



---

# *EDUCATIONAL NOTE*

---

**C-1 RISK**

**COMMITTEE ON INVESTMENT PRACTICE**

**MAY 1997**

*Ce document est disponible en français*



**Canadian Institute of Actuaries Institut Canadien des Actuaire**

## MEMORANDUM

**To:** All Fellows and Students of the Canadian Institute of Actuaries  
**From:** Simon Curtis  
Committee on Investment Practice  
**Date:** May 2, 1997  
**Subject:** **Educational Note on C-1 Risk**

---

The intention of this educational note is to help the actuary quantify C-1 risk for the purpose of:

- formulating an investment yield assumption, and
- estimating the present value of future losses from C-1 risk

This note updates the C-1 risk materials previously distributed by the Committee on Investment Practice, and reflects regulatory and professional guidelines as of November 1996. It also consolidates the C-1 materials into a single educational note, and replaces the following notes previously distributed to the membership.

- C-1 Risk – Discussion Paper (November 1992)
- C-1 Risk – Discussion Paper (January 1993)
- Draft Guidance Note: Provision for C-1 Risk – Preliminary version (November 1993)
- Draft Guidance Note: Provision for C-1 Risk – Real Estate – Preliminary version (December 1993)
- Draft Guidance Note: Provision for C-1 Risk - Mortgages – Preliminary version (January 1994)
- Guidance Note: Assessment of the Overall C-1 Risk of a Company's Investments (August 1994)
- Draft Guidance Note on Cyclical Credit Loss Exposure (August 1994)

The new consolidated educational note has been subdivided into self-contained sections each dealing with a different aspect of C-1 risk. This is intended to allow the user of this note to quickly find the pertinent sections of the text to address his/her concerns.

The note describes C-1 risks in general, discusses various asset classes and how C-1 risks vary by asset class, and provides a framework for the determination of C-1 risk valuation assumptions (expected losses due to C-1 risk and a margin for adverse deviations). The note also discusses elements to consider in assessing the overall C-1 risk to which the financial entity is exposed, and the relationship between actuarial and accounting provisions.

SC

## TABLE OF CONTENTS

I	<u>Definition of C-1 Risk and Relationship to Other Investment Risks</u> .....	5
II	<u>C-1 Risk Expected Loss Assumptions</u> .....	6
	1. Fixed Income Assets	
	2. Non-Fixed Income Assets	
III	<u>C-1 Risk Margin for Adverse Deviations</u> .....	7
IV	<u>Role of the Actuary and Accountant in Making Provisions for C-1 Risk</u> .....	8
	1. GAAP Considerations	
	2. Relationship of Actuarial and Accounting Provisions	
	3. CICA Handbook, Section 3025	
	4. OSFI Guidelines on Impaired Loans	
	5. Reserving Implications	
V	<u>Considerations for Determining Overall C-1 Risk of a Portfolio</u> .....	11
	1. General	
	2. Asset Class Overview	
	3. Adequacy of the Overall C-1 Risk Provision in Financial Statements	
	4. Cyclical Credit Losses	
	5. Investment Expertise	
	6. Reliance on Investment Advice	
	7. Investment Philosophy	
	8. Diversification and Cumulative Level of Risk	
	9. Internal Consistency	
	10. Territory	
VI	<u>Specific Considerations for Bonds</u> .....	20
	1. The Nature of C-1 Risk in Bonds	
	2. Determination of Expected Cash Flows and Related Considerations	
	3. Determination of Margins for Adverse Deviations Tables & Appendix	
VII	<u>Specific Considerations for Mortgages</u> .....	39
	1. Nature of C-1 Risk in Mortgages	
	2. Material Factors Impacting Company C-1 Risk Loss Experience	
	3. Significant Considerations in Setting C-1 Risk Expected Loss Assumptions and Margins for Adverse Deviations	
	4. Other Considerations	
VIII	<u>Specific Considerations for Common Stock</u> .....	48
	1. Nature of C-1 Risk in Common Stocks	
	2. Determination of Expected Cash Flows	
	3. Determination of Margins for Adverse Deviations	
IX	<u>Specific Considerations for Equity Real Estate</u> .....	53
	1. Nature of C-1 Risk in Real Estate	
	2. How Real Estate Market Values are Set	
	3. Determination of Expected Cash Flows	
	4. Determination of Margins for Adverse Deviations	

---

X	<u>Specific Considerations for Derivatives</u> .....	56
	1. Nature of C-1 Risk in Derivatives	
	2. Managing Derivative C-1 Risk	
	3. Measuring Derivative C-1 Risk Exposure	
	4. Determination of Margins for Adverse Deviations	
XI	<u>Specific Considerations for Asset and Mortgage-Backed Securities</u> .....	62
	1. Nature of C-1 Risk in Securitized Investments	
	2. Overview of Asset-Backed Securities	
	3. Overview of Mortgage-Backed Securities	
	4. C-1 Risk versus C-3 Risk	
	5. Determination of Margins for Adverse Deviations	
XII	<u>Specific Considerations for Strategic and Non-Traditional Investments</u> .....	67
	1. Overview of Other Assets	
	2. How Asset Values are Established	
	3. Determination of Projected Returns/Future Cash Flows	
XIII	<u>Glossary of Key Terminology</u> .....	68

## **I DEFINITION OF C-1 RISK AND THE RELATIONSHIP TO OTHER INVESTMENT RISKS**

C-1 risk is the risk of economic losses due to inherent (natural or involuntary) weaknesses in the asset itself, changes in general market conditions, or a combination of these factors. The concept of C-1 risk addresses the risks on both fixed income and non-fixed income investments.

Fixed income instruments define the obligations of the issuer/borrower in terms of future requirements to pay cash, the amount and timing of which are defined in the terms of the document evidencing the obligation. Note that preferred shares may be considered fixed income instruments though they are not debt. Fixed income investments are essentially debt. Fixed income C-1 risk involves the risk of asset default and also the widening of yield spreads as a result of credit risk.

Non-fixed income investments include common shares, real estate, and subsidiaries. Some assets, such as mortgages, may be set up as fixed income assets, but may subsequently become non-fixed income assets if they are foreclosed. Non-fixed income C-1 risk involves the risk of decreasing market values, and the consequent potential need to disinvest such assets at low market values, as well as the risk of reduced cash flows and horizon values (asset values at end of projection period) on these investments.

C-1 risk affects investment return, which is critical to actuarial and financial applications, including:

- The valuation of most policy liabilities for life or property and casualty insurers
- The valuation of pension liabilities
- Dynamic capital adequacy testing for life or property and casualty insurers
- Pricing insurance policies and acquisitions
- Optimizing asset mix in an investment portfolio
- Financial planning

There are four major risks attaching to asset cash flows and therefore investment return.

### **1. C-1 Risk**

### **2. C-3 Risk (Risk of Interest Rate Swings)**

C-3 risk refers to the risk of economic losses arising from the disinvestment or reinvestment of cash flows in different interest rate environments. It is sometimes called “mismatch” risk because it is often associated with the interaction between assets and liabilities.

### **3. Liquidity Risk**

Liquidity risk refers to the risk of cash being demanded in unexpected amounts by policyholders or borrowers with commitments, where these cash demands must be funded by forced asset sales or by additional borrowing to the extent that the financial entity’s solvency may be threatened.

### **4. Foreign Investment Risks**

This risk involves the currency, regulatory and sovereign risks associated with foreign investment.

While the content of this note is general to most investment environments, the note is written with particular emphasis on the Canadian context.

When quantifying C-1 risk, the focus may vary according to the type of application and/or type of financial entity the actuary is valuing. For example, the approach to assessing future asset default losses in a pension plan valuation may differ from a life insurance valuation. Nevertheless, the actuary should be aware of and recognize credit risk losses to the extent required by the valuation standards applicable to the financial entity being valued. Material issued by the Office of the Superintendent of Financial Institutions (OSFI) is normally applicable to all federally regulated financial institutions.

Guidance with respect to C-3 risk may be found in the educational note issued by the CIA in June 1995 entitled *Measurement of Exposure to Interest Rate Risk* as well as CIA Valuation Technique Papers 3

and 9, the *Provision for Adverse Deviation* paper, and elsewhere. Guidance with respect to liquidity risk may be found in the educational note issued by the CIA in March 1996 entitled *Liquidity Risk Measurement*.

While a distinction can be drawn between C-1, C-3, liquidity and foreign investment risk, these asset risks are subject to interactions which the appointed actuary should not overlook. For example, there are C-3 risk mismatch effects that result from the disruption of cash flow due to C-1 risk asset depreciation. This interaction could be captured in an integrated cash flow testing analysis.

As a second example, if cash levels are depleted by liquidity risk, asset sales may be triggered. The level of C-1 risk in the portfolio will affect the prices the assets will attract in the market. Assets with greater perceived credit risk, or higher, more volatile spreads may have to be sold at fire sale prices, particularly if the liquidity crisis were stimulated by turbulent economic conditions. This interaction should be taken into account when assessing liquidity risk.

As a final example, attempts to hedge currency risk can be undermined if the underlying asset suffers C-1 risk losses.

## II C-1 RISK EXPECTED LOSS ASSUMPTIONS

C-1 risk must be considered when estimating expected future net cash flow. Expected future cash flow refers to the best estimate of future cash flow projected from the assets in a portfolio. It is instructive to consider cash flows in terms of two types of assets: fixed income assets and non-fixed income assets.

### II.1 FIXED INCOME ASSETS

The expected cash flows for a fixed income asset are partly determined by its “promised cash flows,” which are the cash obligations of the borrower or issuer under the governing financial instrument (bond, mortgage, collateral loan, corporate term loan, consumer loan, long-term lease, mortgage-backed security, etc.). Promised cash flows, such as fixed income investments with embedded options like prepayment or call features, may vary by economic scenario. Expected cash flows for fixed income assets are the promised cash flows reduced by expected losses arising from C-1 risk, which are losses due to a “credit risk event.” A credit risk event includes:

- (i) failure, inability or refusal of the borrower to meet the terms of the instrument, and
- (ii) an actual or anticipated downgrade to credit rating or internal quality rating.

The first credit risk event can arise as a result of failure to make timely payments (delinquency) on account of an insolvency or bankruptcy of the borrower, or a restructuring. Restructuring generally involves the voluntary acceptance by the lender of less favourable future repayment terms (timing, amount or both). It is important that the C-1 risk analysis recognize all additional costs such as unpaid property taxes, administrative and legal costs, as well as the loss of interest and principal associated with non-performance of fixed income instruments.

The latter credit risk event may be preceded or accompanied by a widening of yield spread on a specific asset or class of assets. Yield spreads can widen for a number of reasons, a common cause being due to a perceived deterioration in quality. Alternatively, an increased yield spread may also be explained in terms of a more general risk-return tradeoff. An increase in the expected volatility of the spread produces more risky returns which tend to lead to higher spreads.

There are two possible sources of C-1 risk losses when yield spreads widen on specific performing investments:

- the disposal of the asset at a depreciated price prior to maturity in order to avoid further loss, and
- the opportunity cost associated with portfolio actions taken to offset anticipated or actual downgrades to credit rating or internal quality rating.

For a fixed income investment, the expected economic loss from C-1 risk is the product of the expected frequency of credit risk events and the expected loss severity on the occurrence of the credit risk event.

## II.2 NON-FIXED INCOME ASSETS

For non-fixed income investments, the concept of promised cash flow is not relevant, and so expected cash flows must be arrived at differently. There are two components to consider:

- cash less expenses expected before disposal of the instrument and before the end of the horizon period. This includes such items as dividends, rental income on real estate, ground rents, etc., and
- capital gains/losses on disposal before the end of the horizon period and increase/decrease in economic value of instruments expected to remain in the portfolio at the end of the horizon period.

The deductions that need to be included in recognizing C-1 risk reflect the reduction to the cash flow arising from these two components. The methods for determining future cash flows net of allowances for C-1 risk are addressed in the portions of this note dealing with specific types of investments.

## III C-1 RISK MARGIN FOR ADVERSE DEVIATIONS

The C-1 risk valuation assumption is a combination of expected experience and a margin for adverse deviation (MAD). Margins are required to provide for two possibilities:

- misestimation of the expected mean economic loss, and
- deterioration in the value of the expected mean economic loss.

Margins vary on a continuum from “low” to “high” situations. High margins of misestimation arise when considerable doubt attaches to the reliability of the expected assumption due to inadequate, unreliable or aggressive use of the experience data, recent changes in circumstances, or policies of the entity, etc. High margin situations of deterioration arise when the available experience is too recent (not yet mature), when its relevance is uncertain due to differences in terms and conditions of the new instrument compared to the ones from which the experience was derived, concern that past behaviour of the economy or its sectors cannot be relied on as a good guide to the future, uncertainty as to the rate of cyclicity, antiselection opportunities embedded into financial instruments, etc.

The methods of identifying high or low margin situations for C-1 risk are addressed in the portions of this note dealing with specific types of instruments. Some general concepts, however, are useful to consider here.

Consider first what margins are not meant to provide for: statistical fluctuations and catastrophic risks. It is the role of surplus to absorb these. There appears to exist general understanding and agreement as to what constitutes a catastrophic event, but less unanimity as to how to draw the line between statistical fluctuations and situations of misestimation or determination of the mean economic loss.

When calculating an appropriate margin for a particular asset class, there may be more than one margin component to consider in assessing the overall level of loss. For instance, the expected C-1 risk for mortgages is the product of the expected frequency of the credit risk event and the expected loss severity on the occurrence of the event. In theory, different margins may be appropriate for the assumed frequency of the credit risk event and the loss severity, since the reliability of each assumption may well be different.

The following example is offered as clarification in the case of C-1 risk for fixed income instruments, but the reasoning can be generalized to any risk:

Suppose that we wish to be 95% confident that the value of aggregate cash flow from a portfolio of bonds will not fall below a stated minimum (e.g., the value of liability requirements). We derive a margin level which, given the quality, diversification, and other characteristics of the portfolio and various future economic scenarios will suffice to cover default losses in 95% of the cases. Our initial condition is then satisfied.

It is evident, however, that we cannot be 95% sure that each year’s margin will suffice to cover that year’s default losses because, if we were, then the overall degree of confidence would be much higher than 95%.

So long as conditions have not sufficiently changed, the original margins need not be revised. In that case, the difference between the margin released in a given year and the actual experience of that year is a statistical fluctuation.

Consequently, the process of setting a margin must take into account all relevant contingencies, including the relative volatility of losses, and will result in higher margins where results can be expected to exhibit larger fluctuations. However, once the margin is determined, the difference each year between it and actual experience is added to or deducted from surplus. Moreover, it is inappropriate to revise margins in response to past fluctuations, unless there are grounds for concluding that underlying conditions have changed sufficiently.

The actuary should ensure that the total of the expected assumption and the margin for adverse deviations make adequate provision for C-1 risk losses. Thus, where the expected assumption for C-1 risk losses is set on a more (less) conservative basis, the margin for adverse deviation may need to be set on a less (more) conservative basis in order to achieve the appropriate result. For new asset classes, such as derivatives, where there is little information available regarding expected C-1 risk losses, it would also be appropriate to use more conservative margins.

For life companies, C-1 risk in excess of expected assumptions and MADs is recognized in the minimum continuing capital and surplus (MCCSR) guidelines issued by OSFI. For example, a life company's holdings of impaired mortgages attract an MCCSR factor of  $[35\% \times (\text{outstanding balance} - \text{insured balance}) \text{ less individual allowances}]$ , and restructured mortgages require an MCCSR factor of 15% of the outstanding balance.

The total of the expected C-1 risk assumption and the margin for adverse deviations may be expressed in terms of a basis-point deduction from the yield on an investment in determining the net yield on assets for valuation purposes. The basis-point deduction may vary according to the time elapsed since the valuation date. In a cash flow valuation method (CFVM) approach, the total of the expected assumption and the margin for adverse deviations can be recognized as a deduction from the asset cash flows. A further dollar provision may be added where deemed appropriate.

## **IV ROLE OF THE ACTUARY AND ACCOUNTANT IN MAKING PROVISIONS FOR C-1 RISK**

### **IV.1 GAAP CONSIDERATIONS**

The Insurance Companies Act prescribes GAAP as the basis of statutory reporting for federally licensed insurers, as does the "Loi sur les assurances" in the case of insurers licensed in Québec. GAAP is codified in the Handbook of the Canadian Institute of Chartered Accountants. Section 4210 of the Handbook covers the general application of GAAP to life insurance companies. Section 3025 of the Handbook establishes explicit standards for the recognition, measurement, presentation, and disclosure of impaired loans, restructured loans, and foreclosed assets under Canadian GAAP. OSFI's "Guideline on Impaired Loans" provides federally regulated financial institutions with application guidance to Section 3025.

GAAP is generally concerned with the fair reporting of income by period. GAAP prohibits the artificial and arbitrary smoothing of income, and requires that the income impact of events should be capitalized into earnings as soon as the event is identified and quantifiable.

### **IV.2 RELATIONSHIP OF ACTUARIAL AND ACCOUNTING PROVISIONS**

Historically with respect to assets, the primary responsibility of the actuary was to provide for losses from future events, while the accountant, on the basis of management estimates, provided for losses on assets on account of events that have already occurred (even if their precise impact is not yet clear). In practice, this delineation was often made by having the accountant make provisions only for losses fully assignable to specific assets, while the actuary made provisions in the reserves for non-asset-specific losses. The recently enacted Section 3025 of the CICA Handbook (1995) now explicitly requires the accountant to make provisions for expected losses on non-asset-specific impairments where there has been a deteriora-



tion in credit quality or any other event that materially changes the credit outlook for an asset class. As a result, accounting provisions may be reflected as actual asset writedowns, as provisions against specific assets, or as general provisions taken against groups of assets. This means that the potential for confusion in what is covered in “actuarial” provisions versus what is covered in “accounting” provisions is increased.

