REPORT OF THE CASUALTY ACTUARIAL SOCIETY ADVISORY COMMITTEE ON SECURITIZATION AND RISK FINANCING

October 14, 2002

Advisory Committee on Securitization/Risk Financing

William F. Dove, FCAS, MAAA
Co-Chairperson

David A. Lalonde, FCAS, FCIA, MAAA
Co-Chairperson

Brian A. Hughes, FCAS, MAAA

Alexander Krutov, FCAS, ASA, MAAA

Michael V. Leybov, ACAS, MAAA

Glenn G. Meyers, FCAS, MAAA

Christopher E. Olson, FCAS, MAAA

Manalur S. Sandilya, FCAS, ASA, MAAA

1. INTRODUCTION

The goal of the Securitization/Risk Financing Advisory Committee is to identify research and education that the Casualty Actuarial Society (CAS) should undertake in the area of securitization/risk financing.
The committee started by defining securitization and risk financing within the context of insurance. Securitization is not a new concept; underlying each transaction are two basic components: a) a risk transfer mechanism, typically a reinsurance contract, which actuaries are familiar with pricing and analyzing, and b) a delivery mechanism, typically a bond or an index contract which the financial market is familiar with delivering. The committee looked at the current level of involvement by actuaries and assessed the skills used. Next the committee considered areas where actuaries may increase the level of involvement and the skills required for this. The delivery mechanism and the overall combination of the risk transfer instrument with a security are areas that may be less familiar to actuaries. The core skills required are financial risk management and structured finance, which are covered to a certain extent on the current syllabus. To increase involvement in securitization actuaries can look to broaden the scope of their financial engineering skills and their understanding of the regulatory environment surrounding investment banking.

The committee considered the state of the insurance securitization market by reviewing the types of deals completed to date. The majority of activity has been related to catastrophe bonds issued on an indemnity or index basis. To achieve the committee's objectives the broad subject area was divided into narrower topic areas of consideration as follows:

- Definition of insurance securitization;
- Pricing and analysis of the underlying risk in insurance securitization;
- Index and indemnity securitization;
- Rating agency considerations;
- Accounting, regulatory and tax considerations.

Following a discussion of each of these topics, we describe the educational requirements that will enable the actuary to obtain a basic level of familiarity with these instruments as well as an expert level of knowledge. This will include a review of the current CAS exam syllabus and an identification of material needed for a general level of expertise that is not covered by the current syllabus.

We will next identify and describe some areas where further research by actuaries is needed to expand the role of the casualty actuarial profession in this quickly evolving field.

Finally, we will summarize the recommendations of the committee and assign to each a priority for completion, a target timeframe, and a CAS committee that could assume responsibility for implementation.

2. AREAS OF CONSIDERATION

In this section, the topic areas identified in Section 1 Introduction will be further explained. For each area the following items will be discussed:

- Key concepts will be defined.
- What role are actuaries currently playing in the area under consideration?
- What additional work could actuaries undertake in the area under consideration?
- What publications or other educational resources exist?
- What educational and research needs exist?

A. Definition of Insurance Securitization

Insurance securitization is the transfer of insurable risk to the capital markets via tradable financial securities, which we will refer to as "insurance-linked securities".

Insurance-linked securities are sold to investors who, with a few exceptions, are lacking specialized insurance expertise and therefore rely on the modeling agencies and rating agencies in their analysis of the securities. In addition, detailed information on the underlying risk is not available to investors. There is no direct client-service provider relationship between the sponsor of the security and the investor. As a result, in order for the security to be attractive to the investors from the qualitative point of view, the underlying risk should satisfy certain requirements:

- The risk should be easy to understand and well defined.
- The risk should be objective, with loss triggers driven by the events fundamentally out of the sponsor's control.
- The risk should be quantifiable.
- The modeling should be done by an independent party, recognized as an expert in the area prior to getting involved in securitization.
- Relevant historical experience should be available.
- Moral hazard should be eliminated or significantly reduced.
- Idiosyncratic risk should be minimal.

This paper focuses on instruments that transfer risk using the capital markets such as cat bonds and index-based options.

While few transactions have been completed to date, some other examples of transactions that could meet the above criteria include securitizing other lines of insurance business, securitization of other insurance-related cash flows, e.g. premium receivables, salvage/subrogation, and catastrophe equity puts involving non-insurance capital providers.

