LIFE PRACTICE NOTE 1995–8
December 1995

Collateralized Mortgage Obligations

Introduction

This practice note was prepared by a work group organized by the Committee on Life Insurance Financial Reporting of the American Academy of Actuaries. The work group was charged with developing a description of some of the current practices used by valuation actuaries in the United States. This work group was originally formed in 1992 and issued the first set of Life Practice Notes that year; changes have been made to this set of practice notes on an annual basis to reflect additional information on current practices.

The practice notes represent a description of practices believed by the work group to be commonly employed by actuaries in the United States in 1995. The purpose of the practice notes is to assist actuaries who are faced with the requirement of adequacy testing by supplying examples of some of the common approaches to this work. However, no representation of completeness is made; other approaches may also be in common use. It should be recognized that the information contained in the practice notes provides guidance, but is not a definitive statement as to what constitutes generally accepted practice in this area. Moreover, these practice notes are based upon the model Standard Valuation Law of the National Association of Insurance Commissioners (NAIC). To the extent that the laws of a particular state differ from the NAIC model, practices described in these practice notes may not be appropriate for actuarial practice in that state. This practice note has not been promulgated by the Actuarial Standards Board, nor is it binding on any actuary.

The members of the work group responsible for the original practice notes are as follows:

Donna R. Claire, chairperson

Arnold A. Dicke
Douglas C. Doll
Craig F. Likkel
Linn K. Richardson
Henry W. Siegel
Steven A. Smith
Stephen J. Strommen
Charles N. Vest
Michael L. Zurcher

LIFE PRACTICE NOTE 1995–8
December 1995

Additional review for the 1995 Life Practice Notes was provided by the following members of the American Academy of Actuaries' Committee on Life Insurance Financial Reporting:

Donna R. Claire
Andrew R. Creighton
James E. Hohmann
Michael J. O'Connor
Frank W. Podrebarac
Meredith A. Ratajczak
Henry W. Siegel

Comments are welcome as to the appropriateness of the practice notes, desirability of annual updating, validity of substantive disagreements, etc. Comments should be sent to Donna R. Claire at her Directory address.

Q. What are *collateralized mortgage obligations*, and where can general information on them be found?

A. Collateralized mortgage obligations (CMOs) are a broad class of investments that, at the core, are supported by residential mortgage loans. There are many types of CMOs, with various levels of risk. One good source of general information on CMOs is in the *1991 Valuation Actuary Symposium Proceedings*, in two presentations by Randall Lee Boushek and David A. Hall ("CMO Boot Camp: In the Tranches," pp. 107–166; and "Practical Asset/Liability Modeling for CMOs," pp. 331–406); also see F. J. Fabozzi, T. D. Fabozzi, and I. M. Pollack, *Handbook of Fixed Income Securities* (4th ed.), chapter 25.

Q. What are the challenges of projecting CMO cash flows?

A. In the 1990 Valuation Actuary Symposium, Mr. Boushek described CMOs as nothing more than "contrived but uncertain" cash flows. The uncertainty is due to the underlying driver of the cash flows—mortgage payments and the prepayment function. The contrivance is due to (1) the extreme complexity of many CMO structures, (2) the fact that CMO structures differ among various CMOs, and (3) the lack of readily available data on CMO structures at points in time after issue. (At the time of issue, the structure is usually available in the prospectus.)

Q. What typically constitutes an adequate CMO model?

A. The desired sophistication and accuracy of a CMO model used for cash flow projections depends on the relative importance of CMO holdings in the portfolio and the volatility of the CMOs held. An accurate model generally will have, as a minimum, the following model features:

(1) cash flows of the modeled tranche, dependent (if appropriate) on cash flows of other tranches; and (2) prepayment rates dynamic over time as interest rates change.

One method of testing the accuracy of the model is to compare results over different scenarios with the results projected by CMO databases and systems operated by broker/dealers or independent vendors. Two of the vendors are Global Advanced Technologies (GAT) and INTEX. A second method that provides some information is to compare the setup that would have been used 1 year ago with the actual cash flows received in the past year from the CMOs.
For companies with large exposures to CMOs, access to a *live* database of CMO issues can help with the two major problems with building CMO models. The first problem is that the great variety of tranches that exists usually makes it difficult for simple models to accommodate them all. The second problem is the difficulty of maintaining up-to-date data, not only on the tranche owned, but on the other CMO tranches that accompany the tranche owned.