Between the actuarial and accounting provisions, all expected losses from C-1 risk should be provided for. The actuary must consult with the accountant to understand clearly what provision the latter has set up, what methodology was used, and to ensure that the total provision is adequate. Should the actuary feel that the provision for past losses may be inadequate, after discussion, it may be proper to strengthen the future provision in the actuarial liabilities to compensate therefore.

### **IV.3 CICA HANDBOOK, SECTION 3025**

Section 3025 covers recommendations for treatment of impaired loans, restructured loans, and foreclosed assets. The key principals of the section are:

- Reductions in carrying amounts should be recognized as an earnings charge from an asset perspective in the period in which an impairment is identified, which should be as events causing changes in conditions occur.
- There should be recognition of impairment for groups of loans when there has been a deterioration of credit quality for the group as a whole, when that is not adequately reflected in identified individual impaired loans.
- Arrears of payments is not necessarily a precondition for recognition of impairment.

Changes in economic conditions as well as general economic trends and the impact of specific events that cause credit deterioration are sufficient conditions for recognition of impairment.

Other key points from Section 3025 include the following:

- A loan can be recognized as impaired even when ultimate collection of principal is not at risk (e.g., payment delays, changes in payment timing).
- The carrying value for impaired loans should be a discounted value of expected cash flows at the interest rate inherent in the loans, or, if this is not available, the estimated fair value or market value of the underlying security.
- For restructured loans, the same discounted cash flow approach should be used using the effective rate inherent in the loans at the impairment date.
- In estimating the carrying value, the assumptions for future economic conditions should be reasonable and conservative in relation to current conditions, and there should generally not be assumptions of improved conditions.
- Allowances for groups of loans should be replaced by allowances against specific loans as soon as there is adequate information to do this.
- Impaired loans should be revalued each year by the discounted cash flow method.
- Foreclosed assets held for sale should be held at the lower of the recorded investment in the loan foreclosed and the estimated net proceeds from sale.

### **IV.4 OSFI GUIDELINES ON IMPAIRED LOANS**

OSFI issued a guideline dated March 1995 entitled *Guideline on Impaired Loans*, and a letter dated September 19, 1995 addressing the implementation of Section 3025. These deal largely with how to report credit losses (i.e., what lines they should be reported on in the financial statements), but there are some important guidelines around setting the accounting provision included. It is explicitly stated that a seriatim mortgage-by-mortgage discounting approach to calculating impaired values must be used for a significant proportion of the impaired mortgage portfolio when measured by value of loans. In using this approach, the importance of accurately estimating the correct timing of cash flows is emphasized. The guideline also emphasizes that, as a minimum criteria, mortgages that are 90 days or more in arrears should be considered as impaired with certain specific exceptions. The first exception is that they are fully secured with

expected repayment within 180 days from the arrears date, in which case, the arrears period is extended to 180 days. The second case is a government/government agency guaranteed asset, where a 365-day period from the arrears date applies.

#### IV.5 RESERVING IMPLICATIONS

Provisions for C-1 losses on the financial statements can be thought of as having five components:

1. Provisions for expected losses due to existing credit impairments as reflected in accounting provisions

An existing credit impairment is an expected loss caused by a current period or previous period event. Under Section 3025 of the CICA standards, this includes the impact of a change in economic conditions, economic trends, and other specific events on credit worthiness/value. This can include provisions both assignable to specific securities, and more general provisions not assignable to specific securities.

2. Additional provisions, if any, made by the actuary for expected losses due to existing credit impairments in reserves
3. Provisions for expected losses due to future credit impairments made by the actuary in reserves
4. Margins for adverse deviations in reserves

The reserve MADS provide for misestimation and deterioration of the expected estimate.

5. Required MCCSR capital for credit losses

The required capital factors cover unusual fluctuations in the losses and catastrophic events.

The actuary and accountant should work together with the appropriate investment professionals to develop internally consistent sets of C-1 loss assumptions, reflecting current and projected future conditions, for use in all aspects of financial reporting. Procedures should be established to verify the completeness and consistency of the C-1 loss assumptions.

Appropriately reflecting expected C-1 losses in reserves (i.e., items 1, 2 and 3 above) depends upon the calculation method:

- Where a cash flow valuation method is used, the asset cash flows within the valuation should be modified to reflect expected C-1 losses (i.e., items 1, 2, and 3). Under the cash flow valuation method, it is the C-1 loss assumptions that the actuary explicitly reflects in the asset cash flows that affect income and surplus. The act of establishing accounting provisions will not directly impact income and surplus unless these are reflected in the cash flows used by the actuary in the reserve calculation. *If the actuary fails to reflect any of these amounts in the asset cash flow projections used in the reserve calculations, surplus and income may be misstated.*

As a simple example, assume that, before any writedown considerations, specific assets with a book value of \$100 produce just sufficient cash flow to support the liabilities on an after-PAD basis. The reserve held would be \$100. If a \$10 accounting writedown is then placed against these assets, but the actuary does not reflect this writedown in the assumed asset cash flows, the asset value and the reserve both drop to \$90, since the modelled cash flow is still sufficient to support the liabilities. If the actuary had reflected the writedown in the assumed asset cash flows, the original asset balance would no longer generate sufficient cash flows to support the liabilities, requiring the actuary to allocate further assets, most likely with book value close to \$10, and, therefore, leading to a reserve close to, if not equal to, the original \$100.

- Where a cash flow valuation is not used and the investment assumption is handled via the discounting assumption, the discounting assumption should be modified to reflect items 2 and 3 above. Item 1 does not need to be reflected in the discounting assumption as it will automatically be reflected via having a lower asset value.

In assessing the future financial condition of an enterprise, the investment income expected to be earned on surplus assets is a critical assumption. Where those assets are bonds, provision for C-1 losses may be made in the same way as described above for reserves by an appropriate reduction in promised yield or promised cash flow.

## V CONSIDERATIONS FOR DETERMINING OVERALL C-1 RISK OF A PORTFOLIO

### V.1 GENERAL

This section deals with the assessment of the overall C-1 risk and should be read in conjunction with the sections dealing with specific types of investments and specific considerations.

The investment review should make a distinction between publicly quoted assets such as bonds and equities, and those that are not, since publicly quoted assets have readily available market values that should reflect changes in credit loss risk. However, those assets that are not widely traded are less likely to reflect changes in credit loss risk through a widening of yield spreads. Mortgages, real estate and private placements are dependent on the internal controls of the financial entity for the assessment of value and risk. When assets are valued at market, the C-1 risk may already be included, but a spread above the government bond rate may mean that additional provisions for C-1 risk are required.

Initially, expected C-1 risk assumptions are determined for each specific class of assets. To test the adequacy of the overall C-1 risk provisions, the first step would be to gauge the overall quality of the portfolio by:

- Reviewing the financial entity's investment philosophy and expertise
- Credit loss management philosophy
- Investment experience and history
- Diversification
- Risk tolerance and the vulnerability of the assets

The results of this overview would then be considered in conjunction with:

- The previous, current and expected future credit loss experience of the portfolio
- Industry credit loss experience
- The expertise, experience and aggressiveness of investment staff
- The availability and credibility of investment data regarding C-1 risk
- Recent changes to the financial entity's asset mix and the ability of investment staff to handle them
- The expected C-1 risk assumptions initially allocated in respect of the various assets
- Drift in asset quality over time
- Correlation of asset classes

Professional judgment is necessary to reconcile this information and determine the appropriateness of the expected C-1 risk assumptions, and, where relevant, the MADs chosen. Initially, the actuary would approach this review on a macro level, surveying broad asset classes to the extent such assets are included in the overall asset portfolio.

Vulnerable assets require special attention. Since vulnerable assets will have a greater potential for credit losses, this should be recognized in establishing the overall C-1 risk provision, especially when such vulnerable assets form a material portion of a financial entity's investments. Depending on the economic circumstances, some asset classes may be more prone than others to such vulnerability. Where vulnerable assets form a material portion of a financial entity's assets or surplus, the actuary would be required to examine such assets in more detail.

In reviewing the overall portfolio, the actuary should guard against complacency. There can be no certainty that asset categories which have caused no problems in the past will maintain such stability in the future. For example, construction loans may have been problem-free in the past, but this does not guarantee that there will be no future distress.

Future difficulties may result from external factors affecting the asset class (e.g., a changing economic climate), but could also be caused by internal factors, such as a change in the financial entity's underwriting standards or expertise. It is important to be aware of economic trends and to be kept well-informed of

changes in the financial entity's investment philosophy and asset selection criteria. The actuary should also consider the level of investment optimism within the entity in relation to the general economic climate.

It is important to be aware of the actual loss experience to date on the asset portfolio, and of expected trends in the credit loss experience, recognizing that longer assets have a greater potential for credit loss over the term of the investment. Low quality investments are more likely to experience greater credit loss risk in the early years, whereas for high quality investments the credit loss risk may increase over time.

Periodic audits should be carried out, usually by the internal audit department, to ensure that there is compliance with the financial entity's policies and procedures established to provide for an effective loss management process and keep credit losses to a minimum. The actuary should be aware of the audit results.

## V.2 ASSET CLASS OVERVIEW

This educational note contains separate sections covering each of bonds, mortgages, common stocks, real estate, derivatives, securitized obligations, and strategic and non-traditional investments in detail. A high level overview of some of the key considerations for these asset classes is given below.

In Canada, recent experience has shown that when insurance companies experienced financial difficulties, the primary cause was attributable to problems associated with **mortgages** and the **real estate** market.

Several lessons regarding these asset classes can be learned from reviewing the experience of the downturn in the early 1990's in the mortgage and real estate markets:

- Weak underwriting and selection practices do increase mortgage losses.
- Even well-underwritten properties can default in a severe downturn (i.e., no one should be complacent).
- Writing mortgages in clusters (i.e., large volumes over a limited time period) can also substantially increase default volatility.
- An annual review process for all loans is essential.
- Dependable watchlists of problem loans developed from the review processes are very useful in identifying loans likely to default and in helping quantify appropriate loan loss provisions.
- Effective workout teams that allow a company to deal proactively with weak loans give companies more flexibility in dealing with these loans, and can reduce losses.

For all asset classes, the actuary should be familiar with the asset rating system employed by the financial entity. The financial entity's board-approved (or trustee-approved) investment policy statement should lay out the criteria for establishing internal loan/security ratings, and the internal compliance function should ensure that ratings are established and maintained in accordance with that policy.

A good asset rating system is crucial for **bonds**. For publicly quoted bonds, if these are rated internally, the ratings should be reviewed frequently and should be comparable with ratings provided by rating services. If private placements are held, the internal rating system should be part of the financial entity's investment policy guidelines. Assets that are not publicly quoted may require careful review in terms of value and risk. If any such assets belong to a class of assets that appears to be more subject to risk in the current economic environment, a more conservative approach may be warranted given the uncertain future.

**Derivatives** are attracting more attention from investment managers as well as regulators. In determining the level of C-1 risk related to derivatives, the following questions should be answered:

- Are derivatives held to hedge risks or for speculation?
- What is the quality of all the counterparties?
- How complex are the contracts?
- How large are the exposures on individual contracts?
- What is the rating of the counterparties?
- What is the current and potential credit exposure?

- Are there credit enhancing features such as periodic settlement or collateral?
- How effective is the credit risk management?

Additional information on derivatives may be found in the Group of 30 Report, the OSFI *Guidelines on Derivatives* (best practices issued in May 1995 and disclosure issued in October 1995), and the note on the *Management, Risks, Regulation and Accounting of Derivatives* issued by the Committee on Investment Practice of the CIA in March 1996.

Credit loss risks may take different forms. For example, foreign asset credit losses may be affected by varying currency values. The actuary should be informed of the credit risk attached to any hedging of such risks as well as the possibility that currency risk exposures could materialize if hedged investments default.

**Leasing** contracts may contain unusual credit loss risks. There are discount leases which are essentially term loans to finance the acquisition of equipment by leasing companies, and security is provided by an assignment of lease payments and a security interest in the equipment. Where a large bullet payment is due at the end of the leasing period, there is a risk that the equipment's depreciation schedule may differ substantially from the principal inherent in the lease payments, resulting in the bullet not being paid. Alternatively, in operating leases, the financial entity has title to the asset and directly leases the asset to a third party, with or without purchase options or obligations at maturity. The credit managers should provide the actuary with a summary of the nature of risks taken and expectations regarding credit risk events.

When determining the C-1 risk related to **securitized assets**, the actuary should:

- Be informed which assets are securitized.
- Assess each mortgage-backed security separately.
- Quantify potential risk using all information including the individual prospectus.
- Be aware of the extent to which C-1 risk is limited by insurance.
- Ensure that the providers of risk information have clear instructions on the distinction between C-1 risk and C-3 risk.

The OSFI guideline issued in July 1994 entitled *Guideline for Asset Securitization* deals with asset securitization transactions and other types of asset transfers with recourse. An OSFI guideline issued in July 1992 entitled *Accounting for NHA-insured Mortgage-backed Securities* addresses some issues related to insured mortgages that are securitized.

With regard to **subsidiaries**, the actuary should consider the legal status and degree of subordination of support provided by the parent financial entity, the impact of changing values of subsidiaries, and of asset credit losses within subsidiaries when reviewing the overall C-1 risk provision. Further information is available in the *Guidance Note on Strategic Investments* issued by the CIA Task Force Report on Strategic Investments in September 1994.

### **V.3 ADEQUACY OF THE OVERALL C-1 RISK PROVISION IN FINANCIAL STATEMENTS**

Sections 3025 and 4210 of the CICA Handbook (discussed in Section IV.1) may affect the distribution of the overall C-1 risk between the accounting and reserve provisions. Nevertheless, total losses from C-1 risk, including losses associated with assets backing both liabilities and surplus, should be fully covered when accounting provisions and reserve provisions are considered together. Reference may also be made to the OSFI guideline issued in March 1995 entitled *Guideline on Impaired Loans* and an OSFI letter dated September 19, 1995 addressing the implementation of new impaired loans policy, when dealing with financial entities covered by the guideline.

Although the assets held in surplus are not accorded the same C-1 risk treatment as assets supporting liabilities, they are expected to be available to cover losses in excess of those provided for by the normal expected C-1 risk assumptions and MADs included in the valuation process. If the assets held in surplus are considered subject to rates of credit loss in excess of the normal range, the impact of high loss scenarios should be tested as part of the DCAT process. Any additional risk (including liquidity risk) may

be dealt with by setting up a supplementary investment provision and/or adding an additional surplus requirement when looking at minimum surplus requirements. The actuary should also consider the appropriateness of the assets in surplus (in terms of cash flows and liquidity) if these are needed in the modelling to replace an asset, allocated to liabilities, that suffers an economic loss.

Total C-1 risk provisions for each class of assets are established based on the general characteristics of the assets in the class. The initial assessment of the overall C-1 risk provision would be equal to the sum of the C-1 risk provisions of the component asset classes. To this initial overall provision, adjustments should be made for those factors discussed in this note that would affect the component C-1 risk provisions. An example of an adjustment would be a situation in which concentration was found across asset classes; in this case, an increase in the C-1 risk provision would be required.

If the financial entity holds a material quantity of vulnerable assets, the overall dollar value of C-1 risk provisions should be sufficient to cover the present value of credit losses expected from those vulnerable assets, as well as a reasonable C-1 risk provision for the remaining satisfactory assets. If this is not the case, increases in the C-1 risk provision would be required.

The total C-1 risk provisions released in the most recent year should be compared with the actual credit losses incurred during the same period. This would provide feedback regarding the accuracy of the assumptions made regarding credit losses in that year, and indicate possible changes, while recognizing the inherent variability in credit losses from year to year resulting from such factors as a relatively small population and the impact of variations in the size of assets. Tracking the actual credit losses over time may also assist in the provision for cyclicity. It is unlikely that the total overall provision would, in practice, be less than the sum of the provisions in separate classes.

Differences in asset holdings within a class may have an impact on credit loss factors used, as would the particular circumstances of the financial entity. The actuary should also consider the ability of the total C-1 risk provision to cover credit losses occurring in an area of high concentration or with respect to a large asset holding. Further testing of the adequacy of the overall C-1 risk provision may be made using cash flows and scenarios reflecting variations in the incidence and extent of cash flow shortfalls resulting from expected defaults.

A review of industry statistics on asset holdings and credit loss factors used may provide guidance as to the appropriateness of the total C-1 risk provisions being considered. Source material includes:

- Moody's and Standard and Poor's bond default studies
- The Society of Actuaries' recent credit loss studies published in *Reports of Mortality, Morbidity and Other Experience*
- The CIA's latest survey of life insurance companies C-1 risk practices and provisions

However, caution should be exercised in applying the results of these studies or the CIA survey. Even if a particular asset portfolio appears to be "average," the actuary cannot assume that an average C-1 risk provision taken from the survey is necessarily appropriate. For example, the appropriateness of the average C-1 risk provision for a mortgage portfolio will be dependent on many factors, such as:

- The size and reliability of the watchlist and how it is managed
- The nature of the particular properties on the watchlist
- Expertise of the workout group
- Concentration
- Underwriting standards
- Certain environmental trends such as leasing rates and vacancy rates
- Trends in default rates and losses

These factors account for the large standard deviations reflected in the results of the CIA survey. The trend of losses sustained to date may assist in gauging the cyclicity of the loss experience. However, historical information is not necessarily a guide to future experience.

This note deals with the narrow definition of C-1 risk. Nevertheless, it is important for the actuary to ensure that all types of risk are covered in the reserving process, or are part of the DCAT analysis, if applicable. For example, liquidity risks may be substantial, yet it may not be clear where provisions for such risks should be held. Additional information on liquidity is provided in the educational note entitled *Liquidity Risk Measurement* issued by the CIA Committee on Investment Practice in March 1996.