Both an additional definition of insurance securitization and discussion of other risk financing arrangements are in "Insurance Securitization: The Development of a New

Asset Class" by Richard Gorvett which is now on the Part 8 exam syllabus. This paper also contains descriptions of past transactions that have been executed.

B. Pricing and Analysis of the Underlying Risk in an Insurance Securitization

The pricing and analysis process for insurance securitizations can be split into two components: analyzing a transaction by itself and analyzing a transaction as part of a portfolio of risks.

- Analyzing a single transaction in isolation: The estimation of the loss distribution stays fundamentally the same here as we move from insurance to an insurance-linked security. The same skill sets/processes that exist for traditional insurance analysis also apply here. In addition, index features or other contractual provisions may introduce new risks that require consideration. For example, estimating the distribution of losses for a catastrophe bond with an industry loss warranty feature will require the development of joint or conditional probabilities for each potential outcome.

- Analyzing a transaction as part of a larger portfolio of risks: To analyze how a new transaction will affect a portfolio of asset and/or liability risks, an actuary will need to assess the marginal capital required for the new transaction. To do this, the actuary will need to determine the relationship between the new transaction and the existing portfolio. Included in this analysis of the relationship will be:

    - Basis risk;
    - Hedge effectiveness;
    - Model results/variances;
    - Portfolio effects (covariance, conditional probabilities, etc.).

What role are actuaries playing in this area? Actuaries are highly involved in the analysis of single transactions in isolation. For example, actuaries are intimately involved in the pricing and reserving analyses performed by insurers and reinsurers.

Actuaries are also highly involved in analyzing portfolios of insurance and reinsurance liabilities, most notably through the loss reserving and insurance company valuation processes. Actuaries are not typically involved in analysis of asset portfolios, despite the fact that these may include insurance-linked securities.

As for the involvement of actuaries in securitizations to date, they have been involved in the design of the structure of the transactions and the measurement of the underlying risks including the correlations between risks. They have explained the underlying risk analysis to potential investors. They have also performed cash flow tests to meet regulatory requirements.

What else could actuaries be doing? Actuaries could have more involvement in managing portfolios of insurance risks, whether through assuming or transferring insurance risk through the capital markets. The skills learned here as well as the skills that actuaries already possess could eventually lead to actuaries managing widely diverse portfolios made up of insurance and non-insurance risks, and more involvement in management decisions regarding the optimal capital structure for insurance enterprises.

What publications are currently available? Current publications that address basis risk and hedge effectiveness include:

Meyers, "A Buyer's Guide for Options on a Catastrophe Index," *Proceedings of the Casualty Actuarial Society*, LXXXV, 1998: pp. 187-210.

The portfolio analysis aspect of this topic also has some similarities with the work being done by many CAS members in Dynamic Financial Analysis. This aspect is addressed in "Catastrophe Risk Securitization: Insurer and Investor Perspectives" by Meyers and Kollar.

As investors assume insurance risk through securitized transactions there will be a desire to diversify their risk among different instruments. They will be measuring correlations between instruments and assessing marginal risk. Actuaries are typically well versed in portfolio theory and can provide assistance. Further emphasis of education in portfolio theory will be beneficial. For catastrophe bonds there has been an assumption of little to no correlation with other asset classes. As insurance linked securitization grows to encompass other lines of business, this assumption will be tested and a higher level of understanding of different asset classes will be required. Current articles on the exam syllabus that address portfolio theory include:

Elton and Gruber, *Modern Portfolio Theory and Investment Analysis*, chapters 4 – 9.

Bodie, Kane, and Marcus, *Investments*, chapters 16 and 26, appendices 6A, 8B, and 8C.

Hull, *Options, Futures, and Other Derivatives*, chapter 14.

What educational and research needs exist? More education is needed in the following areas:

- Basis risk;
- Hedge effectiveness;
- Model results/variances/interpretation;
- Portfolio effects (covariance, conditional probabilities, correlations, etc.);
- What current tools and indices are available;
- Credit risk analysis and similarities/differences with analysis of insurance-linked securities.

