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# Introduction

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During the late 1980s and early 1990s we have seen insurance and financial markets interact more closely than ever before. New tools for managing insurance risk emerge frequently, usually with roots in financial markets. A strong motivating factor has been the record number of natural catastrophes and their impact on insured losses. The potential for earthquake and storm losses in the U.S. exceeds insurance market capacity. Reinsurers, banks, security exchanges, and others are developing products, sometimes involving creation of new organizations or joint ventures, to profitably meet this demand. The 1995 Bowles Symposium provided a forum to explore some of these products and to discuss new possibilities.

The Chicago Board of Trade (CBOT) futures on catastrophic loss indices provided an early example of these products, perhaps the first exchange traded insurance derivative securities. Over-the-counter products such as bonds with coupon or principal payments tied to an insurance portfolio loss ratio are examples of privately placed insurance securities. There is more information available on the publicly traded examples, and, naturally, the majority of the symposium papers treat these products. This introduction was written after the symposium to serve as a guide to readers of the papers that were presented in Atlanta. The symposium was organized in three sessions, as follows:

*Session 1. Interplay between Capital Markets and Insurance*

Leader: Hans Bühlmann

Presenters: Stephen P. Lowe, Aaron Stern

Audience discussion led by Frank Pierson,  
Jon Roberts

*Session 2. Insurance Futures*

Leader: Paul Embrechts

Presenters: Prakash Shimpi, Morton Lanc,  
Patrick L. Brockett

Audience discussion led by Paul Embrechts

*Session 3. Actuarial Bridge between Insurance and Finance*

Leader: James C. Hickman

Presenters: Elias Shiu, Hans Gerber, Graham Lord,  
Frank Sabatini

Audience discussion led by Jim Hickman

The symposium began with a welcome from John Hogan, Dean of the College of Business Administration at Georgia State University. The first Thomas P. Bowles, Jr. Chairholder, Professor Hans Bühlmann, was introduced by Professor Samuel H. Cox of GSU. In the opening presentation, Bühlmann showed that, in general terms, all securitization can be viewed as cross-hedging. He illustrated this fundamental notion with catastrophe insurance and reinsurance, but the principle was applied generally. This created the environment for the other contributors.

Continuing in the first session, Stephen P. Lowe discussed U.S. property/casualty risk-based capital and some of the implications of capital structure, product pricing, and insurance portfolio strategy. He showed that actuarial theory and financial theory of asset portfolios converge in practice. In the third presentation in the first session, Aaron B. Stern described the interplay between catastrophe exposures and capital markets. Stern argued that establishing catastrophe insurance as an asset class will provide capital to cover potential earthquake or hurricane losses of \$50–100 billion. The presentations in the first session were practice-oriented. They did not refer to the difficult mathematical problems encountered in developing pricing and reserving methods for insurance derivative securities.

The second session, led by Professor Paul Embrechts, provided several advances in the modeling of insurance derivatives, although the first presentation was nonmathematical. The audience participated fully in a vigorous discussion, which ended as we adjourned for lunch. Professor Harry Panjer gave a luncheon speech on the research activities of the Society of Actuaries Foundation.

In the beginning of the second session, Prakash Shimpi discussed the concept of tradable risk in general terms while using the CBOT futures as an illustration. This led to a vigorous and completely nonmathematical discussion of why insurance risk is traded. Dr. Morton Lane followed this with a more technical discussion, showing how insurance market prices reveal information about the underlying loss distribution. This interesting notion was conveyed clearly without heavy mathematical machinery. In the third presentation,

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Professor Embrechts laid out the sophisticated mathematical modeling required for a rigorous valuation of insurance derivative securities. As it is applied in the usual financial setting, arbitrage pricing requires (or is roughly equivalent to) complete markets. The financial market may not be complete—financial prices may not contain adequate information about insurance risk. Professor Embrechts showed how this difficulty can be approached through the use of utility theory or general equilibrium techniques. Professor Brockett referred to a related problem as information asymmetry. In his presentation he showed how to determine optimal bounds on insurance derivative prices based on the available information. If the information is complete, the methods coincide with arbitrage-pricing methods. The second session ended after a very active discussion with various members of the audience. A beer and wine social hour on the patio concluded the symposium activities for the day.

Professor James C. Hickman opened the third session Friday morning. The “actuarial bridge” is not one bridge, Dr. Hickman explained. This session illustrated three such “bridges,” which allow for interaction of actuarial and financial theory and practice. Arbitrage pricing was conveniently stated in terms of a Martingale measure. In the final session, Hans Gerber and Elias Shiu revealed a surprising use of an old actuarial technique—the Esscher transformation of a loss distribution can be applied to the distribution of returns of a security to easily obtain an explicit representation of

an equivalent Martingale measure. Their presentation was based on work that won the Annual Prize of the Society of Actuaries and the Halmstead Prize of the Actuarial Education and Research Fund.

In applying arbitrage pricing to insurance products, or more generally, in simulating blocks of insurance business, getting a reasonable model of the term structure of interest rates is often the most important step. In the second presentation, Graham gave an overview of several of the principal approaches to term structure modeling. Several of the methods are currently used in financial and actuarial pricing and reserving. Dr. Lord demonstrated some of the difficulties encountered in applying these methods to practical problems. Asset liability management is a key application of term structure modeling. Frank Sabatini surveyed the key elements of asset liability management, emphasizing life insurance business. The typical life company is faced with what he described as a short straddle challenge.

The symposium ended with a final audience discussion on the interaction of finance and insurance that is fostered by actuarial science.

The symposium was above all intended to promote an understanding of the basic ideas of securitization and to discuss the fundamentals of new emerging products. The interaction between innovations in the financial markets and the needs of the insurance sector has been an excellent topic for bringing financial specialists and actuaries closer together so that they can learn from each other.