#### V.4 CYCLICAL CREDIT LOSSES

Cyclical credit loss exposure is the tendency of credit loss rates in certain asset classes to show cyclical behavior. This behavior is generally characterized by recurring patterns of long periods of low credit loss rates followed by shorter periods of higher credit loss rates (i.e., spikes). Cyclical credit loss behavior is not the same as credit loss volatility. Credit loss volatility may be either cyclical or more random in nature. Cyclical credit losses tend to be linked to some recurring phenomena, primarily different stages in the recurring economic cycle, while randomly volatile credit loss rates lack this linkage. While frequency and duration of credit loss spikes are often consistent from cycle to cycle, the severity is often quite variable both between cycles, and between companies.

Because abundant evidence exists that, for certain asset classes, C-1 risk losses increase during or following bouts of economic adversity, it is important for actuaries to consider at least the near term economic outlook and ensure that assumptions are appropriate. Consideration of the near term economic outlook requires an assessment of the position of the economy in the general business cycle. As asset classes and sectors vary in their response to the business cycle, and recessions in particular, it is useful to review the behaviour of different asset classes under conditions of economic adversity.

In looking at the different asset classes, the following summary observations can be made:

- Publicly Traded Investment Grade Bonds
  - ratings drift has cyclical tendencies
  - credit loss rates for different ratings are reasonably consistent
- Publicly Traded High Yield Bonds
  - clearly volatile credit experience
  - newness of asset class makes it difficult to determine if cyclical
- Private Placement Bonds
  - historically quite stable, but nature of asset class is changing
- Commercial Mortgages
  - credit losses show clear cyclical behavior
  - experience tends to deteriorate slowly, and the impact generally lags the onset of a recession by up to two years
- Residential Mortgages
  - credit losses show cyclical behavior, but the magnitude of the spikes tends to be lower than commercial mortgages

The area with the greatest potential for gaps/overlaps between the actuarial and accounting provisioning is in the area of provisioning for credit losses, most specifically in the provisions for expected credit losses that are not asset-specific. GAAP standards through Section 3025 state that expected credit losses should be expensed (i.e., capitalized into earnings) on an existing asset portfolio as soon as the impact of a change in economic conditions/trends or a specific event can be reasonably assessed, even when these are not asset-specific.

During high credit loss periods for cyclical asset classes, the actuary must understand to what extent the accounting provisions make sufficient allowances for these losses in future years on the existing portfolio. In addressing this issue, key questions for the actuary include:

- How broadly does the accountant apply non-asset-specific writedowns to cover these losses?
- How far into the future does the accountant look in determining writedown provisions?

- How conservative is the accountant in determining impaired amounts?
- Does the accountant make full provision for these losses, or only unusual losses above a base long-term average level?

To the extent that the accounting provisions do not, in the actuary's judgment, make sufficient allowance for the expected cyclical losses, the actuary should accordingly make additional provisions in the reserves (i.e., item 2 in the reserve components described in Section IV.5). Good actuarial practice requires the actuary to use best-estimate assumptions for each cash flow assumption at each valuation date regardless of the amounts specifically recognized by the accounting provisions taken.

A practical approach to undertaking this analysis and establishing appropriate total provisions for an asset class is as follows: First, estimate the long-term levelized average annual credit loss rate for an asset class over the full economic cycle. This becomes the base allowance for future credit loss events in the valuation (item 3 in the reserve components described in Section IV.5). The second step would be to pick a shorter horizon (e.g., three to five years) and analyze in detail the expected credit loss experience over this horizon. The amount needed to cover the excess of the short-term expected losses over the long-term levelized average annual credit loss rates are identified. These amounts are then compared to the amounts embedded in the accounting provisions for credit losses. To the extent that these short-term losses are not adequately covered by the loss amounts embedded in the accounting provisions, additional loss provisions should be established in the reserves (i.e., item 2 amounts in the reserve components described in Section IV.5).

Overall, the total of the actuarial and accounting provisions being held should then be sufficient to cover expected C-1 risk losses due to current or past events assignable to individual specific existing assets, expected losses due to current or past events not yet assignable to specific existing assets, and expected losses due to events not yet taken place.

Theoretically, in calculating the longer term credit losses due to future events, the actuary could use a cyclical assumption in this area instead of using the long-term levelized annual credit loss rate. This requires a lot of judgment and expertise on the part of the actuary. If done properly, a reserve would be built up gradually over an economic cycle that would then be released to offset the credit losses during a default spike. Unfortunately, there is limited current actuarial expertise in this area, and so it is a difficult approach to apply in practice. It requires the actuary to develop indicators that allow the actuary to estimate with confidence the longer cyclical credit loss outlook. As an alternative, during periods of good experience in the economic cycle, the actuary may wish to consider increasing the long-term expected loss assumption in anticipation of the next cyclical deterioration in experience.

Actuaries may be tempted to utilize a fluctuation reserve approach to overcome the computational difficulties highlighted above. It should be noted that, under GAAP, a reserve method that simply accumulates the difference between the long-term average credit loss assumption and the actual period-by-period credit losses in a fluctuation reserve is inappropriate since there is arbitrary smoothing of income taking place.

The credit loss spikes of cyclical asset classes can have substantial impacts on income, surplus, and liquidity, regardless of valuation method:

- Credit loss spikes usually lead to substantial negative income fluctuations, either at time of actual loss, or at the time provisions against loss are established (unless these provisions have been built up gradually).
- The surprise element and unpredictability of these losses is greater if the company ignores cyclical exposure in its reserving/asset provisioning practices.
- Credit loss spikes can lead to liquidity concerns. Restructured or nonperforming loans can be difficult to sell unless a company is willing to suffer a substantial loss.
- During credit loss spikes, the downturn in earnings that usually results from the spikes can make new capital difficult to raise.
- Regulatory required capital will likely increase during periods of credit loss spikes due to asset restructuring and nonperforming asset required capital factors.



There is a general risk that, over the economic cycle, companies will overweight recent emerging experience and reduce margins as good experience emerges, rather than increase margins as the cyclical nature of credit losses would suggest should generally be done. There are repeated examples across the financial services industry of companies that are under-capitalized and under-provisioned to meet the cyclical spikes of credit loss experience on cyclical asset classes despite pre-existing evidence of their cyclical nature (e.g., commercial mortgages).

The several different ways that credit losses can impact the financial health of an organization as highlighted above serve to emphasize the importance of stress testing adverse credit loss scenarios in dynamic capital adequacy testing and other organizational financial modelling. This type of analysis is critical to understanding an organization's ability to cope with the implications of asset credit losses.

## **V.5 INVESTMENT EXPERTISE**

Investment expertise is an important element in the assessment of overall C-1 risk. The actuary should make an assessment of the level of investment expertise for each asset class and in respect of vulnerable assets. This expertise includes the investment area's ability to underwrite new investments and to avoid and minimize losses on the existing portfolio. The actuary should know when there has been a loss of expertise. If the company introduces a new investment category or materially increases its exposure to an existing investment category, the level of investment expertise will need to be reassessed.

In general, it is the presence of aggressiveness and complacency rather than the absence of expertise and experience that may lead investment professionals to ignore and bypass appropriate investment guidelines. It is important that the actuary show the investment professionals how their decisions affect actuarial liabilities and hence the overall profitability of the financial entity.

Investment staff should be able to demonstrate skills in their area of practice. Expertise would require not only a thorough technical understanding of the various assets, but hands-on experience with such assets in good as well as bad times.

Staff dealing with mortgages should not only have good underwriting skills, but maintain proper, up-to-date documentation for each mortgage, with pertinent, current information such as vacancy rates, lease expiry dates, and debt income coverage readily available. Dealing with deteriorating assets requires a skill set different from that required to manage fully performing assets. The workout team should be proactive in dealing with assets on the watchlist and make every effort to minimize potential losses. In addition, the total resources available to manage credit loss risk is important: if the number of vulnerable assets increase, more resources would be required to mitigate losses. The level of expertise would have an influence on the overall C-1 risk provision required.

The more proactive the investment area is in terms of predetermining changes in the value of assets and acting on such findings, the less the actuary should have to provide for such changes. Knowledge of the ranking and quality system used by the investment area would aid in evaluating quality control, as would information on the monitoring system in place. (An aggressive monitoring system would probably give the actuary more comfort.) It is essential to be aware of the internal controls covering staff responsible for derivatives. If the asset mix is changing, a key concern is whether the investment staff have the required level of knowledge and experience to deal with the changes.

Money management may be internally or externally controlled. If it is externally controlled, the persons controlling it should be made aware of the impact of credit loss risk on the actuarial valuation.

## **V.6 RELIANCE ON INVESTMENT ADVICE**

The following comments offer some guidance in interpreting the influence of the investment area on the level of credit losses.

The actuary should:

- Be familiar with the financial entity's investment policies and all supporting documents

- Be provided with the results of all internal audits covering compliance with the investment policies of the financial entity to determine the adequacy of the written policies regarding actuarial requirements, including credit loss risk limitations, and be able to suggest changes to the investment policies
- Ensure that the investment area has a clear understanding regarding the information required by him/her to determine appropriate total provisions for C-1 risk

The actuary should assess his or her degree of confidence in relying on the abilities and knowledge of investment staff, including such areas as projecting cash flows (e.g., real estate, mortgages), projecting defaults and the workout team.

The CIA has periodically carried out a *Survey of Appointed Actuaries of Life Insurance Companies Concerning C-1 Risk Practices and Provisions*. These surveys present the range of total C-1 risk provisions established by participating companies for bonds and mortgages. Because the standard deviations are often large, the results of a comparison of the financial entity's recent credit loss rates with the survey's range of total C-1 risk provisions should be viewed with caution, but may cast some light on the quality of the financial entity's asset portfolio and credit loss management. The comparison could be in respect of one or more of the asset classes surveyed, expressing credit loss rates as a number of basis points.

## V.7 INVESTMENT PHILOSOPHY

Since the financial entity's investment objectives (e.g., to maximize income or to protect capital) may influence the level of risk in the portfolio, knowledge of such objectives is important. The actuary should provide for any investment policies likely to produce additional risks.

The actuary should be familiar with the financial entity's written policy governing investment activities, to ensure that it is consistent with the actuarial assumptions made. This written policy may also indicate some aspects of the financial entity's investment philosophy. However, not all investment objectives may be clearly stated in the written investment policy approved by the board. For instance, the written policy may not address the ability of the institution to absorb potential losses. The existence or lack of particular investment policies may cause an unexpected increase in defaults within a specified class of assets. For example, the lack of appropriate underwriting procedures can lead to investments in commercial mortgages that will later produce higher defaults than expected. Regular reports covering investments are submitted to the board's investment committee and the actuary should be apprised of all aspects therein pertaining to credit loss risk.

Legislation may also be pertinent. For example, under Canadian law (Sections 492, 551 and 615(1) of the Insurance Companies Act) the board of directors of an insurance company is required to establish, and the insurance financial entity is required to adhere to, investment and lending policies, standards and procedures that a reasonable and prudent person would apply in respect of a portfolio of investments and loans to avoid undue risk of loss and obtain a reasonable return. OSFI issued a related guideline dated January 1993 entitled *Prudent Person Approach*. Section 244 of An Act Respecting Insurance (Québec) also deals with this topic. The actuary should also note any federal pension legislation and provincial legislation that may be applicable.

## V.8 DIVERSIFICATION AND CUMULATIVE LEVEL OF RISK

The volatility of losses arising from C-1 risk will affect the size of the margin for adverse deviations. A generally accepted technique followed by investors to reduce this volatility in their portfolios is diversification. The purpose is to reduce the variance of net return on the portfolio held, where the portfolio held is a subset of the universe of all possible holdings. Diversification can reduce concentration risk by:

- Number of assets
- Sector
- Asset type
- Geographic region

Diversification can control C-1 risk since it can reduce the variance of losses from C-1 risk without reducing the mean return on the portfolio. This variance reduction can be achieved by each of the following two actions:

- The number of assets within a given category can be increased.
- The number of investment categories can be increased.

The first action reduces non-systematic risk or C-1 risk which is unique to the portfolio. However, diversification is unlikely to reduce C-1 risk which is endemic in a particular asset category. For instance, when the performance of an entire asset class (e.g., real estate), region or the entire economy turns adverse, diversification within that asset class, region or within the whole portfolio will not help.

The second action reduces the correlation between C-1 risk losses within the portfolio and thus reduces the variance of losses from C-1 risk. Depending on the additional investment categories chosen, the expected level of total C-1 risk losses may also be affected.

As to the optimal degree of diversification, this is a balance between reducing the variance of portfolio C-1 risk on the one hand and the cost of acquiring, tracking and disposing of a larger number of individual assets and/or asset categories on the other.

From the perspective of the actuary, the important points are:

- The margin for adverse deviation for C-1 risk should reflect the concentration of risk by region, asset class or number of individual assets.
- The “mean” of the distribution is not determined by degree of diversification but rather depends on economic conditions and types and quality of assets held.

Diversification protects the portfolio from the pitfalls of asset concentration. The primary danger from asset concentration is that changing circumstances could produce far greater credit losses than would arise if assets were diversified. Volatility of credit losses is also a problem associated with concentration. In view of the impact of concentration, concentration limits should be part of the financial entity’s written investment policy. The actuary should be familiar with the financial entity’s concentration limits and should be informed of the results of audits examining the entity’s adherence to the concentration limits set out in the written investment policies.

Concentration can appear in several guises, both obvious and subtle. On a macro level, an example of concentration could be the geographical location of assets, while on a micro level, concentration may arise if several mortgages are issued to a single individual or financial entity, or if there are multiple exposures (i.e., stocks, bonds, private placements, and mortgages) in the same group.

In determining the level of concentration, it is important to review asset holdings, not only of the financial entity and any subsidiaries, but also of the borrowers. Thus, the actuary should be aware of the subsidiary relationships of borrowers in areas such as commercial paper and mortgages. Attention should also be paid to concentration arising from mergers and acquisitions, both within the financial entity and in companies in which investments are made.

The cumulative level of risk would reflect the materiality of vulnerable assets, as well as risks ensuing from a study of the entire asset portfolio, such as concentration and contagion risks. Some factors affecting risk may have a synergistic effect. Such a possibility would be more apparent when the overall asset portfolio is considered. For example, areas of concentration that were not apparent when looking at one class of assets could materialize when the portfolio is looked at in its totality.

Even if assets appear to be of high quality, concentration may create strain, as happened in the 1990’s to holders of various mortgage bonds issued by the same group. Concentration should be considered not only in terms of types of assets held by the financial entity, but also in terms of the different forms of lending made to the same borrower or an affiliated group of borrowers. The cumulative level of risk should be contrasted with the capital available, and losses expected from an analysis of specific weak assets.

For information on the asset mix, the total assets should be grouped by class. The default risks involved should be considered when choosing the classes. For example, bonds should be split into federal government, federal government guaranteed, provincial government, provincial government guaranteed and corporates, with each category subdivided according to rating (and public/private placement where applicable). The results may indicate a concentration in an area becoming more susceptible to credit loss. If such potential losses were realized, how well could the surplus cover such losses in excess of the total provision for C-1 risk?

The asset mix could be used in setting the maximum acceptable concentration levels in various markets or jurisdictions. The impact of the business cycle should be recognized in this process, since rapid growth may result in a change in the asset mix, leading to serious consequences if the outcome is concentration in a class of asset susceptible to high credit losses. This happened in the late 1980's and early 1990's when rapid growth led to instances of heavy investments in commercial mortgages. A period of rapid inflation or deflation may also have an impact on the appropriateness of the asset mix.

The sensitivity of the current asset mix may be determined from an examination of the impact on the credit loss experience of different economic scenarios such as changes in interest, inflation, and taxes.

In assessing potential actions to reduce exposure to high risk assets, an important consideration is that a lack of liquidity can make restructuring difficult to implement without incurring large losses.

Losses from concentration risk could arise from environmental risks such as pollution - for example, where a group of mortgages cover gas stations. This situation would be complicated by the legal liability involved. The financial entity would be reluctant to foreclose on polluted properties because of the legal liability for potential environmental problems where the cost to the entity could exceed the value of the property.

There are a variety of possible contagion issues associated with geographical concentrations that may have an impact on credit losses. Examples are natural disasters, political risks (such as the closure of military bases) and industry decline. When there are concentrations of loan activity at certain points in time, there is the potential for collateral values to be temporarily inflated. This was the problem with commercial mortgages issued from 1986-1989, which tended to have much higher credit loss rates and loss severity rates than mortgages issued at other times. The actuary might consider developing an early warning system to identify emerging trends.

## **V.9 INTERNAL CONSISTENCY**

The underlying economic assumptions should be consistent between asset classes. It is inappropriate, for example, to assume that interest rates will rise in respect of one asset class and that they will fall in respect of another, simply because, in each case, that is the adverse scenario. Evident as the principle may be, it is easy for the problem to occur in practice if C-1 (or C-3) risk assumptions are determined separately for each asset class, perhaps even by different people.

## **V.10 TERRITORY**

The actuary should be aware of, and take into account, differences by territory (country) in the contractual provisions and behaviour of different asset classes. The actuary should also be aware that economic cycles often differ by territory both as to severity and timing. Consequently, it will be necessary to separately determine both the expected experience and the margin for adverse deviation for each territory in which the insurer holds significant investments.

# **VI SPECIFIC CONSIDERATIONS FOR BONDS**

## **VI.1 THE NATURE OF C-1 RISK IN BONDS**

A bond is a debt instrument used by corporate entities to finance longer term borrowings. Such entities may be national or other governmental entities, local authorities, para-public corporations and commercial corporations. Certain supra-national entities such as the World Bank and the International Monetary Fund also issue bonds. A bond is usually structured with a fixed date(s) of principal repayment and a stipulated

rate of interest periodically payable on the outstanding balance. The interest rate is more commonly fixed but may be variable, usually on the basis of an index. There may be identified security pledged or there may be no security other than the good faith and credit of the issuer. The latter type are usually called debentures.