More research is needed in these areas:

- Application and applicability of actuarial pricing methods to capital markets risks;
- Role of the actuary in defining ratings criteria;
- Liquidity;
- Expenses;
- Taxes;
- Cost of capital and capital structure efficiency;
- Accounting, legal, and regulatory considerations;
- Securitization of insurance risk other than property.

C. Index and Indemnity Securitization

An important distinction between types of securitizations is indemnity securitizations versus index securitizations. Payment to the insurer in an indemnity securitization depends on the insurer's own losses for a covered event. In this aspect of the transaction, an indemnity securitization is very similar to reinsurance. Payment to the insurer in an index securitization depends on the events other than the insurer's actual losses. Examples of "other events" can include industry losses on a hurricane, or an earthquake whose severity exceeds a predetermined magnitude on the Richter scale.

There are advantages and disadvantages to both kinds of securitizations.

- Index securitizations are subject to basis risk. That is an insurer's recovery from an index securitization may not match the actual losses incurred by the insurer. Insurer's can minimize this risk by carefully selecting the indices that it uses for the securitization. It also behooves the supplier of indices to design indices that will allow the insurer to minimize basis risk. Adverse selection risk (from the perspective of the seller of the security) is eliminated because settlement is based on external events.

- Indemnity securitizations are subject to adverse selection. That is the insurer has better knowledge of the risk that it is taking. Also, the insurer's incentive to control losses is not as great when its losses are ultimately paid with someone else's money. Guarding against adverse selection can involve expensive legal and due diligence costs. Insurers prefer indemnity securitization because they can tailor the contract to minimize basis risk, although in some contracts it may still be present.

Early securitizations were indemnity contracts but recent transactions have tended to be index-based contracts. Indemnity contracts are similar to reinsurance where there are precedents in dealing with the adverse selection issues. Index-based contracts create basis risk for ceding companies, which they are learning to manage effectively. Standardization of index-based securitizations should lead to lower transaction costs over time. In some instances (if a sponsor is a reinsurance company) index securitizations seem to be the only viable alternative.

What role are actuaries playing in this area? The ultimate purpose of a securitization program is to manage insurer risk. The actuary can play a major role in the design of securitization programs. In designing these programs the actuary will have to know:

- How the various securitization programs work. That is to say, know who pays for what under the possible loss scenarios that could happen.

- How to evaluate risk/reward trade-off afforded by a given securitization program.

- How the effectiveness of the securitization transaction will be viewed by rating agencies and insurance regulators.

- The necessary and sufficient conditions needed to obtain regulatory approval for reinsurance accounting treatment of indemnity and index securitization contracts. Minimally, actuaries will need to prove the existence of risk transfer in the underlying indemnity or index securitization contract.

- Comparison of the relative complexity, risks and rewards of Index and Indemnity treaties.

What else could actuaries be doing?

<u>Index Securitization</u>:

- Develop and maintain appropriate indices for different lines of insurance; minimize the cost of obtaining indices.

- Research the property of indices to enable estimation of basis risk, e.g. an index based on Florida hurricane losses will lead to very low basis risk for the Florida CAT Fund but will be totally useless for the California Earthquake Fund. Parameters should be made available to quantify the basis risk. For example, a zip-code/exposure cross table could be constructed to describe a typical payoff structure.

<u>Indemnity Securitization</u>:

- Develop standardized audit procedures to identify potential for moral hazard and adverse selection and to control their impact.

- Maintain a database for Legal and Due Diligence cost estimates.

<u>D. Rating Agency Considerations</u>

In rating insurance-linked securities, the following characteristics are common to the rating agency approach:

- Heavy reliance on modeling firms to estimate loss distributions;
- Review of assumptions used by modeling firms;

- Review of data integrity;
- Stress testing of the models;
- Collaboration of structured finance and insurance rating analysts.

Approaches to rating other types of insurance-linked securities are usually ad hoc with significant reliance on outside expertise.

Rating assignment is similar to that of collateralized debt obligations, with rating assigned primarily on attachment probability. In addition, rating agencies examine parties to the transaction, agreements binding each party, and the safety of assets in the collateral account.

For indemnity securitization transactions, insurance companies usually receive full reinsurance credit. Index transactions (loss or parametric based) are analyzed individually with an emphasis on basis risk and hedge effectiveness.

Actuaries should be familiar with the rating agency considerations in structuring and modeling securitization transactions.