Q. What prepayment assumptions may be used?

A. The actuary generally is not trying to *predict* a specific prepayment rate as much as trying to *correlate* prepayment rates with changes in interest rates and other economic variables. The actuary's primary objective typically is to ensure that the correlations are reasonable. The following is a list of some of the items that the actuary can check for reasonableness:

1. the prepayment rate generally rises as interest rates decrease, and such changes typically follow an S curve (i.e., some additional prepayments with small changes in interest rates form the bottom of the curve; then prepayments accelerate as the difference between the original coupon rates and current market rates widens; and followed by prepayments eventually leveling off at some rate); likewise, the prepayment rate typically slows as interest rates increase;

2. prepayments are generally slower for lower coupon collateral and faster for higher coupon collateral;

3. prepayment rates usually vary by type of collateral (GNMA versus FNMA/FHLMC, 15-year versus 30-year, new versus seasoned mortgages);

4. prepayment rates are usually consistent across CMOs with comparable collateral;

5. prepayment rates for the level-interest-rate scenario bear a reasonable relationship to *street median* PSAs or historical PSAs (PSAs are the Public Security Association Standard Prepayment Model); and

6. prepayments may slow due to the *burn-out factor*—the mortgage holders who watch interest rates prepay when interest rates are first lowered, while those remaining may not react as much to subsequent interest rate changes.

The actuary generally will evaluate the sensitivity of results to the prepayment function. If the prepayment assumption on CMOs is a key assumption in asset adequacy testing, the actuary may wish to perform sensitivity tests.

Q. Are there any additional prepayment considerations when the underlying collateral is based on floating-rate, rather than fixed-rate, mortgages?

A. Base prepayment rates on floating-rate mortgages appear to be higher than those on fixed-rate mortgages. This may be because some floating-rate mortgage holders may just be waiting for the "right" time to convert to a fixed-rate mortgage. Therefore, some actuaries model dynamic prepayments on floating-rate mortgages based on changes in the coupon rates of 15- or 30-year fixed-rate mortgages.

Q. What other assumptions—besides prepayment rates—are necessary to consider for CMOs?

A. Another assumption the actuary may want to evaluate is the sensitivity of indexed tranches (e.g., the floating-rate tranches indexed to the London Interbank Offering Rate (LIBOR)), with regard to the link of the index to the scenario interest rate. In addition, for a CMO that is non-agency backed, a default assumption is needed.

Q. What does the NAIC model *Actuarial Opinion and Memorandum Regulation* require be shown in the actuarial memorandum regarding CMOs?

A. The NAIC's model *Actuarial Opinion and Memorandum Regulation* states that the memorandum should include portfolio descriptions and investment assumptions. Details as to assumptions used in modeling CMOs include the prepayment assumption, and any simplifying assumptions used in modeling the company's CMOs.

Q. Can grouping methods be used for modeling CMOs?

A. Some actuaries have used grouping methods for modeling CMOs. However, some regulators

may request scenario cash flows on an individual CMO basis.

Q. What are some suitable methods of determining the market value of CMOs at a future point in time?

A. The market values of CMOs are usually important if the CMOs are modeled as being sold at a certain point in the future. In order to model the CMO, the actuary usually considers the underlying mortgage and the tranches preceding the CMO tranche owned.

There are currently several methods of modeling the market value of CMOs being used by actuaries. One of these methods is to use option pricing to evaluate the expected market value at each future period used in the testing. Another method is to assume that the interest rates from the point being tested remain level from that point on, evaluate the worth of the underlying mortgage pool, and then determine the market value of the CMO owned.

Q. What are *FLUX scores*, and should they be related to asset adequacy testing?

A. FLUX (FLow Uncertainty indeX) scores are designed to measure the volatility of cash flows from CMOs. The formula used for deriving these numbers was designed by testing expected cash flows of various CMOs under several interest rate paths. The FLUX numbers are available on most major CMO data bases. They are also available to regulators via the State Data Network. However, it is possible that a company with CMOs with a number of high FLUX scores may have additional questions asked by the regulators regarding any cash flow testing done. Actuaries may, therefore, wish to know the FLUX scores of CMOs tested.

Q. Where can further information on CMOs be obtained?

A. In the *Dynamic Financial Condition Analysis Handbook* (Society of Actuaries, 1995), chapter 4, "Analysis of Assets," there is a section on CMOs.