Bonds may give the unilateral right to the issuer to prepay at certain times at a pre-stipulated price (referred to as the call right). They may obligate the issuer to repurchase stated amounts of the original issue at stated times, either at a fixed price or by purchase in the open market. This is called a sinking fund provision and its purpose is to enforce an orderly repayment plan. Frequently, such sinking fund provisions optionally allow the borrower to “sink,” that is, repurchase, additional amounts at the same time, up to a stated limit such as equal to, or double, the obligatory repurchase. Call and sinking fund (including optional sinking fund) features constitute primarily a C-3 risk for lenders. They also impact credit risk, however, because only healthy borrowers tend to have the wherewithal or credit rating to take advantage of prepayment rights. Therefore, in a period of falling interest rates, when it is worthwhile to call and refinance, the credit quality of the remaining portfolio tends to deteriorate. The same can happen if the credit ratings of corporations improve because they find they can then borrow at more attractive terms. Call rights tend to be more prevalent and generous in the U.S. than in Canada. Sinking fund features tended to be more common in Canada, but have fallen into disfavour in recent years.

While the material in this section refers to bonds (both publicly traded and private placement), similar credit instruments such as corporate term loans (another name for private placements) and corporate notes may be handled by similar methods. Hybrid debt/equity instruments such as convertible bonds may also be treated the same way for simplicity, by ignoring the conversion feature. Various kinds of specially designed hybrid instruments, ranging from virtual debt to virtual equity, have been proliferating in the U.S. The actuary should be familiar with the terms, behaviour and risks of such instruments, if they constitute a material portion of the portfolio, but their description is beyond the scope of this educational note. Preferred shares have some of the same features as bonds, but are, nonetheless, sufficiently different to necessitate separate treatment.

### **Nature and Purpose of Credit Ratings**

The ability of the issuer of a bond to meet contractual interest and principal payments as they fall due depends on its financial strength and its cash management. Measures of creditworthiness attempt to evaluate this ability. The public rating agencies, such as Standard and Poor's, Moody's, and Duff and Phelps in the U.S., and Canadian Bond Rating Service (CBRS) and Dominion Bond Rating Service (DBRS) in Canada have developed proprietary measuring systems of creditworthiness which they apply to issues of publicly traded debt, whether governmental, para-public or private. Ratings are revised and updated periodically in the attempt to keep them current.

The rating agencies assign a rating to each separate bond issue of an issuer. That is because their ratings are meant to be a combination measure of both the possibility of default and the loss severity on default (this varies by rating agency: for example, S&P concentrates primarily on the probability of default in assigning a rating, while Moody's clearly incorporates the expected loss severity as well). Thus, when an issuer defaults, that default may conceivably not affect all its issues, but if it does, the higher-ranking (“senior”) issues will likely experience lower loss severity than lower-ranking (“junior”) issues. Further complicating matters is that, in the U.S., the legal environment tends to favour equity holders over debt holders. Thus, in the case of default (or even before), companies may seek protection from creditors under the law (“Chapter 11”). The actuary should be aware that the net result of this process may be lower or less timely recovery of the debt than would be the case in Canada.

Lenders active in the private placement markets must largely rely on their own abilities to assess creditworthiness, though they may have access to credit analyses done by investment dealers. Most lenders active in the private placement market develop internal rating systems, but they endeavour to establish rating categories comparable to those of the rating agencies. They frequently also use such internal ratings to assess publicly traded bonds. If this practice is followed, the actuary should be aware of the differences

between the internal and public ratings. This facilitates internal comparisons of creditworthiness and allocation of funds between various purchase possibilities. Private placements can be readily tailored to suit the convenience of both borrowers and lenders. They tend to be issued by smaller borrowing entities than public issues because the costs of conforming to regulatory requirements can only be justified by substantial issue size. Private placements are negotiated by, and between, the borrower and the lender(s) and are subject to no such regulatory requirements.

A relatively new development in the U.S. is the so-called Section 144A private placements. They have the characteristics of private placements in that they are not available in the public markets, but also have characteristics of publicly traded bonds in that they are registered by the SEC, under a procedure that is simpler and less onerous than regular public bonds, and are offered to, and traded by, eligible institutional buyers. These bonds are considerably more liquid than traditional private placements. The tailoring of private placements can include collateral security arrangements, protection against loss on calls (so-called "make whole" provisions), and interest and repayment terms to suit particular circumstances. Collectively, such arrangements can improve the appeal of private placements to the point of being very attractive to larger lenders possessing the sophistication and administrative capacity to negotiate and track such investments. Under such circumstances, their credit performance can be even better than publicly traded bonds. Frequently, private placements are syndicated among several companies. The rating may be jointly assigned in such cases, or it may be assigned by the lead company originating the bond who then offers participation to other companies. The actuary should be aware of who assigned the rating and how consistent that rating is with the company's normal rating system.

In the U.S., virtually all U.S. bonds, including private placements, held by insurance companies are also rated by the Securities Valuation Office (SVO) of the National Association of Insurance Commissioners (NAIC). In the case of new private placement issues, an insurance company would submit a Securities Acquisition Report to the SVO in order to apply for a rating designation. For public issues, the SVO would assign a rating based on ratings assigned by Moody's, and Standard and Poor's. The SVO ratings appear in a book entitled *The Valuation of Securities* published annually by the NAIC.

### **The Meaning of Ratings**

Typical rating categories vary from AAA for the strongest borrowers, through AA, A, BBB, BB, B and CCC. Below CCC, some agencies continue with yet lower ratings (CC and C) while others do not. D stands for a defaulted bond. While the nomenclature may differ, the equivalent rating categories of the various rating agencies tend to represent similar creditworthiness. Categories BBB or higher are collectively referred to as investment grade. The lower categories are variously referred to as speculative, noninvestment grade, high yield or "junk." Each of the major categories are further subdivided into three subcategories, denoted e.g., A+, A and A-. These subcategories are also referred to as notches. Some rating agencies do not subdivide the highest and lowest category (AAA and C or equivalent).

The debt of national governments denominated in their own currencies is considered to be risk-free by definition because such governments possess not only unlimited taxing power (theoretically), but also the power to print money. In fact, even national governments are not 100% risk-free (for example, the U.S. government put a moratorium on the payment of interest on long-term bonds for a brief period in the early 1930's).

The debt of other levels of government is not considered risk-free because, while they possess taxing power, they do not possess the power to create money. Their debt is, therefore, rated. Canadian provinces are rated on scales similar to corporate bonds, but it is the view of the investment community that the ratings are not entirely comparable: a BBB province is considered to be a stronger credit than a BBB corporation. The difference is variously estimated at two to four notches, depending on the province, so that a BBB province would be considered to possess similar risks to a corporation rated A- to A+. Because of the fundamental differences between provincial and corporate obligations, their creditworthiness is difficult to compare directly on the basis of their ratings. The latter are more useful in making comparisons within categories. In fact, no Canadian province has defaulted since the 1930's. Some

consider that provinces carry an implied guarantee because the federal government would not permit a province to default. Note, for example, that the required MCCR component for credit risk is nil on provincial debt. If a province were to experience a credit risk event, it is more likely to manifest itself as a postponement or reduction of coupon(s) due or the maturity value than through an outright full default.

Debt of a number of provincial para-public bodies or crown corporations, such as Ontario Hydro or Hydro-Québec, enjoy provincial guarantees and constitute similar risks to the guarantor. Municipal governments, school boards and similar issues have much more limited taxing powers compared to the senior levels of government. However, their borrowing power is usually also limited both as to purpose (capital projects only, not current spending) and amount (such as may be supported by X% of tax revenues). Defaults on Canadian municipal or like debt are rare. Defaults of U.S. municipal debt have been more common. A significant portion of municipal debt is raised through provincial funding organizations created for this purpose, endowing such debt with at least implied provincial guarantee. The debt of para-public organizations such as hospitals, universities, school boards and the like tends to behave similarly and be subject to similar considerations and constraints as the debt of municipalities.

### **Probability of a Credit Risk Event**

The contention of the rating agencies is that a given rating implies, in good times and bad, the same level of short-term risk. This contention has been roughly confirmed by past U.S. publicly traded bond experience (an exception is that defaults do increase in poor economic times for the lowest rating classes). The experience does, however, tend to fluctuate substantially because there have been relatively few defaults, especially of investment grade securities.

The Canadian public bond market is too small to have developed credible experience. However, the same methodology is used by the rating agencies to assess Canadian debt as U.S. debt. Therefore, there is no *a priori* reason to expect that Canadian debt will exhibit fundamentally different credit loss experience from U.S. debt. A possible exception to this general rule is that portfolio quality degradation due to extensive calls (see Section VI.1) is likely to occur less in Canada.

Because ratings are designed to be indicators of short-term creditworthiness, they tend to be well correlated with yield spread over corresponding term treasuries, sometimes leading, at other times following, the market (i.e., widening of the yield spread may occur as a result of downgrade by the rating agencies, but at other times market spreads may react before formal action by the rating agencies). Actuaries should be aware of the differences between the terms of similar securities in different markets and the way they behave in those markets. While describing them is beyond the scope of this note, if the company is active in territories outside North America, the actuary must acquire the requisite familiarity.

Longer term risk levels change because some firms succeed while others falter. Thus, the ratings of some bonds will improve (an upgrade) while others will worsen (a downgrade). Therefore, over time, the risk attaching to a bond originally issued or purchased at a given rating will change. This phenomenon is referred to as "rating drift," and the probability of moving from one rating class to another in a given time period is referred to as "transition probability" or "transition ratio."

### **Loss Severity on Occurrence of a Credit Risk Event**

The economic loss sustained by the holder of a bond subject to a credit risk event will depend on the nature of the event and the post-event circumstances. For example, it may happen that the failure to pay is due to a temporary or unusual circumstance and is cured relatively quickly. In that case, loss may be minor, if any, probably related to the timing of cash receipts. That, however, is relatively rare. In the case of distress exchanges, which may occur either following or in anticipation of failure to pay contractual interest or principal, the lender agrees to a revision of the contractual terms. This is done in the expectation that such a revision will enable the borrower to survive and lead ultimately to a smaller loss of value than outright default would have produced.

The most common type of credit risk event is that of default. In this case, the borrower's assets become subject to court supervised disposal and the severity of loss will depend on the extent to which the realizable value of the assets of the borrower suffice to cover its debts. The claims of creditors are satisfied in order of a set of priorities set out by the court pursuant to applicable law and the terms of the various credit instruments. All creditors of a particular class must be satisfied before any creditors of a lower ranking class may receive any amount. It is for this reason that lower loss severity may be expected on senior as compared to junior or subordinated debt.

The theoretically correct measure of loss severity is based on "cash to cash," that is, on a comparison as of the credit risk event date of the then present value of cash flows actually received on the bond compared to the present value of the originally promised contractual cash flows. The actual formulae used in the Society of Actuaries' credit risk study of private placement bonds conforms closely to this definition (see the Appendix titled "Methodology for SOA Credit Risk Study on Private Placement Bonds" at the end of this section for details of these formulae). In practice, however, it is frequently necessary to substitute expected cash flows on occurrence of a credit risk event for actual ones because credit risk events may take a long time to play out. The SOA study used just that approach so that, over time, its results may be modified as actual cash flows are substituted for estimates. Experience to date suggests that loss severities are subject to a wide scatter, varying from 100% to near nil. Indeed, in the case of private placements, negative severities have occasionally been observed. For a discussion of how that outcome can arise, please refer to the SOA study.

## VI.2 DETERMINATION OF EXPECTED CASH FLOWS AND RELATED CONSIDERATIONS

Expected cash flows are computed by deducting the expected loss on account of credit risk events from the promised cash flows. By modelling rating drift and attaching short-term (e.g., annual) default probabilities and loss severities to each rating class, it is possible to forecast the proportion of promised cash flows that is expected to be lost due to credit risk events.

Experience suggests that, even in relatively good economic times, the probability of downgrades of investment grade issues tends to exceed the probability of upgrades. For example, Table 1 (see end of this section), extracted from Altman and Kao, is based on the experience of over 7,000 bonds issued in the 1970-1988 period and exposed to 1989. While covering a nearly 20-year period, the bulk of the exposure occurs in the 1980's, but prior to the downturn of the economy at the end of the decade. It thus reflects relatively good economic times. More recent information may be culled from rating agency publications, such as the special report on corporate defaults published by Standard and Poor's *Creditweek* (see May 1, 1995 issue) or Moody's 1995 publication *Corporate Bond Defaults and Default Rates, 1970-1994*.

It should be noted that Moody's has changed the methodology in its 1996 version of the default study, which covers the period 1938-1995. The new Moody's study uses the "mortality" approach of dividing the number of defaults by the number entering the particular year, which is similar to the SOA methodology. Other changes were also made to the earlier methodology to more accurately measure the experience, in the opinion of Moody's. These changes appear to bring the Moody's study closer to the SOA approach.

Considerable care must be exercised in using the results of rating agency studies because terms used by the rating agencies are not necessarily given the meaning that actuaries would attach to them. For example, both S&P and Moody's publishes annual and cumulative default rates for various cohorts of bond issuers. The default rate for a given year  $t$  after the formation of the cohort is calculated as the ratio of in-year defaulters to the original cohort, even though other cohort members may have defaulted earlier or been removed from the cohort for other reasons. By analogy to death rates, instead of  $QX=DX/LX$ , the rate cited is  $DX/L_0$ , resulting in an understated default rate as actuaries would use the term.

A useful source for loss severity information on publicly traded bonds is the Salomon Brothers March 1996 bond research report *Recoveries on Defaulted Bonds: By Industry and Debt Seniority*. Rating drift varies considerably depending on economic conditions as Table 2 (see end of this section), based on experience to 1943, demonstrates. Similar conclusions can be drawn from more recent data, by isolating the experience of years of strong growth, slow growth and recession. Table 2 shows not only the one-year



upgrade or downgrade experience, but also the one-year default rates experienced by the various rating classes. The probability of default of a bond for any future year is determined by the rating class into which the bond will then fall and the default rate applicable to that rating class.

The studies referred to above are based on the experience of issuers of U.S. publicly rated bonds. There is no comparable published Canadian experience to the best of the Committee's knowledge. There is no *a priori* reason to believe, however, that Canadian corporate bond default experience would differ substantially from U.S. experience. There may be some reason to expect slightly better experience for two reasons: because Canadian bonds are called much more rarely than U.S. ones, there should be less "antiselective" culling of the universe from calls. Also LBOs and other highly leveraged transactions have been relatively less prevalent in Canada. Such transactions may increase sharply the risk of default of debt of the target company issued prior to the transaction.

The only source of information with respect to the experience on private placements is the Society of Actuaries' *1986-1992 Credit Risk Loss Experience Study: Private Placement Bonds* (the study, which is dated July, 1996, may be ordered from the office of the SOA - it is eventually expected to be published in the *Reports of the SOA*). The study includes and updates the pilot study of the Society, covering the 1986-1989 period and is complete in itself. The 1986-1992 study is based on the experience of a dozen or so large U.S. life insurers. As such, it is not necessarily representative of Canadian experience, but the latter is probably insufficient to support a statistically credible study and no data of the kind has to date been collected in Canada, to the best of our knowledge. Neither is it necessarily representative of the experience of smaller life insurers who rely on syndicators for private placement sourcing and who may not possess knowledgeable workout departments.

The importance of possessing relevant private placement expertise may be partially inferred from the difference between the results of the study and those of the public studies. A large section of the Society of Actuaries study is devoted to that comparison. Incidence rates are largely comparable, though private placement incidence rates are slightly higher in the case of investment grades and materially lower at the lowest noninvestment grades. The key difference lies in the loss severities, where overall private placement experience averages 36% over the study period compared to public studies which have consistently reported loss severities of around 60%. As a result, the aggregate private placement economic loss experience is about two thirds of the corresponding experience for the publicly traded universe. It should be noted that this ratio is derived by adjusting the universes to represent comparable quality. The raw observed difference was much greater, with private placement economic loss being only about one third of the public figure, however, the public universe contained a much larger proportion of noninvestment grade bonds.

It is not unreasonable to infer that one reason for the consistently better loss severity performance observed was the ability of private placement issuers to identify problem situations and react to them more quickly and effectively than is possible in the case of publicly traded securities.

### **Modelling Credit Risk**

The probabilities of a bond falling into various rating classes in future years and then suffering a credit risk event can be modelled stochastically under various economic scenarios, and a sufficiently large number of runs performed to yield a reliable mean of expected losses. Loss severity on occurrence of a credit risk event may also be varied by economic scenario, although this is, in most cases, an unnecessary refinement.

Table 3 (see end of this section) shows expected cash flow losses from credit risk events – expressed as level reductions of bond yield – for various initial ratings. The modelling approach used is briefly described in the notes to the tables. The model used is one of many possible and its results are merely illustrative. Results clearly demonstrate that the expected loss of cash flow due to a credit risk event will depend on rating drift which in turn depends on the economic conditions assumed for valuation purposes. There is some (but scant) evidence that loss severity may also increase in adverse economic conditions (see, e.g., the Salomon Brothers study on recoveries, cited above) but, as mentioned earlier, modelling it may be an

unnecessary refinement. Moreover, no such pattern was discernible in the case of the Private Placement study. The consequence of rating drift is “select and ultimate” bond mortality. This implies that, on investment grade issues, losses from credit risk events will increase over time as the bond ages.

Studies by Moody’s, S&P and Altman (cited above) confirm that such is the case. For example, Table 4 (see end of this section) is taken from the Moody’s study. Note that in the case of these studies, bond mortality is defined to include only defaults, which understates somewhat the expected cash flow loss due to non-default credit risk events, such as distress exchanges. On the other hand, on junk bonds, the reverse may occur. With losses from credit risk events being concentrated in the early years, once the bond survives those initial years (is “seasoned”), its quality tends to drift up and losses from credit risk events decrease.

A particular point to note is the relatively large risk attaching to a zero-coupon non-government bond. Both the rating drift model and actual experience confirm that long-term zero coupons are subject to greater credit losses than normal coupon bonds of comparable maturity because the issuer must survive to the maturity date of the bond before any reimbursement is made. Conversely, a normal bond of corresponding maturity will have returned a significant portion of the total promised cash flows prior to that maturity. In other words, the entire cumulative probability of default impacts the likelihood of recovery on the zero coupon. Since the probability of default tends to increase with duration, the risk attached to the recovery of zeroes grows exponentially with time to maturity. A 20-year zero-coupon bond is, therefore, subject to the same credit risk as the last coupon of a regular 20-year bond, but this risk is greater than the average level of risk applying to the entire 20-year bond.