What role are actuaries playing in this area? Actuaries have been involved in various aspects of the rating process for insurance-linked securities and this role can be enhanced. The skills used in the rating process include:

- Reviewing modeling assumptions and data integrity;
- Design and analysis of stress/sensitivity tests:
- Quantification of uncertainty;
- Assessment of correlation.

What else could actuaries be doing? Statisticians, research scientists and experts in financial structuring currently perform these tasks. The rating agencies have not tended to have actuaries on staff and this is an area where actuarial skills could be employed in a non-traditional field. Actuaries' skills can be utilized from a rating agency perspective throughout all phases of a transaction. They may be involved in supporting the issuing company, working with investment banks in structuring transactions to achieve optimal rating for the risk transferred, designing and performing analysis to assist in rating agencies, and interpreting the ratings as an investor.

What publications are currently available? There are several references available from the rating agencies that detail their respective rating practices. These references include:

Fitch Ratings, *Rating Guidelines for Catastrophe-Linked Bonds*, 2001.

Standard & Poor's, *Modeling Catastrophe Reinsurance Risk: Implications for the CAT Bond Market*, 1999.

Moody's, *Moody's Approach to the Rating of Catastrophe-Linked Notes*, 1997.

What educational and research needs exist? Actuaries are already provided with training and education in the quantification of uncertainty. The gap to bridge is the application of these skills to the rating process.

E. Regulatory Considerations

Most work an actuary performs within the realm of securitization/risk financing will require some knowledge of regulatory issues.

What role are actuaries playing in this area? Most of the time, actuaries are involved in pricing and reserving these transactions.

What else could actuaries be doing? Actuaries could get more involved in structuring these deals. In structuring them, the actuary needs to understand the accounting, securities regulation, and tax issues associated with these transactions.

Factors that may require different treatment from other work the actuary is routinely involved in include the following:

- Pricing: costs, fees and timing of cash flows;
- Accounting and risk-based capital formula: does the transaction affect the asset or liability account?
- Tax: timing of tax liability as well as whether it affects net income or capital gains.

What references are available?
The sections outlined below contain references that will assist the actuary in these areas.

- Accounting Issues: There are several categories of accounting considerations that may be important.

  With regard to Generally Accepted Accounting Principles, index-based transactions are discussed in Statement of Financial Accounting Standards No. 133 – Accounting for Derivative Instruments and Hedging Activities. For statutory accounting, refer to Statement of Statutory Accounting Principles No. 86 – Accounting for Derivative Instruments and Hedging Activities, which is effective January 1, 2003.

  Indemnity-based transactions are routinely handled through creation of an offshore Special Purpose Vehicle (SPV) with reinsurance. However, a few onshore transactions have been completed through creation of a limited syndicate on the Illinois Insurance Exchange. In addition, Illinois has recently adopted its Special Purpose Reinsurance Vehicle (SPRV) Law. The National Association of Insurance Commissioners (NAIC) is presently working on the SPRV Model Act. It is in committee (and not yet tested), having been adopted by the NAIC's Technical Group. In June, 2002, the Financial Accounting Standards Board issued an exposure draft: "Proposed Interpretation – Consolidation of Certain Special-Purpose Entities" to address consolidation of SPVs by business enterprises where Accounting Research Bulletin (ARB) No. 51 does not apply – namely, where the SPV is not subject to control through the ownership of voting rights.

If the transaction is conducted through a protected cell with an indemnity-based trigger, the NAIC's Statement of Statutory Accounting Principles No. 74 – Accounting for the Issuance of Insurance-Linked Securities Issued by a Property and Casualty Insurer through a Protected Cell will apply. Another relevant source of information is Statutory Issue Paper No. 103 on the same topic which includes the Protected Cell Model Act. Note, however, that no transactions have been completed to date through a protected cell and, therefore, the principle is untested.

The accounting treatments applied in this area are developing particularly rapidly at the date of this writing and the actuary practicing in this area will need to make special efforts to keep his or her knowledge up to date.

- Securities law issues: Reference to Regulation D should be made to determine whether the transaction is exempted from the registration requirements of section 5 of the Securities and Exchange Act of 1933. If the security is unregistered and is to be resold, reference should be made to Rule 144A – Private Resales of Securities to Institutions.

