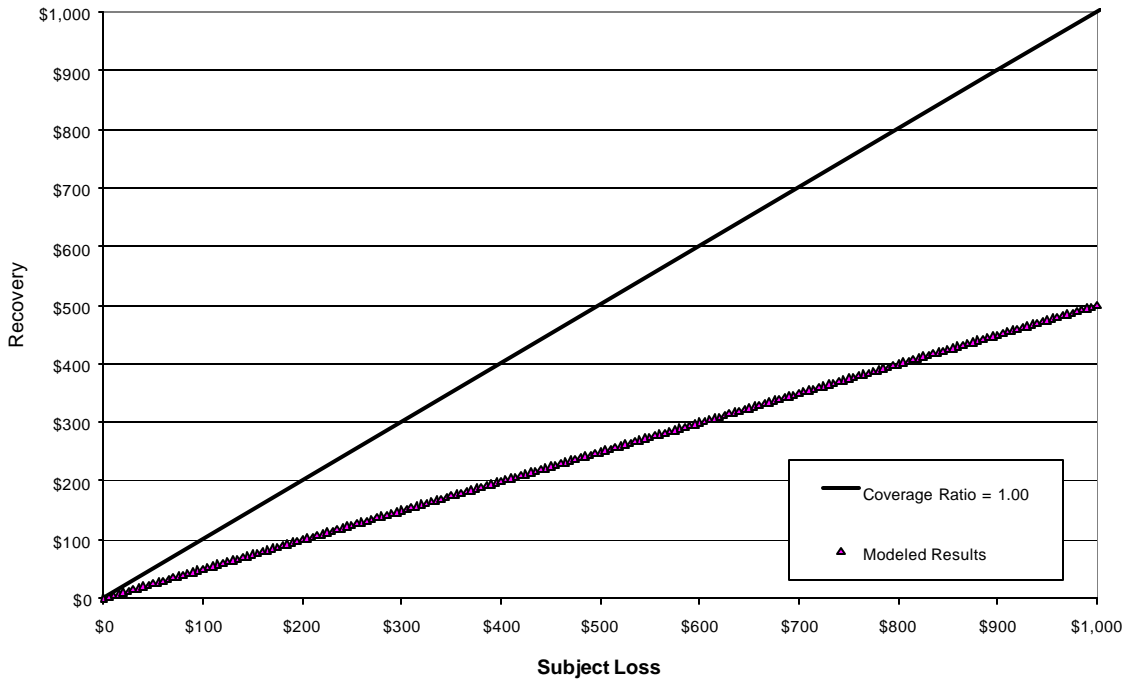
A statistical measure commonly thought to measure hedge effectiveness is the correlation coefficient. In layman's terms, correlation measures the degree to which two variables are linearly related. Mathematically, the formula for correlation is:

$$\text{Correlation} = \frac{E[(\text{hedgedloss} - E[\text{hedged loss}])(\text{recovery} - E[\text{recovery}])]}{\sigma[\text{hedgedloss}] \times \sigma[\text{recovery}]}$$

While a high correlation can indicate a close relationship, it can also be misleading. Simple correlation does not consider the relative magnitudes of movements between two variables. Thus, a high correlation statistic means that the variables move together, in a consistent pattern, but not necessarily in a one-to-one relationship. For example, if recoveries from a derivative were always exactly twice the level of the subject losses, the correlation between subject losses and recoveries would be equal to 1 (or 100%). Similarly, if recoveries were always one-half of subject losses, the correlation would also be 1.

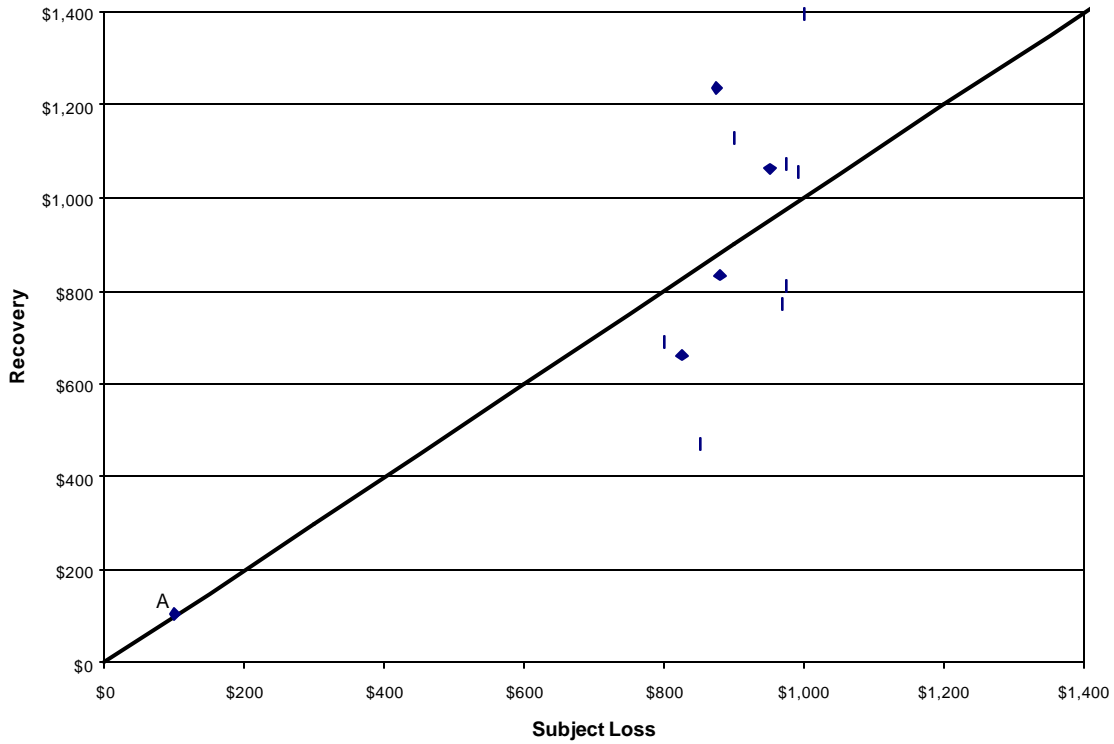
The latter example is illustrated in Figure 9. The lower line represents the recoveries and insurer's losses from each event. As can be seen, except for very small events, it is never close to the diagonal line as is desired. Of course, if the exposure to be hedged were restated as a 50% participation in the previously defined layer or if twice as many derivatives were purchased, this hedge would be perfect. However, it does illustrate one of the inadequacies of using correlation as a sole measure of hedge effectiveness.

Figure 9



Another concern with using correlation is shown in Figure 10. In this illustration, the correlation is 76%, a value considered relatively high. However, this high correlation is driven by the single point, A, which is an extreme value at which both the recovery and insurer's loss are low. This illustration also demonstrates the benefit of eliminating small losses from consideration of hedge effectiveness, such as those smaller than 25% of the expected loss. In this illustration, the hedged loss at point A is \$105, whereas the expected value of the hedged loss is \$870. Therefore, the limitation eliminates this point. The correlation excluding this single point is only 57%.

Figure 10



Correlation is a statistic commonly used to test relationships between two variables. The above examples have demonstrated a number of the weaknesses of correlation and why it may be inappropriate to be used as a sole measure of hedge effectiveness. It may have merit as part of an effectiveness test when used in conjunction with the other measurements above.