An alternative way of estimating the expected loss of cash flows can be based on a select and ultimate model of credit risk event behaviour by assuming that losses increase with increasing duration because the probability of not receiving future promised cash flow is cumulative. Thus, the result is a reduction of promised yields that increases with maturity. For example, expected credit losses, expressed as a decrease in yield, might amount to eight basis points (.08%) for a five-year A bond, but 35 basis points (.35%) for a 20-year otherwise identical bond (see Table 3, middle column). The difference between using the rating drift model and the select and ultimate model is that, under the latter, no direct modelling is involved. Instead, an appropriate table of bond mortality by rating at issue (e.g., based on the Moody’s study) is used to estimate defaults by duration and the results applied to a simplified model of the company’s bond portfolio. Loss severity may be estimated simply as around 65% (that is, 35% of value is recovered). This relatively high severity rate is appropriate because the public studies do not consider all credit risk events but only formal defaults on which losses tend to be large. As noted above, a lower severity may be considered for private placements.

In all instances, whichever method is used, it is usually convenient to express the provision for C-1 risk losses as a level decrease of promised yield. That level decrease in yield is equal to the reduction in promised yield required to equate the present value of expected cash flows - after credit losses - to the book value of the assets being considered. Where the expected impact of near-term economic conditions is to increase cash flow losses, some actuaries use a two-part methodology. First, the expected losses from credit risk events associated with long-term economic expectations are determined, usually expressed as a reduction of the assumed rate of return, as described above. The additional near-term losses are separately calculated and either expressed as an additional reduction in the assumed rate of return for the years in question, or simply held as an addition to the policy liability otherwise determined. The methodologies described are meant to apply theoretically on a bond-by-bond basis, but, in practice, it is common to use groupings or other approximations. Any such methods that simplify the work or improve the actuary’s control over it are acceptable, provided the actuary is satisfied that no material misstatement is created.

### VL3 DETERMINATION OF MARGINS FOR ADVERSE DEVIATIONS

#### Standard Method

The expected loss of cash flows is determined by the economic scenario assumed, and the pattern of assumed rates of credit risk event incidence and the assumed loss severity associated with that scenario. It is independent of portfolio size or diversification. In valuation terms, it represents expected experience or the “mean” referred to in the PAD paper. A margin for adverse deviation must be added to provide for misestimation or deterioration of the mean. The following list shows factors that would tend to be associated with high risk situations calling for high margins because of the likelihood of misestimation of the mean:

- Portfolio concentration (opposite of diversification) by number of issue, issuer or industry
- A relatively large proportion of noninvestment grade issues
- A relatively high proportion of junior issues
- A material proportion of private-placement issues where the company does not possess the resources to perform sound internal credit analysis on a continuous basis, or where it lacks the work-out expertise
- Past credit losses in excess of average for the market
- Investments in types of assets that the company lacks experience in acquiring and managing

Factors that may lead to high risk of deterioration of the mean include, in addition to the above:

- Future economic conditions worse than those assumed
- Event risk (i.e., a sudden external event that fundamentally alters creditworthiness, such as product liability)
- Loss of expertise in the investment area
- Slow reaction to deteriorating experience
- Limited ability to track credit quality on an ongoing basis

Low margin situations would be characterized by the absence of these risk factors. The minimum margin in a low margin situation should be a function of the expected loss. A reasonable minimum margin is 25% of the expected loss of cash flows on account of credit risk events, but not less than five basis points. A material margin is required even in low margin situations because of the low incidence and consequent high variability of default losses and because deterioration of the mean largely depends on factors beyond the company’s control.

The debt of national governments denominated in their own currencies can reasonably be excluded from the minimum margin criteria above. Other government or government guaranteed debt does contain some level of C-1 risk, and should, therefore, be subject to a C-1 risk margin.

A high margin situation might be identified as one where at least two of the first six listed risk factors are present. In such situations, a margin of the greater of 100% of the expected loss of cash flows or 10 basis points per annum might be called for.

The comments at the end of the previous section concerning the use of groupings and approximations apply with equal force to the determination of margins.

#### Alternative Method

An alternative way of setting required margins is to calculate the surplus requirement related to the bonds in question, and then to calculate the required rate of return thereon. The surplus requirement could be the MCCSR (though it fails to reflect certain risks such as diversification), a multiple thereof that the company adopts as a target, or an internal target surplus measure. For example, if the target after-tax return on required surplus is  $j$ , then the margin can be calculated as follows:

$$M = \frac{j}{i - r} RS - i \times RS$$

A

Where:

M = the margin expressed as a reduction in annual before-tax return from assets

j = target after-tax return on required surplus

i = risk-free rate of return

r = total income tax rate applicable

RS = required surplus for C-1 risk, for assets supporting the liabilities being valued

A = assets on which margin requirement is calculated; the formula assumes that all investment income from those assets is fully taxable

The margin so calculated may need to be increased if risk factors not reflected in the method of determination of RS are present. The minimum margin should also apply. In most situations, however, the alternative is likely to result in higher margins than the standard method. This alternative method for setting the margin may be used for all types of assets, not only bonds.

TABLE 1

Table II Ratings Drift Results for All Issues, 1970-1989 (% of original issues by rating)

		One Year Since Issuance									
Obs.		AAA	AA	A	BBB	BB	B	CCC	CC	C	D
649	AAA	94.3	5.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1917	AA	0.7	92.6	6.4	0.2	0.1	0.1	0.0	0.0	0.0	0.0
2410	A	0.0	2.6	92.1	4.7	0.3	0.2	0.0	0.0	0.0	0.0
1090	BBB	0.0	0.0	5.5	90.1	2.9	1.1	0.1	0.0	0.0	0.3
237	BB	0.0	0.0	0.0	6.8	86.1	6.3	0.9	0.0	0.0	0.0
702	B	0.0	0.0	0.2	1.6	1.7	94.0	1.7	0.3	0.0	0.6
173	CCC	0.0	0.0	0.0	0.0	0.0	2.8	92.5	0.0	2.3	2.3
13	CC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	84.6	15.4	0.0
1	C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0
3	D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
		Three Years Since Issuance									
Obs.		AAA	AA	A	BBB	BB	B	CCC	CC	C	D
541	AAA	81.0	15.7	2.6	0.7	0.0	0.0	0.0	0.0	0.0	0.0
1510	AA	2.0	77.8	17.5	2.0	0.2	0.1	0.1	0.0	0.0	0.3
1938	A	0.3	6.9	78.9	12.0	1.3	0.7	0.0	0.0	0.0	0.0
807	BBB	0.3	0.7	14.6	73.4	7.0	2.1	0.7	0.0	0.0	1.2
170	BB	0.6	0.6	1.8	17.1	62.9	11.7	3.0	0.6	0.0	1.8
431	B	0.3	0.3	1.1	1.9	4.2	75.4	10.7	1.2	1.4	3.7
77	CCC	0.0	0.0	1.3	0.0	2.6	14.3	66.3	1.3	2.6	11.7
9	CC	0.0	0.0	0.0	0.0	0.0	11.1	11.1	44.4	0.0	33.3
0	C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
		Five Years Since Issuance									
Obs.		AAA	AA	A	BBB	BB	B	CCC	CC	C	D
450	AAA	69.8	23.5	2.9	3.6	0.0	0.0	0.0	0.0	0.2	0.0
1048	AA	2.5	67.9	22.8	5.2	1.1	0.3	0.1	0.0	0.0	0.0
1429	A	0.4	9.2	72.5	15.2	1.9	0.7	0.0	0.0	0.0	0.1
514	BBB	0.4	1.6	19.6	65.7	7.6	1.7	1.9	0.0	0.0	1.4
103	BB	0.0	0.0	7.7	20.4	40.8	16.5	6.8	1.0	0.0	6.8
222	B	0.4	0.0	2.7	4.5	8.6	59.9	13.5	0.4	0.9	9.0
28	CCC	0.0	0.0	3.6	3.6	0.0	35.7	28.6	7.1	0.0	21.4
1	CC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0
0	C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0	D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Ten Years Since Issuance									
Obs.		AAA	AA	A	BBB	BB	B	CCC	CC	C	D
238	AAA	52.1	35.7	7.1	4.6	0.0	0.4	0.0	0.0	0.0	0.0
576	AA	3.5	46.7	27.6	19.2	2.4	0.2	0.0	0.0	0.0	0.3
831	A	0.8	12.5	61.5	20.2	3.4	0.9	0.6	0.0	0.0	0.1
217	BBB	0.0	2.8	36.8	43.3	8.3	4.6	1.9	0.0	0.0	2.3
37	BB	0.0	0.0	10.8	27.0	21.6	13.5	18.9	2.7	0.0	5.4
52	B	1.9	0.0	7.7	9.6	5.7	53.9	9.6	0.0	0.0	11.5
7	CCC	0.0	0.0	0.0	0.0	0.0	0.0	85.7	0.0	0.0	14.3
1	CC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0
0	C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0	D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Source: The Implications of Corporate Bond Ratings Drift  
Edward I. Altman and Duen Li Kao  
Financial Analysts Journal/May-June 1992

**TABLE 2**  
**One-Year Corporate Bond Rating Drift (1916-1943)**

<b>Exposure</b>	<b>AAA</b>	<b>AA</b>	<b>A</b>	<b>BBB</b>	<b>BB</b>	<b>B</b>	<b>CCC</b>	<b>D</b>
<b>GOOD YEARS</b>								
AAA	2027	0.97	0.021	0.00	0	0	0	0
AA	2260	0.05	0.901	0.03	0.007	0.00	0	0.000
A	2202	0.00	0.086	0.84	0.057	0.00	0	0.000
BBB	2369	0.00	0.004	0.09	0.805	0.07	0.00	0.008
BB	1594	0	0	0.00	0.126	0.76	0.07	0.015
B	1163	0	0	0	0.005	0.14	0.77	0.028
CCC	438	0	0	0	0	0.13	0.66	0.187
<b>GROUPED DEFAULT RATES</b>								
Total:	12053		AAA-BBB: 0.003		BB-CCC: 0.044		Total: 0.014	
<b>AVERAGE YEARS</b>								
AAA	604	0.98	0.014	0.00	0	0	0	0.001
AA	502	0.04	.896	0.04	0.007	0	0	0.003
A	455	0.00	0.072	0.84	0.076	0	0	0
BBB	429	0.00	0.009	0.14	0.778	0.05	0.00	0.002
BB	196	0	0	0.00	0.127	0.69	0.11	0.025
B	63	0	0	0.01	0	0.15	0.61	0.079
CCC	17	0	0	0	0	0.29	0.23	0.470
<b>GROUPED DEFAULT RATES</b>								
Total:	2266		AAA-BBB: 0.002		BB-CCC: 0.065		Total: 0.010	
<b>BAD YEARS</b>								
AAA	397	0.95	0.042	0.00	0	0	0	0
AA	495	0.06	0.858	0.07	0.002	0	0	0
A	500	0	0.066	0.80	0.124	0.00	0	0
BBB	552	0	0	0.06	0.780	0.14	0.00	0.003
BB	371	0	0	0	0.148	0.67	0.15	0.018
B	256	0	0	0	0.003	0.09	0.71	0.085
CCC	163	0	0	0	0	0.04	0.53	0.337
<b>GROUPED DEFAULT RATES</b>								
Total:	2734		AAA-BBB: 0.001:		BB-CCC: 0.106		Total: 0.031	
<b>WORST YEARS</b>								
AAA	1156	0.82	0.151	0.01	0.002	0	0	0
AA	972	0.06	0.690	0.19	0.043	0.01	0.00	0
A	1060	0	0.042	0.64	0.241	0.05	0.00	0.002
BBB	901	0	0.003	0.06	0.631	0.22	0.05	0.011
BB	522	0	0	0.00	0.049	0.53	0.27	0.030
B	236	0	0	0	0.004	0.05	0.47	0.152
CCC	119	0	0	0	0	0.01	0.50	0.445
<b>GROUPED DEFAULT RATES</b>								
Total:	4966		AAA-BBB: 0.003		BB-CCC: 0.120		Total: 0.024	

Source: Data collected by the Nation Bureau of Economic Research of the U.S.  
Years classified according to growth in real GNP as follows:

Description	Growth in GNP
Good	3% or more
Average	0 to 3%
Bad	-5 to 0%
Worst	-5% or less

TABLE 3

<b>2 Bad Years, then simulated</b>					<b>1 Bad Year, then simulated</b>					<b>Simulated</b>				
	<b>30</b>	<b>Bonds</b>	<b>100</b>	<b>Bonds</b>		<b>30</b>	<b>Bonds</b>	<b>100</b>	<b>Bonds</b>		<b>30</b>	<b>Bonds</b>	<b>100</b>	<b>Bonds</b>
<b>5 Years</b>	E b.p.	95% C-1Q	E b.p.	95% C-1Q	<b>5 Years</b>	E b.p.	95% C-1Q	E b.p.	95% C-1Q	<b>5 Years</b>	E b.p.	95% C-1Q	E b.p.	95% C-1Q
AAA	1	0.00%	1	0.00%	AAA	0	0.00%	0	0.00%	AAA	0	0.00%	0	0.00%
AA	3	0.00%	3	0.00%	AA	2	0.00%	2	0.00%	AA	1	0.00%	1	0.00%
A	12	0.00%	12	3.35%	A	8	0.00%	8	1.86%	A	4	0.00%	4	0.04%
BBB	43	4.90%	43	4.39%	BBB	32	0.00%	32	4.23%	BBB	21	0.37%	21	3.18%
BB	134	16.25%	134	6.04%	BB	118	15.88%	118	5.87%	BB	102	14.21%	102	5.93%
B	391	25.46%	391	15.61%	B	365	25.25%	365	14.39%	B	342	22.33%	342	13.08%
CCC	924	31.53%	924	18.32%	C	844	31.57%	844	18.19%	CCC	746	31.42%	746	16.38%
	<b>30</b>	<b>Bonds</b>	<b>100</b>	<b>Bonds</b>		<b>30</b>	<b>Bonds</b>	<b>100</b>	<b>Bonds</b>		<b>30</b>	<b>Bonds</b>	<b>100</b>	<b>Bonds</b>
<b>10 Years</b>	E b.p.	95% C-1Q	E b.p.	95% C-1Q	<b>10 Years</b>	E b.p.	95% C-1Q	E b.p.	95% C-1Q	<b>10 Years</b>	E b.p.	95% C-1Q	E b.p.	95% C-1Q
AAA	2	0.00%	2	3.19%	AAA	2	0.00%	2	2.14%	AAA	1	0.00%	1	1.54%
AA	8	0.00%	8	4.47%	AA	5	0.00%	5	3.71%	AA	3	0.00%	3	2.93%
A	24	4.43%	24	4.34%	A	18	3.75%	18	4.24%	A	13	3.66%	13	3.84%
BBB	66	9.75%	66	3.50%	BBB	54	9.03%	54	3.15%	BBB	42	6.92%	42	3.19%
BB	170	14.98%	170	8.14%	BB	155	13.95%	155	7.21%	BB	142	13.94%	142	6.54%
B	405	24.56%	405	12.61%	B	383	24.65%	383	12.41%	B	367	24.72%	367	11.78%
CCC	852	25.78%	852	12.96%	C	791	25.36%	791	14.07%	CCC	722	25.85%	722	13.82%
	<b>30</b>	<b>Bonds</b>	<b>100</b>	<b>Bonds</b>		<b>30</b>	<b>Bonds</b>	<b>100</b>	<b>Bonds</b>		<b>30</b>	<b>Bonds</b>	<b>100</b>	<b>Bonds</b>
<b>20 Years</b>	E b.p.	95% C-1Q	E b.p.	95% C-1Q	<b>20 Years</b>	E b.p.	95% C-1Q	E b.p.	95% C-1Q	<b>20 Years</b>	E b.p.	95% C-1Q	E b.p.	95% C-1Q
AAA	7	4.11%	7	2.92%	AAA	6	2.73%	6	2.54%	AAA	5	2.24%	5	2.26%
AA	18	6.92%	18	3.01%	AA	14	6.32%	14	3.10%	AA	11	5.29%	11	2.69%
A	42	9.46%	42	2.89%	A	35	9.11%	35	2.23%	A	29	8.10%	29	1.86%
BBB	94	8.02%	94	3.36%	BBB	81	7.64%	81	3.08%	BBB	69	8.10%	69	3.33%
BB	198	12.29%	198	7.51%	BB	184	12.27%	184	6.87%	BB	173	11.56%	173	6.31%
B	408	17.00%	408	6.20%	B	389	17.11%	389	6.45%	B	376	16.72%	376	6.55%
CCC	804	15.50%	804	4.18%	C	751	16.82%	751	4.41%	CCC	693	16.65%	693	4.95%
<b>Portfolio 30</b>	<b>Bonds</b>	<b>100</b>	<b>Bonds</b>		<b>Portfolio 30</b>	<b>Bonds</b>	<b>100</b>	<b>Bonds</b>		<b>Portfolio 30</b>	<b>Bonds</b>	<b>100</b>	<b>Bonds</b>	
<b>Mix</b>	E b.p.	95% C-1Q	E b.p.	95% C-1Q	<b>Mix</b>	E b.p.	95% C-1Q	E b.p.	95% C-1Q	<b>Mix</b>	E b.p.	95% C-1Q	E b.p.	95% C-1Q
<b>10% Junk</b>	51	4.40%	49	2.15%	<b>10% Junk</b>	44	3.68%	42	2.07%	<b>10% Junk</b>	37	3.36%	35	1.81%
<b>Inv. Grade</b>	38	4.67%	37	2.09%	<b>Inv. Grade</b>	31	4.09%	30	1.74%	<b>Inv. Grade</b>	23	1.54%		
	24	3.81%												

**All Average Years**

<b>Portfolio 30</b>	<b>Bonds</b>	<b>100</b>	<b>Bonds</b>	
<b>Mix</b>	E b.p.	95% C-1Q	E b.p.	95% C-1Q
<b>10% junk</b>	47	3.73%	44	1.99%
<b>Inv. Grade</b>	33	4.00%	31	1.79%

**Notes to Table 3**

1. The tables show the expected default loss (E b.p.) expressed as level annual basis points and the C-1 equity risk (see Note 5 below) at the 95% confidence level (95% C-1Q) for portfolios of 30 or 100 identical size bonds.
2. The portfolios are five-year bonds, 10-year bonds and 20-year bonds and portfolio mixes composed of 50% five-year, 25% 10-year and 25% 20-year bonds. The portfolio mixes are either all investment grade, in which case they are 30% AA, 30% A and 40% BBB or they are 10% junk, in which cases, the BBB component is reduced to 30% and a BB component of 10% is introduced.