- Insurance regulation: The NAIC's Securities Valuation Office (SVO) assesses the credit quality and valuation of securities owned by state regulated insurance companies. The Purposes and Procedures Manual of the NAIC Securities Valuation Office contains the NAIC's credit assessment methodologies and valuation policies.

  As regulators evaluate these transactions, one important consideration is "stress testing" the transaction. This may include an assessment of various loss scenarios, the probability of those scenarios, and the company's ability to financially withstand various "bad case" scenarios.

- Federal tax issues: Tax issues associated with insurance securitizations can be found in IRS Handbook 104.7 – Financial Products and Transactions (FPT) Handbook. The most relevant portions are chapter 4 (Tax Law Applicable to FPT) and chapter 5 (FPT Issues).

What educational and research needs exist? The sources of information outlined above, while complete and comprehensive, can be cumbersome and confusing to use. The committee recommends a primer be written on this topic by an individual well-versed and experienced in dealing with these transactions firsthand. As new accounting and/or tax rules are introduced, the primer would need regular updating. Actuaries could also benefit from additional background in the following areas:

- Understanding regulations in other relevant jurisdictions;
- Considerations in structuring special purpose vehicles.

3. EDUCATIONAL REQUIREMENTS

In this section we discuss the following items:

- Two levels of expertise in the field as defined by the committee;
- Topics with which actuaries need to be familiar in order to contribute to work in the securitization/risk financing area;
- Resources available to actuaries and actuarial students to gain knowledge in this field, including a review of CAS exam syllabus coverage of the material needed by a general actuarial audience.

A. Expertise level

As insurers become more active in the securitization/risk financing arena the need for actuaries familiar with these concepts will increase. Two levels of expertise can be envisaged: (i) a general level of familiarity with the concepts of securitization and risk financing for all actuaries and (ii) expert level familiarity with both the financial theory behind the development of this business and the details required to design and implement an insurance-linked securities transaction.

- General actuarial audience: Understanding concepts should be the focus of education for this level of expertise. Education could begin with a review of pricing property catastrophe reinsurance and explore non-reinsurance transactions that are being used by insurers. Understanding basis risk and the general structure of fixed income securities will allow the actuary to understand the development of insurance-linked securities. A general level of familiarity with the other topics listed will then allow the actuaries to know how to get to the expert level quickly.

- Experts: These are actuaries working with insurance-linked securities or in adjacent areas. Their level of expertise should allow them to play an active role in pricing, valuing, designing and investing in insurance-linked securities. The knowledge level should now expand to obtain a complete understanding of the market structure, relationships with the capital markets, construction of portfolios, and optimization. Expertise in accounting, regulatory, and tax issues will become important for an actuary to be effective.

B. Topics

The topics with which the actuary needs to be familiar within the securitization and risk financing arena are many and varied. This section outlines those topics. The level of knowledge attained can range from a general conceptual understanding to in-depth expertise.

- Fixed income securities: a general knowledge of the asset class and how these securities work.

- Property catastrophe (re)insurance: an understanding of the underlying exposures to be re(insured), the ways in which multiple policies, coverage areas and/or company assets can be impacted by the same event, the products/policies/treaties that provide coverage, and the pricing approaches to those products.

- Portfolio management: a general knowledge of portfolio optimization, theory of ruin, and dynamic financial analysis.

- Structure of insurance-linked securities: an understanding of the types of structures utilized for insurance-linked securities.

- Catastrophe bonds: this particular class of insurance-linked security is by far the most common and the structure to which other types of securities are often compared.

- Pricing and reserving of individual insurance-linked securities and portfolios: the methods utilized by both the insurance industry and the financial markets in pricing these products and the methods used to analyze portfolios of these products.

- Basis risk: an understanding of the types of exposures the issuer retains after hedging its catastrophe risk with an insurance-linked security, especially an index-based product, and how to quantify and manage this basis risk.

- Accounting, regulatory and tax issues: in structuring these transactions, an understanding of the accounting, securities regulation, and tax issues is needed. How these issues affect a transaction can have a material effect on the economics and attractiveness of a particular deal.

C. Resources

There are many and varied resources available to actuaries and students interested in gaining knowledge in the area of securitization. In fact, given the intense interest and rapid development of securitization in the insurance industry and other parts of the financial services sector, it is impossible to provide a complete list of references that would not become instantly obsolete.

