

Appendix B: Presentations on This Research

New Zealand University

(Presentation given; details to be added.)

CAS Basic DFA Limited Attendance Seminar, Washington, DC, July 2003

A brief reference to the project, along with a description of research highlights, was provided.

Actuarial Research Conference, Ann Arbor, MI, August 2003

The PowerPoint presentation is included in this report as Appendix B-1. An abstract of presentation that was made follows:

The Casualty Actuarial Society and the Society of Actuaries are co-sponsoring research involving the modeling of economic series. This research is important for generating reasonable future economic and financial scenarios, and has critical implications for dynamic financial analysis and cash flow testing. An essential aspect of this research involves determining the interdependencies between the various economic and financial series, especially, but not exclusively, the interrelationships between the different series and interest rates. This session will present a summary of the results and findings of this research, and will provide a description of how the results can be utilized by academics and actuarial practitioners.

American Risk & Insurance Association Annual Meeting, Denver, CO, August 2003

The following session proposal was accepted for presentation at this meeting:

Financial Scenario Generator Project

Introduction

In April, 2001, the Casualty Actuarial Society (CAS) and the Society of Actuaries (SoA) solicited proposals for research involving the modeling of economic series, including inflation, interest rates, equity returns, dividend yields, real estate returns and unemployment rates. We propose to present the results of our work on this project. This research is important for generating reasonable future economic and financial scenarios, and has critical implications for dynamic financial analysis and cash flow testing. One essential aspect of this research involves the interdependencies between the various economic and financial series, especially the interrelationships between the different economic series and interest rates. We will summarize the key work in this area, present the financial scenario generator model, explain the process for determining the model parameters and describe the results of running the model with the selected parameters.

Literature Review

The key prior work in the area of actuarial modeling of financial variables was performed by Wilkie (1986, 1995) and Hibbert, Mowbray and Trunbull (2001). This project builds on their work, and develops a financial scenario generator model that actuaries and researchers can use in dynamic financial analysis, cash flow testing and regulatory applications. The works of Hull-White (1990, 1994), Vasicek (1977) and Hardy (2001) are incorporated into the model.

Financial Scenario Generator

In this model, inflation and real interest rates are each modeled separately, and then combined to determine the nominal interest rate. Equity returns, real estate returns and the unemployment rate are also modeled separately, but are dependent on the nominal interest rate levels determined previously. Inflation is modeled as a one-factor mean reverting process. Real interest rates are modeled as a two factor mean reverting process. Equity returns are modeled by a regime switching process, with two different lognormal distributions used to generate returns. Real estate returns are modeled based on a one factor mean reverting process. Unemployment is modeled as a one factor mean reverting process, with an additional factor representing an inverse relationship to nominal interest rates.

Results

Regardless of the mathematical sophistication of the variables incorporated in a model, the accuracy of the calibration process used to determine the parameters, and the timeliness of the values on which the calibration is based, the most important test of the validity of any model is the reasonability of the results. This section will examine the results of a representative run of the model and compare these results with historical values for interest rates, inflation, stock and real estate returns, dividend yields and unemployment rates.

The model was run using the base parameters to generate 5000 iterations. The results are presented in a variety of different ways to allow individuals wanting to apply the model to understand the usefulness of this approach. Summary statistics, correlation matrices, funnel of doubt graphs, comparison graphs showing model and historical values are all presented to show the reasonability and accuracy the model can provide.

Conclusion

Insurance companies and other financial institutions require models that can generate realistic values for key variables that affect operating results, assets and liabilities. The values must be able to be projected over a long time horizon, be internally consistent and be fully understood by the individuals responsible for applying them within organizations. This research represents a step in this process by providing a model of financial variables that are relevant for insurance companies. This model can be calibrated to any historical data set of inflation, interest rates, equity returns, real estate returns or unemployment patterns, representing different countries or different time horizons. Additional variables can be added to the model as needed. The goal is to foster more accurate financial planning for insurers.

CAS Asset-Liability Management / Finance Limited Attendance Seminar, Chicago, IL, September 2003

A brief reference to the project, along with a description of research highlights, was provided.

Western Risk and Insurance Association, January 2004

The PowerPoint presentation is included in this report as Appendix B-2.

Enterprise Risk Management Symposium, Chicago, IL, April 2004

The PowerPoint presentation is included in this report as Appendix B-3.

Actuarial Research Clearing House 2004

The paper is included in this report as Appendix B-4.