3. Three economic scenarios were used:
  - Two bad years followed by simulation
  - One bad year followed by simulation
  - All simulated

For simulation purposes the following probabilities or occurrence were assumed:

- Good years 37.5%
- Average years 37.5%
- Bad years 25%

For each of the three economic scenarios, a single simulation was used for all portfolios to ensure consistency of results.

In addition, for comparison, the results are also shown for a scenario of all average years for the portfolio mixes.

4. The expected default loss was determined using one-year rating drift probabilities derived from recent experience, and one-year default probabilities at each current rating just prior to default derived from the same experience. Under worse economic conditions, it was assumed that lower rating classes will have a probability of default at maturity which is higher than before maturity. There is insufficient experience to derive loss severities on default by rating class at default, but the loss severities used were such as to reasonably resemble overall past experience.
5. The C-1 equity risk shown in the table is the amount that must be added to the starting asset portfolio to ensure with the stated degree of confidence (95%) that the present value of future cash flows from the portfolio, discounting at the expected yield rate (that is, promised yield minus expected default loss =  $Y-E$ ), will not fall below the initial (book) value of the original portfolio. It was determined in each case using 1000 stochastic simulations to produce the scatter of portfolio values after simulated defaults. Evidently, the higher the confidence limit required, the higher the C-1 equity risk.
6. The figures in the table are simply illustrative of methodology and are not to be interpreted as representing the subcommittee's views of appropriate levels of expected C-1 risk losses.
7. Note that  $E$ , the expected experience, represents pure expected losses as derived from the model and does not include any margin for adverse deviation.
8. The expected experience  $E$  is independent of portfolio size, so it is the same for 30-bond and 100-bond portfolios by rating class. The slight difference in the portfolio mixes of 30 and 100 bonds arises from the fact that the mixes are nearly, but not absolutely, identical.

As the tables demonstrate, the C-1 equity risk is normally larger for a small, therefore, less diverse portfolio. This accords with logical expectation. However, the reverse can surprisingly be the case (see e.g., 10-year AAA or AA bonds). The reason is that when the probability of default is low, for a small portfolio, a smaller number of the stochastic simulations may result in default losses than is suggested by the confidence limit chosen, 95% (consider the extreme case of a portfolio of a single, five-year AAA bond). At the 99% confidence level, all the 30-bond portfolios in the table would have required a higher C-1 equity risk than the corresponding 100-bond portfolios.



TABLE 4

Table 8: Average Cumulative Default Rates 1 to 20 Years (Percent)

<u>Years</u> <u>20</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>17</u>	<u>18</u>	<u>19</u>
Aaa 2.3	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.4	0.5	0.7	0.8	1.0	1.2	1.4	1.6	1.9	2.1	2.3	2.3
Aa 2.1	0.0	0.0	0.1	0.2	0.3	0.4	0.4	0.5	0.6	0.8	0.9	1.1	1.3	1.5	1.5	1.5	1.6	1.8	1.9
A 4.7	0.0	0.1	0.3	0.4	0.6	0.8	1.0	1.2	1.5	1.8	2.1	2.4	2.7	3.0	3.3	3.6	3.9	4.2	4.5
Baa 10.8	0.2	0.5	0.9	1.4	1.9	2.3	2.9	3.6	4.2	4.7	5.3	5.8	6.4	7.0	7.7	8.4	9.1	9.7	10.3
Ba 27.8	1.7	4.1	6.5	8.9	11.1	12.9	14.4	15.8	17.1	18.4	19.6	21.0	22.2	23.1	24.0	24.9	25.7	26.4	27.1
B 42.0	7.9	14.2	19.3	23.3	26.5	29.7	31.8	33.8	35.3	36.7	37.7	38.3	39.0	39.6	40.2	40.9	41.7	42.0	42.0
Investment Grade 6.4	0.0	0.2	0.3	0.6	0.8	1.1	1.4	1.7	2.1	2.4	2.8	3.2	3.5	3.9	4.4	4.8	5.2	5.6	6.0
Speculative Grade 33.2	4.3	8.1	11.4	14.3	16.8	19.0	20.7	22.2	23.5	24.8	26.0	27.1	28.2	29.1	29.8	30.7	31.4	32.0	32.6

## **APPENDIX 1: METHODOLOGY FOR SOA CREDIT RISK STUDY ON PRIVATE PLACEMENT BONDS**

### **1. Definitions**

#### *a) Incidence*

Incidence of an event is generally defined as the number of actual occurrences of that event out of the total possible number of occurrences, in a given time interval. For credit risk, incidence can be measured either by number of assets or by dollar (\$) volume. It is the number (\$ volume) of assets experiencing a CRE in a given year (the unit of time interval used for the study) divided by the total number (\$ volume) of assets exposed. The measurement can be made for the entire data base or by any predefined component thereof, referred to as a “cell.”

#### *b) Economic Loss and Loss Severity*

Loss severity with respect to a particular asset is defined as the loss actually sustained, given the occurrence of a CRE, as a proportion of the maximum possible loss on that asset. The maximum possible loss is calculated as the present value, on the CRE date, of originally scheduled cash flows still remaining. The “recovery rate” or “salvage rate” is the present value on the CRE date of the revised cash flows the investor received (and expects to receive in future) on the CRE, divided by the maximum loss. The severity is then one minus the salvage rate.

Economic loss on that particular asset is defined as its exposure, that is, its carrying value or book value at the time of the CRE, multiplied by the loss severity.

In effect, economic loss is thus the dollar difference between the net present value of original and revised cash flows, multiplied by a factor that converts the loss to be on a basis consistent with the carrying value of the asset.

Present values are calculated using interest rates described in Section C4 of this Appendix.

For a group of assets each of which experienced a CRE, the economic loss is the sum of the asset by asset economic losses, while the loss severity is that sum divided by the sum of the corresponding exposures.

#### *c) Economic Loss per Unit of Exposure*

Economic loss per unit of exposure is defined as the total economic loss in respect of those assets in the cell that experience a CRE, divided by the book value (outstanding principal) of all assets exposed in the cell (for precise description of how to calculate the exposure, please refer to Section C5).

Equivalently, the economic loss per unit of exposure may be expressed as the product of the loss severity rate and the incidence rate by amount for the cell.

It may be interpreted (after multiplying by 10,000) as the cost, in basis points, of credit risk in the particular year. In other words, it is the reduction of investment yield on the exposed assets, compared to their contractually promised yield.

## 2. Loss Statistics

Consistent with the model, the following loss statistics are calculated:

- a) *Incidence rate by number, IR<sup>No.</sup>*

$$IR^{No.} = \frac{\text{Number of credit risk events (CRE) in cell}}{\text{Total number of exposure units in cell}}$$

- b) *Incidence rate by amount, IR<sup>Amt</sup>*

$$IR^{Amt} = \frac{\text{Amount of CRE Exposure in cell}}{\text{Total amount of Exposure in cell}}$$

- c) *Loss severity, LS*

$$LS = \frac{\text{Economic Loss for cell}}{\text{Amount of CRE Exposure in cell}}$$

- d) *Economic loss per unit of exposure, EL/E*

$$EL / E = \frac{\text{Economic Loss for cell}}{\text{Total amount of Exposure in cell}}$$

### 3. Calculation of Economic Loss

Traditionally, asset default studies have looked at either the incidence of default (number of defaults) or losses of par value. Studies considering only losses of par value do not accurately account for all lost cash flows, costs of collection, or restructure, or for the time value of money. In this study, the measure of loss resulting from a credit risk event is based on comparing, at the loss calculation date, the present value of the remaining cash flows of the original investment to the present value of the cash flows that result from the credit risk event. This measure provides a single point-estimate of the losses based on the information available up to the calculation date. The economic loss needs to be recalculated whenever the cash flow changes.

The economic loss for credit risk event  $i$ ,  $ELCRE_i$  is given by

$$ELCRE_i = OP_{PYE}^{CRE_i} \left( \frac{PV_{\text{loss calc date}}^{OCF CRE_i} - PV_{\text{loss calc date}}^{RCF CRE_i}}{PV_{\text{loss calc date}}^{OCF CRE_i}} \right)$$

where  $OP_{PYE}^{CRE_i}$  = outstanding principal for credit risk event  $i$  at the year end (or more recent date if available) immediately preceding the loss calculation date

$PV_{\text{loss calc date}}^{OCF CRE_i}$  = present value of the original contractual cash flows for credit risk event  $i$  at the loss calculation date

$PV_{\text{loss calc date}}^{RCF CRE_i}$  = present value of the revised cash flows (net of event expenses) for credit risk event  $i$  at the loss calculation date

**Note:**

$$\begin{aligned}
 \text{a) (1) } \quad \text{PV}_{\text{loss calc date}} \text{ OCF CRE}_i &= \text{OCF}_1 v_1(\text{date 1-loss calc date}) / 365 \\
 &+ \\
 &+ \dots + \\
 &\text{OCF}_n v_n(\text{date n-loss calc date}) / 365 \text{ (1)}
 \end{aligned}$$

$$v = \frac{1}{\left(1 + \frac{i_j^{(2)}}{2}\right)^2}$$

$i_j^{(2)}$  is determined as indicated in Section C5 below  
(assuming nominal annual rates convertible semiannually)

date j = date of payment of  $j^{\text{th}}$  payment

$\text{OCF}_j$  =  $j^{\text{th}}$  original cash flow

n = number of original contractual cash flows on or after the loss calculation date

$$\begin{aligned}
 \text{(2) } \text{PV}_{\text{loss calc date}} \text{ RCF CRE}_i &= \text{RCF}_1 v_1(\text{date 1-loss calc date}) / 365 \\
 &+ \\
 &+ \dots + \\
 &\text{RCF}_k v_k(\text{date k-loss calc date}) / 365 \text{ (2)}
 \end{aligned}$$

$\text{RCF}_j$  =  $j^{\text{th}}$  revised cash flow (net of credit risk event expenses)

k = number of revised cash flows on or after the loss calculation date

- b) The  $v_j$  in equation (2) are usually different from the  $v_j$  in equation (1) because a different  $i_j^{(2)}$  is usually used for the revised cash flows (RCF).
- c) If only the year of the loss is given, July 1 is assumed; if only the year and month are given, the 15th of the month is assumed.
- d) If the loss calculation date is between payments, the calculation begins with the next payment.

**4. Interest Rates Used for Discounting Cash Flows**

The determination of the interest rates to use to calculate the present values is a critical component because the ultimate quantification of the economic loss depends upon the interest rates used. There are several alternatives for developing these interest rates. The following summarizes the approach used.

For bonds, three issues to consider are: Should spread vary by maturity? by quality? or by date of CRE? Based on the data provided by ACLI for spreads at issue, it was determined that, for this study, the

spreads should vary only by quality and time period, and that the spread for AAA, AA and A bonds should be the same. Thus, the interest methodology used in this study includes the following components:

- a) the treasury spot yield curve as the base;
- b) the spreads listed in the following table for the indicated rating and period combinations:

#### Spread in basis points<sup>1</sup>

From	Through	AAA-A	BBB	BB	B and below
1986: Q1	1987: Q3	135	175	325	400
1987: Q4	1989: Q1	135	175	275	325
1989: Q2	1991: Q3	135	175	325	400
1991: Q4	1992: Q4	135	175	350	575

- c) discounting original cash flows using spreads based on the quality rating at issue;<sup>2</sup>
- d) discounting revised cash flows using spreads based on the quality rating immediately after the credit event; where not available that rating was assumed to be "B and below";<sup>3</sup> and
- e) each element of the original and revised cash flows was discounted using the spot yield corresponding to its term, that is, the period from the CRE date to the date of occurrence of the particular cash flow element.

It is anticipated that the same methodology will be used for the study of data through 1994, with the appropriate spread values based on the ACLI data through 1994.

## 5. Calculation of Exposure

The exposure base represents the total holdings for those investments included in the study during the study period. Using year-end values facilitates data collection from Schedule D of annual statements.

The calculation of exposure is based on , the outstanding principal at year-end  $j$ , as follows:

- a) *Assets that are not credit risk events*
  - i) Assets in both year-end  $j-1$  and year-end  $j$  exposure data files
 
$$\text{ExposureYear } j = (\text{OP}_{j-1} + \text{OP}_j) / 2$$
  - ii) Assets only in year-end  $j-1$  exposure data file (e.g., maturity)
 
$$\text{ExposureYear } j = (\text{OP}_{j-1}) / 2$$
  - iii) Assets only in year-end  $j$  exposure data file (e.g., new acquisition during year)
 
$$\text{ExposureYear } j = (\text{OP}_j) / 2$$
- b) *Assets that incurred a credit risk event during year  $j$* 

$$\text{ExposureYear } j = \text{OP}_{j-1}$$
- c) *Assets that incurred a credit risk event prior to year  $j$  and are in year-end  $j-1$  and/or year-end  $j$  exposure data file*

$$\text{ExposureYear } j = 0$$

Aggregate exposure is the sum of the exposure for the individual assets. Exposure by number of assets is calculated using the same principles.

<sup>1</sup>There was insufficient data for developing a reasonable spread estimate for classes below B.

<sup>2</sup>A bp of 165 was used when original quality rating was not available.

<sup>3</sup>Since spreads for classes below B can normally be expected to be larger than those for B, there may be a slight underestimation of loss caused by this methodology. It is not thought to be material.

## **VII SPECIFIC CONSIDERATIONS FOR MORTGAGES**

### **VII.1 NATURE OF C-1 RISK IN MORTGAGES**

A “mortgage” is the pledge of property to secure a loan. The most common type of property is real estate. Mortgages are generally negotiated between borrowers and lenders. This means that there is less homogeneity between the terms and conditions of mortgages, especially commercial and industrial, than is generally the case with public bonds. This lack of homogeneity in mortgage terms, along with the unique nature of the property that provides the security, introduce significant illiquidity into mortgage assets, and is a primary factor in understanding the nature of C-1 risk in mortgages.

C-1 risk in mortgages flows from the following considerations:

- Mortgage illiquidity can severely impede the quick sale at fair market value, eliminating a potential means of helping to control loss credit exposure.
- The unique nature of the property that provides security in each mortgage means that credit loss exposure has many characteristics that are particular to the loan and the company, which must be reflected in the credit loss analysis.
- Super-imposed on the portfolio specific analysis is the historical experience of strong cyclical waves of credit loss experience for the whole asset class (see Section V.4 of this educational note).

Before addressing in detail the factors that effect credit loss experience, a quick overview of the different types of mortgages, and their expected cash flow structure is provided below.

#### **Commercial/Industrial Mortgages**

Commercial/industrial mortgages are classified by the type of real estate backing the mortgage (e.g., multi-family residential, retail, etc.). This is to recognize that mortgage credit risk varies with the type of real estate securing the mortgage. Structurally, a typical commercial/industrial mortgage grants no prepayment privileges, or severely limits them by requiring that the investor is made whole through a yield maintenance agreement or through the payment of penalty interest. However, Canadian commercial/industrial mortgages issued to individuals, like all Canadian mortgages issued to individuals, can be prepaid in full after five years with the payment of three months penalty interest (i.e., between commitment and funding), when the borrower can walk away from the mortgage at the cost of losing the commitment fee. It is also worth noting that commercial mortgages may be issued with a provision for additional income beyond the contract yield through equity participation, purchase/lease back and joint venture. Such arrangements tend to be associated with riskier mortgages, and are most prevalent when high interest rates prevail.

#### **Residential Mortgages**

In Canada, residential mortgages generally have an interest rate that is fixed for a term of one to five years. In the U.S., residential mortgages generally have a rate fixed for 30 years, although so-called adjustable rate mortgages have become somewhat more popular in recent years. The mortgage rate is usually the lower of the mortgage rate at the commitment date and the rate on the funding date.

The borrower may have the right to prepay all or part of the mortgage before the end of the contracted term. The risk to the lender is that these prepayment options are executed at a point in time when current interest rates are below the interest rate of the mortgage. While a penalty for prepayment may apply, the penalty may not cover the loss experienced by the lender. Typically, Canadian, single family residential mortgages, whether NHA or not, provide for partial prepayments without penalty, viz. prepay 10% of original balance once a year or double the normal monthly payment without penalty, etc. The prepayment penalty otherwise payable is often less than a full market value adjustment. U.S. residential mortgages have no prepayment penalty. The long term (30 years) and the absence of a prepayment penalty makes prepayment and extension risk many times greater on U.S. residential mortgages than Canadian mortgages.

The ability of the individual U.S. taxpayer to deduct interest paid on residential mortgages from taxable income creates a strong incentive to borrow against a home to the highest extent permitted by lenders. Should the lenders have little reason to avoid underwriting risk, this level may be high. A combination of higher borrower and lender leveraging may lead to both higher arrears and greater losses on default in the U.S. on residential mortgages.

For C-1 risk, an important consideration is mortgage insurance. In Canada, the Canadian Parliament established the Canada Mortgage and Housing Corporation (CMHC) in 1946, whose purpose is to insure first mortgage loans made by private lenders in the housing sector. The CMHC guarantees the timely payment of principal and interest on their due dates as set forth in the loan agreement. Mortgages insured by CMHC are frequently referred to as NHA mortgages.