- Papers, Textbooks and Other Publications: There are two recent bibliographies of publications dealing with insurance securitization that have been prepared by recent CAS and American Academy committees. The AAA Insurance Securitization Task

Force published a bibliography of securitization references in September 1999, and it is available on the CAS web site at http://www.casact.org/research/istf/istfbibl.htm. The CAS Valuation, Finance and Investments Committee (VFIC) also produced a bibliography of relevant material. It is located at http://www.casact.org/CASBiBSearch.cfm and can be reached by searching on "Financial Analysis" or "Valuation" from the Topics dropdown window. Each page can also be reached from the CAS home page by clicking on "Search for published actuarial articles" below the window "CAS Library Search".

- Topical sessions in current seminars (Annual/Spring Meetings, CARe etc): The Spring and Annual meetings of the CAS offer a convenient vehicle for introducing the emerging area of specialization to a general audience of Casualty Actuaries. One concurrent session per meeting should be devoted to introductory material on the subject. A couple years down the road, the topic is likely to grow in importance and demand a General session. Topics should update the audience on the emerging market for insurance linked securities and CAT bonds and should discuss Regulatory and Tax issues.

- Special interest seminars (an annual limited attendance seminar for experts or near-experts): CAS should plan for an annual special interest seminar on insurance securitization with potential experts as the target audience. The pedagogical tools should include lectures, discussion sessions, and case studies discussing the structure, pricing and reserving of insurance-linked securities, catastrophe bonds, basis risk, and accounting and regulatory issues.

- Exam syllabus: The committee reviewed the current CAS examination syllabus in order to determine the extent to which the topics described in Section 2 are covered to the level required for the general actuarial audience. The committee agreed that familiarity with securitization and risk financing at least to this level should be expected of every FCAS.

  The committee found that many of the topics are covered by the current syllabus. The following table illustrates the findings.

Topic	*Syllabus Coverage*
Fixed Income Securities	Part 2 – Kellison Part 8 – Fabozzi
Property Catastrophe Reinsurance	Part 6 – Clark, Ludwig
Portfolio Management	Part 2 – Brealey & Myers Part 8 – Chew
Structure of Insurance-Linked Securities	Part 8 – Gorvett
Catastrophe Bonds	Part 8 – Gorvett
Pricing, Reserving of Individual Insurance-Linked Securities and Portfolios	None
Basis Risk	Part 8 – Gorvett
Accounting, Regulatory, Tax Issues	Part 8 – Gorvett

The committee concluded that the Portfolio Management, Pricing and Reserving of Individual Insurance-Linked Securities and Portfolios, Basis Risk, and Accounting, Regulatory and Tax topics would all benefit from additional coverage on the exam syllabus. Members of the committee would be willing to provide assistance to the CAS Syllabus Committee to identify specific resources to cover these areas.

- CAS Web Site: The committee recommends that the CAS expand the utilization of the CAS web site www.casact.org to help achieve the educational goals described by the committee. The web site could be used both as a source of reference material and as a medium for delivering education through on-line courses, for example the recent CAS Online Course "Financial Risk Management: Securitization."

  Possible uses of the web site as an educational resource include the following:

  -Posting of relevant papers from CAS publications;
  -Posting of presentation materials from CAS events;
  -Links to other relevant web sites and publications;
  -Use of CAS Discussion Forum to facilitate relevant discussions for CAS members and students;
  -Offering of additional on-line courses.

  In order to develop this resource, the CAS will need to solicit volunteers to identify relevant papers and appropriate web sites for links. These items will need to be maintained regularly given the rapid profusion of information on the internet.

4. RESEARCH RECOMMENDATIONS

The Securitization/Risk Financing Advisory Committee recommends that the CAS should encourage additional research be done on the following topics. This could be done through new call paper programs, discussion paper programs or Proceedings papers. Research could be initiated by the CAS and its members, or coordinated with other actuarial organizations through the Actuarial Education and Research Fund.