### **Mortgage-Backed Securities**

A substantial portion of U.S. residential mortgages are securitized as mortgage-backed securities. A much smaller portion of Canadian residential mortgages are securitized, although in recent years, it has begun to grow. Credit risk considerations for mortgage-backed securities are covered in detail in Section XI of this education note. In addition, for a general understanding of this asset class, the *Educational Note on Asset and Mortgage-Backed Securities* is available on request from the CIA Secretariat.

### **Registrable Assignments**

Some companies purchase blocks of registrable assignable mortgages from another company. In these situations, the originating company holds the title and receives an administration fee for originating the loan and for the ongoing servicing of the mortgage. The risks associated with these loans do not change because of this arrangement, and the buyer has the same credit risk on these mortgages as if they were regular direct mortgages. There is, however, an added risk to buyers since they must also underwrite the originating company.

## **VII.2 MATERIAL FACTORS IMPACTING COMPANY MORTGAGE C-1 RISK LOSS EXPERIENCE**

As mentioned in the introduction, the real estate sector, including mortgages, is subject to broad cyclical behaviour in credit loss experience. Within these broad cycles, however, company specific factors significantly impact the level of credit loss experience incurred by individual companies.

Five material factors impacting company-specific mortgage C-1 risk loss experience will be discussed in turn. These factors are underwriting, portfolio diversification by location and type, portfolio growth, problem loan management, and economic loss ratio.

### **Underwriting**

The objective of mortgage underwriting is, in part, to filter out those risks that do not meet the company minimum mortgage quality standards. The importance of mortgage underwriting standards, procedures and practices to C-1 risk loss experience is easy to underestimate. There is little public information demonstrating the link between lax underwriting and credit loss experience. Moreover, inadequate underwriting standards, procedures and practices may have little adverse credit loss impact for a period of several years, during which company and industry mortgage experience is relatively favourable. However, one cannot necessarily infer from a period of good experience that sound underwriting is unimportant, or that a company's underwriting is sound. Inadequate mortgage underwriting can be expected to have a relatively devastating impact on both the rate of default and the C-1 risk loss ratio when the economy and property values take a turn for the worse.

The considerations below are important not only for assessing original underwriting, but for quantifying the ongoing exposure to C-1 risk losses:

- **Quality of Underwriters and Overall Controls/Processes:** Underwriter's experience and abilities are critical to a satisfactory mortgage origination process. Over the long term, C-1 risk



losses can be expected to be relatively lower to the extent that underwriters are experienced and knowledgeable, apply sound underwriting standards and procedures, and keep up to date on the latest information on real estate vacancies and rents.

At the portfolio level, underwriting and reporting procedures must be in place to ensure that the quality and diversification profile of new mortgages is consistent with portfolio objectives. In particular, a strong ability to review and underwrite mortgages across the full range of locations and mortgage types will contribute to a high quality, diversified portfolio.

The underwriting process is made particularly challenging by the fact that each individual mortgage is supported by a “unique” business property or set of circumstances, and that the motives of the borrower are not always absolutely clear. The situation is also complicated by the fact that the underwriter is often dealing in a competitive marketplace, where full information disclosure may not be provided. However, notwithstanding these problems, solid mortgage underwriting can be achieved through adherence to sound principles, procedures and practices.

These principles, procedures and practices should be designed to ensure that underwriters are trained and capable of making knowledgeable and informed decisions. They should also ensure that care and diligence are exercised with respect to the risk assessment of each and every mortgage placed on the books. C-1 risk assessment is a judgmental process, and information and knowledge are the keys.

Underwriters must have a clear understanding of the full range of factors that can impact a business or property values and the full range of information that may be needed to assess these factors. Information gaps concerning the key risk factors should be recognized and handled with care. While risk cannot be totally eliminated, a systematic process for identifying and assessing risks can ensure that risks taken on are fully acknowledged and understood.

It must be recognized that regardless of the quality of underwriting management practices, the riskier the mortgages that are accepted, the higher will be the arrears and economic losses.

- **Loan-To-Value Ratio:** The loan-to-value ratio is an important consideration in evaluating the quality of a property. Ratios above 75% represent fairly high risk loans, whereas ratios below 50% are fairly low risk loans. Adhering to established loan-to-value ratios, such as the life insurance industry standard of 75%, will provide a cushion in case of problems. The 25% or greater margin represents the borrower’s equity and provides a strong incentive to the borrower not to walk away from the property. Legislation requires that Canadian residential mortgages with a loan-to-value ratio above 75% be insured with CMHC. The maximum ratio CMHC will insure is 95%.

- |                                   |  |
|-----------------------------------|--|
| • Property age                    | • Landscaping/maintenance                  |
| • Design (layout of the building) | • Property and asset management ability    |
| • Parking rations                 | • Appropriateness of building and location |
| • Quality of construction         | • Building function and style              |

**Stability of Income:** In underwriting a loan, the borrower analyzes the amount of cash flow per square foot or per dollar of loan that the property generates. Although it is desirable to have a large value per square foot, this amount must be reasonable in relation to other similar properties. During economic boom periods, demand for space is high, rents rise and planned construction becomes excessive. If rents are significantly above market, they will not be sustainable when leases come up for renewal. If the economy weakens, excess space comes on stream and tenants are induced into moving into new space by being offered lower rents.

The greater the number of tenants, the lower the risk that the owner of a building will not be able to pay the mortgage cash flows. In particular, mortgages where a property is dependent on a single tenant or on a single industry would be riskier than a multi-tenant multi-use property. Special purpose properties are especially vulnerable should the current tenant vacate. It may be difficult to lease up and expenditures may be needed to modify the building. An analysis of diversification would include:

- Lease terms, status and rates (e.g., expiry terms, tenant mix, below market rates) and tenancy credit
- Income generation mix (e.g., locals vs. anchors)
- Detrimental lease clauses
- Owner occupied
- Rent controls

**Site Location:** Considerations for site location would include:

- Visibility
- Ingress/egress
- Major freeways (accessibility)
- Metro area market and submarket outlook and location
- Neighbourhood
- Conformation (located in a planned park)

The location factor takes on added importance during periods where a particular industry, or the economy, is in a recession. If the borrower cannot manage the cash flow payments, the lender may have difficulty selling the property. If a residential property is in a remote location or in an undesirable part of a community, it may be difficult to sell at a sufficient price to cover the mortgage, especially during a recession.

**Debt Service Coverage:** Debt service coverage, both now and in the future, is an important consideration. A property with a 1.2 “coverage” ratio of income to the sum of operating costs, taxes and mortgage service provides strong coverage. Coverage below 1.1 generally indicates a weaker mortgage.

**High Risk Loans:** Certain forms of loans are, by their nature, high risk. These commonly include construction loans, land loans, hotel loans, loans on recreational properties, joint ventures, participating or convertible mortgages, tax-driven condominiums, residential subdivisions, or speculative projects. Permanent mortgages on mature properties that have achieved a certain level of occupancy are less risky. Occupied properties are less risky because they have been “market tested.”

**Covenants:** In many cases, a lender will insist that a covenant be added to the mortgage. A covenant may cause other specific financial assets of the borrower to be used as collateral. There may be recourse to the borrower or the borrower’s business so that defaulting on the mortgage will only arise if the net worth has been exhausted and bankruptcy occurs. There may be recourse against more than one borrower involved in the mortgage for the entire amount of the mortgage, should any one of the borrowers default on his or her share of the mortgage payments. Several properties could be used to secure each of a group of mortgages. Should any of the group of mortgages default, then all the properties can be claimed as security. Most commercial/industrial loans have such a covenant. In many residential mortgages, the borrower must add a personal covenant. If they do not, the mortgage would be considerably riskier.

**Quality of the Borrower:** Considerations in underwriting the borrower include:

- Condition of borrower’s financial statements and financial strength (is the borrower a good business person?)
- Amount of consumer debt
- Experience/reputation ethics of the borrower
- Type of applicant (i.e., partnership, syndication)
- Amount and quality of the guarantee
- Existing mortgages
- Lien position and title
- Income enhancement and credit support
- Stability of borrower income, other sources of income

- Payment history of loan
- Commitment of borrower to maintain mortgage payments

### **Portfolio Diversification**

It is important to understand the geographical diversification of a loan portfolio and diversification by type of loan, since these two factors can dramatically impact C-1 risk loss experience in a given economic cycle. Portfolio diversification by geographic location and type of mortgage will reduce the specific risk of a mortgage portfolio, just as with other asset classes.

In Canada, geographical location might be determined by province or major urban centre. In the U.S., a breakdown into Pacific, Mountain, South Central, North Central, New England, Mid-Atlantic and South Atlantic regions is typical. A typical analysis by type might break out single family dwelling, multi-family residential, shopping, hotel, restaurant/bar, other commercial, office, industrial, land, and miscellaneous. The mortgage portfolio profile would then be analyzed into cells by both location and type factors. If a company takes on higher risk forms of lending, these would also be analyzed separately into each of their various types (see the preceding section on underwriting for a list of riskier type mortgages).

As mentioned, the extent to which property values are impacted by economic factors can vary significantly by geographic location and type of mortgage. Concentration in the more adversely impacted location and mortgage type can obliterate any favourable impact from superior underwriting. Past favourable experience may have been due to concentrations that are about to come home to roost. For example, a company that was relatively overweighted in Ontario and underweighted in the West, all else being equal, is likely to have had favourable mortgage C-1 risk loss experience in the 1980's, followed by relatively unfavourable experience in the 1990's.

Because of the points outlined above, industry and company comparisons are generally meaningful only if analyzed on the basis of appropriate geographical and mortgage type breakdowns. Even then, a similarly diversified portfolio to the industry may have significantly different C-1 risk loss experience from the industry if its diversification has not tracked that of the industry over the previous business cycle.

Consider a company that decided to correct its underweighting (relative to the industry) to the Ontario economy at the peak of Ontario property values in 1989 and early 1990. This decision to "diversify" the portfolio by increasing exposure to Ontario property values is likely to translate into inferior portfolio experience relative to the industry. While the properties of the company and the industry may suffer the same percentage decline in market values, the newer mortgages in the portfolios would have higher loan-to-value ratios. Consequently, the same decline in market values creates more defaults for the newer portfolios than for the mature portfolio. The industry portfolio, all else being equal, will have superior average loan-to-value ratios with respect to its Ontario exposure since it will be less concentrated in newer mortgages. Thus, the reduction of Ontario property values can be expected to have a relatively more adverse impact on this company's C-1 risk loss experience.

### **Portfolio Growth**

The year of mortgage origination is a third dimension of diversification complementary to location and type. Two mortgage portfolios can be presumed to have similar expected C-1 risk losses only if they have similar profiles of diversification across location, type and year of origination. All else being equal, a mortgage portfolio that has experienced relatively rapid recent growth can be expected to experience relatively greater C-1 risk losses than an older portfolio.

The rationale is as follows: The outstanding principal of a mortgage decreases over time. If the value of the property does not decline or, in fact, increases, the mortgagee's equity increases. If a C-1 risk loss occurs, it will be less severe. Also, a mortgage that has been "seasoned" through a market cycle is much less likely to default. For these reasons, credit risk events may first increase and then decrease as the mortgage ages.

Consider again the company that increased its exposure to Ontario property in the late 1980's, relative to the industry. The relatively rapid growth of that period meant that loans issued then reflected the higher property values in their loan amounts. When real estate values dropped in the early 1990's, these same loans then had higher loan-to-value ratios than loans issued at other times, which is likely to translate into inferior portfolio experience relative to the industry. This would happen even if the company had superior mortgage underwriting and diligently tracked industry diversification throughout the business cycle.

### **Problem Loan Management**

There are several aspects to problem loan management:

**Workout Team:** The workout team actively manages the mortgage portfolio to minimize the credit losses arising from problem mortgages. Periodically selected mortgages are reviewed by the workout team. Mortgages would be selected for this initial review based on predetermined factors, such as the large size of the mortgage and/or the type or location of the property. Those that satisfy enough of the criteria listed on the next page would be placed on the watchlist. The workout team also reviews annually all mortgages that are on the watchlist. Using the results of the reviews, they consider all possible courses of action and assess which approach would minimize C-1 risk losses.

**Nonperforming Mortgages:** The level of economic loss can be significantly impacted by the skill, efficiency, and knowledge brought to problem loan management. Early acknowledgement and effective handling of problem loans is critical if losses are to be minimized. An effective workout team is also important to minimizing losses on problem loans.

Effective action begins with an immediate response to new arrears and a sustained effort to turn the situation around and prevent further impairment of value. Economic loss will be significantly reduced by early recognition of mortgages that cannot be salvaged. Early attachment of rental income will prevent diversion of rents by the borrower. Prompt action to realize value through power of sale, quit claim or foreclosure will mean sale proceeds can be invested in an income earning asset at the earliest possible date.

The full range of legal remedies should be considered in order to maximize the economic value realized. While speedy attention is critical, the best course of action is not always to unload a property as quickly as possible. Taking the time to lease up a property or to make necessary repairs may be amply rewarded.

**Restructured Mortgages:** Commercial mortgages may be restructured because high vacancy rates have lowered the debt service coverage to the extent that the mortgagor is unable to maintain payments at contracted interest levels, and the mortgage would become nonperforming if no action were taken. The immediate result of restructuring would be lower cash flows and the resultant need for additional assets to cover the same liabilities.

Restructuring a mortgage can keep the person who is best situated to realize the maximum value from a property in charge. On the other hand, it may simply defer the recognition of an irretrievable situation. In the longer term, the restructured mortgage may still become nonperforming and the restructuring may simply have delayed the credit loss.

**Watchlist:** A watchlist identifies performing mortgages that are potentially problematic (i.e., significant risk of credit losses). Such a watchlist is an ideal source of information on the weak loans in the portfolio, based on the financial entity's internal rating system. An appropriate analysis of the watchlist data can be the basis of an early warning system to identify trends in the credit loss experience of the mortgage portfolio. Watchlist loans would normally be riskier, and appropriate margins should be held. The financial entity's investment policy guidelines should establish the criteria for placing loans on the watchlist.

Criteria for deciding which mortgages to maintain on the watchlist could include a combination of the following factors:

- Loan-to-value ratio > 90%
- Debt service coverage < 110%
- Vacancy rate > 15%
- Taxes in arrears
- Connected borrower problems
- Loan in and out of arrears
- Lag factor - major leases coming up for renewal
- Deferred maintenance
- Cash flow being subsidized
- Financial statements show continuing losses
- Mortgage has been restructured previously
- Mortgage has previously been written down

Forced renewal mortgages (these are mortgages that do not meet current underwriting standards) are logical candidates for watchlist inclusion. If a forced renewal is at above market rates, the increase in reserve due to its higher risk would normally be expected to prevent taking this extra return into income. Mortgages that have been restructured or that have had past writedowns should be identified and would again be strong candidates for inclusion on a watchlist. Experience shows that even if these mortgages are now performing, their future experience will be worse than the portfolio as a whole.

The actuary should develop a sense of whether his or her financial entity experiences delays in placing loans on the watchlist. A credible watchlist is one that predicts future C-1 risk losses. This will be the case if most C-1 risk losses arise from mortgages that were on the watchlist prior to default. To assess the reliability of the watchlist as a source of data for C-1 risk loss predictions, mortgage defaults should be tracked to assess the extent to which they had been identified as being weak, and, as such, were included on the watchlist. There is a positive correlation between the effectiveness of the watchlist and the accuracy of the mortgage C-1 risk provision in reflecting credit losses.

As mentioned earlier, the workout team also reviews annually all mortgages that are on the watchlist to determine the approach which would minimize C-1 risk losses. This may result in one of a number of actions, such as renegotiating the terms of the loan (restructured mortgage), negotiating a vendor take-back mortgage, maintaining a property in the investment real estate account, conducting a fire sale of the property, or effecting capital improvements prior to selling the property.

The actuary should be aware of all extension risks, such as mortgages subject to forced renewals. Asset categories should reveal the level of investments in groupings, such as mortgages subject to forced renewals, written-down mortgages, restructured mortgages, and vendor take-back mortgages, since these categories will normally be subject to additional credit loss risks. With respect to vendor take-back mortgages, a wide variety of industry practice is likely occurring, and additional default risk may or may not be present, depending on a financial entity's underwriting stringency for taking back mortgages when liquidating real estate acquired by foreclosure. For these categories of assets, the cash flows generated should recognize the expected depreciation.

Restructured mortgages, vendor take-back mortgages, mortgages with extension risk such as forced renewals, mortgages in foreclosure, and other mortgages with deteriorating financial conditions, all of which would generally be included on a watchlist, have an increased probability of credit risk events and economic loss.

**Accounting Treatment:** The actuary should be fully conversant with the application of accounting rules to mortgages, especially with regard to the manner in which writedowns are handled when mortgages become nonperforming, are foreclosed, or restructured (see Sections 3025 and 4210 of the CICA Handbook.)

### **Economic Loss Ratio**

C-1 risk losses should reflect the writedown of principal, the loss of interest due, and all costs associated with managing and resolving problem mortgages, including expenses incurred in selling properties. There can be additional economic losses whenever the foregone future interest payments on the mortgage are at higher interest rates than currently available new money rates. Asset default models may be useful for

estimating loan losses and their cash flow impacts. When a mortgage is transferred to the real estate portfolio, use of unrealistically high transfer values should be avoided, and ultimate sales values should be tracked.

Economic loss ratios, like arrears experience, will vary from company to company due to statistical fluctuation and a range of factors including underwriting, diversification, portfolio growth and problem loan management. Economic loss ratios of the entire industry may also vary with the economic conditions and level of property values prevailing at the time of default.