- Application of capital markets techniques to insurance securitization:

  - Arbitrage equivalent pricing techniques: Many other capital markets rely on arbitrage equivalent pricing techniques to give investors comfort with the risk they are assuming. No such methodology currently exists for insurance pricing. Can a methodology be developed that uses arbitrage concepts? If not, how can this barrier be overcome?
  - Conversion of insurance pricing to investment community measures: While actuaries typically use expected loss and standard deviations in the pricing of a risk, the investment community uses measures like Sharpe ratios which can compare many types of investment vehicles. Is it possible or desirable to convert

actuarial measures into investment community measures? If so, what are the best ways to do this?

- Pure insurance securitization research:

  - Structure of indices: What are some new ways, or the best ways, to structure industry indices?
  - New indices: What kinds of indices could be used for different lines of insurance? Are there de facto indices in existence right now that could be used? What existing data could be used to construct indices?
  - Securitization of non-catastrophe lines of business: To date, catastrophe risk has been primarily the risk securitized. What other lines of insurance could or should be securitized? What are the incentives and disincentives for each? Why haven't other lines been securitized?
  - Costs of securitization: What are the costs of securitizing insurance risk? How does that cost compare the industry's cost of capital? Items that could be addressed include taxes, legal and regulatory costs, general expenses, and the additional cost required by the market to invest in a new type of security.
  - Basis risk: If companies use index-based securities in lieu of traditional reinsurance or insurance, they will need to know how to measure and manage the resulting basis risk. What are the best ways to do that? What will rating agencies likely require in order to recognize the actual transfer of risk when assigning claim-paying ratings?

5. SUMMARY OF RECOMMENDATIONS

This section will summarize the advisory committee's recommendations of educational and research initiatives to be undertaken by the CAS in the field of securitization. To each recommendation is assigned a prioritization, a suggested timeframe for completion, and a proposed locus of responsibility within the CAS.

The advisory committee's recommendations are as follows:

- Coverage of securitization topics on the CAS exam syllabus should be increased, specifically in the areas of Portfolio Management, Pricing and Reserving of Individual Insurance-Linked Securities and Portfolios, Basis Risk, and Accounting, Regulatory and Tax. The committee agreed that this recommendation should be assigned a high priority and should be implemented as part of the ongoing reviews of syllabus content over the next two years. The Syllabus Committee should be responsible for implementing this recommendation.
- Continuing education opportunities for actuaries in the securitization field should be increased, targeted at both the general actuarial audience and the expert. At this stage, the most practical forum for such events is through concurrent sessions at annual and spring meetings, the CAS Ratemaking Seminar, and the Seminar on Reinsurance. As interest and activity in the securitization arena grows, it is possible that Special Interest Seminars or Limited Attendance Workshops could become

useful in the future. This also is assigned a high priority and implementation should begin during 2003. The Program Planning Committee, the Committee on the Ratemaking Seminar, the Reinsurance Research Committee and the Joint Program Committee for Reinsurance Seminars should be involved in implementation.

- Bibliographies of publications dealing with insurance securitization should be updated and maintained. The best current source for this information is the VFIC bibliography on the CAS web site. The committee recommends that VFIC take responsibility for maintaining and updating the on-line bibliography on a regular basis beginning in 2003. This should be given a high priority.
- Additional research in the securitization area should be encouraged by the CAS, particularly in the areas identified above under Research Recommendations. This should be given a high priority. The committee recommends that a new call paper program on securitization be implemented during 2003. If there remain significant unmet research needs after completion of such a program, then the committee recommends that VFIC take responsibility for completing additional research or consideration be given to establishing a prize paper program or commissioning specific funded research.
- The CAS web site should be used to deliver additional educational opportunities and content. In July of 2002 the first online course on securitization was offered and opportunities such as these should be encouraged and publicized. Because work already appears to be underway in this area, the committee felt that this item should be a low priority.

6. CONCLUSION

The advisory committee has spent most of the past 12 months defining its goals, parsing an immense area of knowledge into relevant and manageable pieces, evaluating the opportunities and challenges facing CAS members and students in this rapidly evolving area, and devising the educational and research recommendations described in this paper. Because of the importance of securitization as a financing tool, many professions have already developed practice areas focused on securitization transactions. The committee feels that the CAS should devote resources to both raising the profile of casualty actuaries with other professionals who are active in the securitization arena and increasing the level of understanding of securitization within the casualty actuarial profession. Implementing some of the educational and research recommendations outlined above would be a welcome first step in that direction.