### **VII.3 SIGNIFICANT CONSIDERATIONS IN SETTING C-1 RISK EXPECTED LOSS ASSUMPTIONS AND MARGINS FOR ADVERSE DEVIATIONS**

Based on the foregoing discussion of the material factors impacting C-1 risk loss experience, projected mortgage C-1 risk loss experience should be assumed to be more severe and the provision for adverse deviation larger than would otherwise be the case, if:

- Past company experience has been less favourable than industry experience when analyzed in aggregate and by location and type.
- Underwriting and problem loan management are not wholly satisfactory.
- Significant relative portfolio concentrations exist with respect to location and mortgage type.
- Portfolio growth has been relatively rapid, especially if it has occurred during an extended period of rising property values.

Projected mortgage credit loss experience on non-watchlist loans should not be assumed to be more favourable than projected industry experience, unless all of the following conditions are known to apply:

- Past company experience has been consistently more favourable than industry experience both in aggregate and when analyzed by location and type.
- A review of both company underwriting and problem loan management standards, procedures and practices establishes that they are prudent, consistent with best industry practise and implemented by those with the necessary knowledge, skill and experience.
- Diversification by geographical location and mortgage type is similar to that of the industry currently and over the past business cycle.
- Portfolio growth rate has been similar to that of the industry over the past business cycle, or has been slower than the industry during periods of rising property values.

Consideration should be given to projecting credit loss experience worse than that projected for the industry, if any one of these factors is known or can reasonably be expected not to be the case. The provision for adverse deviation should be increased to the extent that these factors are not known to apply.

### **VII.4 OTHER CONSIDERATIONS**

#### **Comparison of Bond and Mortgage C-1 Risk**

It makes eminent sense to compare the credit risk and quality of a mortgage to another mortgage. However, comparing mortgages to bonds is problematic because exposures to business and property values are fundamentally distinct as to nature, characteristics and vulnerability to adverse economic factors.

The credit risk associated with a mortgage is almost entirely linked to the underlying property exposure. This operates like a “put option” owned by the borrower, where the option is out of the money based on the difference between the appraised property value and the loan amount. The loan amount is the “strike price” at which the borrower can “put” the property to the lender. With a 75% loan-to-value ratio mortgage, this means that only 25% of the property value must be eroded before the borrower has a clear incentive to exercise the put option by defaulting on the mortgage. This is usually a fundamentally different exposure than that of a bond.

Not only is it difficult to meaningfully compare business and property values, it is even more difficult to make comparisons as to how these values are likely to change through time and across various interest

rate and economic scenarios. The factors materially impacting the one value are not altogether the same factors that will materially impact the other. In particular, it should not be presumed that the C-1 risk profile and C-1 risk experience through time of a high quality diversified mortgage portfolio is comparable as to magnitude and characteristics to that of a high quality diversified bond portfolio.

Mortgage C-1 risk losses are highly cyclical whereas bond losses are significantly less so. Mortgages losses are cyclical because of the link between mortgages and both economic conditions and real estate values. Adverse economic conditions create declining employment, business profits and cash flow, and high levels of bankruptcies. They lead to lower real estate values due to falling demand, prices and rental income, and increased vacancies and rental arrears. The value of mortgage loan collateral and family and business net worth drops and the borrower's ability to service debt declines. When these cycles are combined with the boom/bust cycles in real estate construction, longer term inflation/deflation cycles, and adverse trends in demographics, office usage and economic restructuring, the combined effect can have a devastating impact on the level of mortgage arrears and foreclosures.

The selection of the historical period that is most representative of what can be expected in the way of future mortgage and real estate loss experience is important. Thus, the existence of somewhat predictable trends in mortgage losses makes it feasible at certain points in the boom/bust cycle to anticipate that the experience of the next few years is likely to be somewhat worse or better than the long-term mortgage C-1 risk losses for 1994-95.

### **Insured Mortgages**

There is some potential for credit losses on insured mortgages. If the insurer is private, for example, the Mortgage Insurance Company of Canada (MICC), they may go into bankruptcy and be unable to pay. There are also a number of circumstances in which the Canada Mortgage and Housing Corporation CMHC can refuse to pay the full balance and accrued interest on a CMHC insured mortgage.

CMHC establishes general terms, conditions and policies governing practices that must be followed in relation to insured mortgages. They may also stipulate terms, conditions and covenants with respect to a specific mortgage. Failure to satisfy the general or specific CMHC requirements may be discovered by CMHC only after a claim has been submitted. There may also be failure to follow prudent lending practices or to obtain appropriate fire insurance, for example. For any of these reasons, CMHC can refuse to make full payment.

Documentation and legal work may be faulty. For example, a claim can only be made to the CMHC if CMHC can be provided with a clear title to the property. If the title is encumbered with a prior claim or is otherwise problematic, the insurance coverage may be placed in jeopardy.

If a workout or sale is undertaken with respect to a property without full prior consent from CMHC, there is potential for loss.

CMHC may also refuse to pay accrued interest for the full period for which a claim is made, if they conclude that the mortgage problem was not dealt with expeditiously.

Finally, a mortgage at above current market rates will result in a loss of the spread between contracted and current rates for the remaining term of the mortgage. This loss can be substantial and is triggered by a credit risk event.

The default loss protection provided by CMHC insured mortgages will vary depending on the terms and conditions set out in the insurer's contract. Thus, if the contract attributes negligence to the lender in the underwriting process, the lender would be responsible for default losses arising from such negligence. Negligence may also arise in other areas. For example, if the actions of the lender related to the foreclosure process are at variance with the requirements of the insurer, default losses may arise. The actuary should be aware of the requirements of mortgage insurers, the extent to which investment staff comply with CMHC rules, and recognize the current and future potential for C-1 risk losses when establishing the default risk.

## VIII SPECIFIC CONSIDERATION FOR COMMON STOCKS

### VIII.1 NATURE OF C-1 RISK IN COMMON STOCKS

Unlike fixed interest-type investments, in purchasing common stocks, an investor takes a direct ownership interest in the underlying entity. In return for this ownership share, the investor gives up the right to a promised rate of return in exchange for direct participation in the future growth in the net worth and distributed earnings of the enterprise.

While the mean return for a well-diversified stock portfolio is not significantly related to the length of the holding period, a risk associated with shorter expected holding periods is the significantly increased variability in return due to market fluctuations. For example, the average annualized return for Canadian stocks from 1950 to 1994 of 10.5% for 10-year holding periods is not significantly different than the 10.05% return for 20-year holding periods. However, the 10-year holding period returns were significantly more volatile: 42% of the 10-year holding period returns were either below 7% or above 12%, while only 16% of the 20-year holding period returns had this variation. For an insurance company, the equity nature of common stock and the resultant swings in market value suggest that stock portfolios are more appropriately considered for long-term investment strategies. The methodology presented in this section looks at expected stock return and the appropriate margin for adverse deviations from this long-term perspective.

### VIII.2 DETERMINATION OF EXPECTED CASH FLOWS

This section discusses the theoretical framework for deriving the total expected future return on current market value using deterministic and stochastic models. The unique considerations for valuation will be discussed at the end of this section.

The total future return on stocks on a Canadian GAAP basis is comprised of two components:

- a) Amortization of the existing market value/adjusted book value difference at 15% a year
- b) Future return on current market value (translated to a Canadian GAAP basis)

This means that two identical stock portfolios that have the same expected future return on market value can have different future Canadian GAAP returns if they have different current adjusted book values.

Quantification of the difference between market value and adjusted book value (component *a* on the previous page) is a straightforward mathematical exercise as no estimation technique or margin for adverse deviations are required. Component *b*, the future return on current market value, is the sum of the expected annual return received before the disposal of the investment and before the end of the projection period (e.g., dividends) and the proceeds from the disposal (full or partial) of the investment before the end of the projection period.

#### Deterministic Models

For deterministic modelling, expected stock returns can be derived either as an absolute return or on an excess spread basis.

On an excess spread basis, the composition of the total expected future rate of return on market value can be thought of as being derived directly from fixed interest as:

$$I = i + r + rp$$

where:

- |           |   |  |
|-----------|---|--|
| <i>I</i>  | = | expected annual total rate of return on market value |
| <i>i</i>  | = | inflation rate                                       |
| <i>r</i>  | = | real rate of return on a risk-free bond              |
| <i>rp</i> | = | risk premium for ownership interest (excess spread)  |

The risk premium for ownership compensates the investor for the uncertainty associated with equity investment (risk of capital loss, risk of lower than risk-free earnings, fluctuation of cash flows/returns). By definition, the risk premium should not only be positive, but should exceed the amount that the debt on a



similar security would yield. The rate of return on a risk-free bond can be either a short-term or a long-term government bond return, with the latter being more common.

Quantification of the absolute return or the risk premium on a stock-by-stock basis is not practical for several reasons:

- In setting market values, the market does not explicitly quantify the IRR (internal rate of return) expected on an enterprise as part of the market value determination.
- Portfolios are usually well-diversified resulting in the need to value a large number of holdings.
- The expertise or knowledge is lacking to forecast the future cash flow (capital growth estimations necessary to make an IRR estimate) with any degree of confidence.

A prudent insurance company will hold a portfolio of stocks that is well-diversified both in terms of number of holdings (i.e., limited concentration with no single holding exceeding 5% of the portfolio) and sector (financial, utility, industrial, etc.) distribution. Historical experience over long-term time horizons has shown that well-diversified portfolios of stocks will generally have similar total return performance. The only consistently significant difference in long-term performance between types of portfolios that has been widely documented is that of large “cap” stocks outperforming small “cap” stocks in the U.S. market. The term “cap” refers to the aggregate market capitalization of an entity.

As a result, in the absence of any knowledge that the long-term future performance will be significantly different from past performance, the use of an historical market index can be a reasonable proxy to the expected return on a diversified portfolio. As the projection period increases, the expected return should converge towards the historical market index.

Two recommended sources for this historical information are:

1. U.S. - SBB *Yearbook* published by Ibbotson and Associates. This annual publication contains detailed bond and stock performance data with small cap stocks split out and reported separately.
2. Canada - CIA annual *Report on Canadian Economic Statistics*.

Based on the data in the CIA annual *Report on Canadian Economic Statistics*, the following are historical returns calculated using geometric averages of annual returns over 15- and 25-year intervals from 1950 to 1994:

	<b>Average annual return for all 25-year periods from 1950 forward</b>	<b>Average annual return for all 15-year periods from 1950 forward</b>
Canadian Common Stock Index	9.98%	10.39%
91-Day T-Bills	<u>6.74%</u>	<u>6.82%</u>
Risk Premium	3.24%	3.57%

It should be noted that the absolute common stock return and the risk premium are very dependent upon the calendar years used. If data from years before 1950 are used, the risk premium is considerably higher, while if data from 1960 forward are used, the risk premium is more than 1% lower. This highlights that the long-term excess stock return over risk-free rates has been falling over the recent decades in Canada.

Significant academic literature has been published supporting the empirically observed phenomenon that stock performance is inversely related to the level of inflation (i.e., real stock returns are significantly lower, or negative, in periods of high inflation relative to low inflation periods). Although use of the formula which relates directly to the level of inflation may be theoretically sound, the derivation of such a formula should only be attempted by those actuaries with sufficient expertise to make the required modifications.

Note that this technique will result in a long-term average value for the expected yield. It is possible that current economic conditions would suggest an adjustment to this yield to reflect expected short-term deviations from this long-term value. Prudence would suggest that short-term adjustments made under the belief that short-term returns would be lower in the immediate future are acceptable actuarial practice,

while adjustments to increase income are not. Actuaries are reminded that any adjustments made with the intent of smoothing reported income may be in conflict with Canadian GAAP.

### Stochastic Models

The expected future market value in year  $t$ , assuming reinvestment of dividends, is derived from the stochastic model:

$$y_t = f(x_t)$$

where:

$$y_t = \text{market value at the end of year } t / \text{market value at the end of year } t-1$$

$$f(x_t) = \text{an appropriate theoretical distribution}$$

$$x_t = \text{random variable calculated using a random number generator}$$

The most widely used model for stock price projection is the log normal distribution which implies that stock returns are normally distributed. The assumption that stock returns are normally distributed may not be appropriate when historical returns have significant observations in the tail. Under the log normal distribution, the stochastic model becomes:

$$y_t = \exp(m + s * x_t)$$

where:

$$m = \ln((1 + \mu) - (s^2/2))$$

$$s = \ln(1 + (\sigma/(1 + \mu))^2)$$

The mean ( $\mu$ ) and variance ( $\sigma^2$ ) are calculated using the historical total returns from an appropriate index of stock returns. After the parameters are chosen, a Chi-Squared Goodness-of-Fit Test can be used to determine how well the theoretical distribution fits the empirical distribution obtained from the sample data of the index.

Next, it is important to consider how the total return and volatility of the actual portfolio relate to the total return of the chosen index. The remainder of this section will discuss the characteristics of a beta analysis.

A beta analysis splits the portfolio's return into a part that is correlated with the index and a residual that is uncorrelated with the index or,

$$r_p(t) = \alpha_p + \beta_p * r_M(t)$$

where:

$$r_p(t) = \text{excess portfolio return over the risk-free return}$$

$$\alpha_p = \text{residual return component uncorrelated with the index}$$

$$\beta_p = \text{Cov}\{r_p, r_M\} / \text{Var}\{r_M\}$$

$$r_M(t) = \text{excess index return over the risk-free return}$$

The beta co-efficient is determined through a regression of the historical excess returns of the index versus the historical excess returns of the actual portfolio. The beta coefficient will be positive if portfolio returns move in the same direction as the index and negative if portfolio returns move in the opposite direction as the index.

The beta analysis can also be used to determine the volatility of the portfolio. Using the equation above, the variance of the portfolio is equal to:

$$\sigma_p^2 = \beta_p^2 * \sigma_M^2 + \omega_p^2$$

where:

$$\sigma_p^2 = \text{variance of the portfolio}$$

$$\sigma_M^2 = \text{variance of the index}$$

$$\omega_p^2 = \text{variance of the residual component}$$

All else being equal, the preceding formulas states that the actual portfolio's expected return and variance relative to the index are directly related to the magnitude of beta. If  $\beta > 1$  or  $\beta < -1$ , the actual portfolio

should expect higher variance in returns than the index. If beta is between  $\{-1, 1\}$ , the actual portfolio is less risky than the index as measured by variance in returns. Portfolios with a negative beta can be used to hedge market risk. The actuary should also consider the results of any beta analysis he/she performs when determining the appropriate provision for adverse deviations.

With the derivation of the future return on current market value, proceeds from disposal of the investment can be calculated as the difference between the total cash flow less the expected dividends.

### **Unique Considerations for Valuation**

The determination of an appropriate return assumption for common stocks will depend on the valuation technique. For a non cash flow valuation, the discount rate is derived from the future expected return on a Canadian GAAP basis, while for the CFVM (cash flow valuation method), the cash flow projection will depend on the future expected market return on the current market value.

## **VIII.3 DETERMINATION OF MARGINS FOR ADVERSE DEVIATIONS**

### **Factors to Consider**

The actuary should pay special attention to all the following factors:

- Expected holding period
  - margin should increase as the expected holding period decreases
- Degree of diversification
  - higher margin for lack of risk diversification (number of holdings/average size) and sector diversification
- Dividend history
  - low or no dividend stocks in portfolio may require higher margin
- Investment policy/performance measurement
  - higher turnover frequency of stock portfolio may require higher margin
- Volatility of stock returns versus the market (i.e., beta analysis)
  - high growth or low “cap” stocks in the portfolio may require higher margins
- Expertise in the area
- Regulatory and tax issues
  - current capital requirements are not related to the investment horizon and so a change in regulation may require a liquidation of the stock portfolio
- Political uncertainty
- Type of liability
  - consider the associated C-3 risk

### **Determining Appropriate Margin For Adverse Deviations for the Expected Holding Period**

This section will discuss three approaches that could be used in order to relate the margin for adverse deviations to the expected holding period.

#### **Approach 1**

The first approach is to reduce the annual expected stock return or excess spread by a constant margin for adverse deviations. An appropriate margin may be derived to ensure that for, say, 90% or 95% of the time, the historical annual rate of return or excess spread for the average expected holding period is greater than the expected value less the margin. The provision can then be adjusted to reflect either a low or high margin situation.

As an example, assume two identical portfolio of stocks are expected to be disposed of over an average of 15 and 25 years, respectively. Using the 15- and 25-year return data from the *CIA Report on Canadian Economic Statistics* as used to derive the expected value of the risk premium above, the

following margins would be required to ensure that the excess stock return assumed was experienced in at least 90% of the 15- and 25-year stock intervals since 1950. Note that the margins were calculated directly by looking at the actual level of the 15- and 25-year returns rather than by fitting a statistical distribution to the mean/standard deviations of the returns.

	<b>Value for <math>rp</math> with no margin</b>	<b>Value of <math>rp</math> MAD Required After MAD</b>	
15-year Interval	3.57%	2.79%	0.78%
25-year Interval	3.24%	1.59%	1.65%

With the limited number of observation periods, the above figures are intended only as approximate guideline values. The figures do, however, highlight that, for shorter holding periods, the increased volatility in the returns requires a considerably larger margin as compared to the margin required for longer holding periods. Note that it may be appropriate for the margin to be in excess of  $rp$  when dealing with very short holding periods or extremely volatile portfolios.

Alternatively, the appropriate margin may be derived by fitting a statistical distribution to the mean/standard deviations of the returns. The most widely used model is the log normal distribution assumption. Under the log normal distribution, the standard deviation of an  $n$ -year holding period ( $\sigma_n$ ) is equal to ( $\sigma_1 / \sqrt{n}$ ). The margin (MAD) can then be expressed as the level needed so that  $\text{Prob}(x > I - \text{mad})$  is experienced in 90% or 95% of the  $n$ -year stock intervals, where  $I$  is the expected stock return from the statistical distribution, and  $x$  is the modelled stock return. There is some evidence that the log normal assumption overestimates the volatility of stock returns over longer holding periods implying that the margin derived for longer holding periods would generally be larger than the similar margins derived without fitting the returns to a distribution.

### Approach 2

The second approach is directly related to the concept of using the cash flow valuation method. The expected holding period for the stock portfolio is determined through a projection of the asset and liability cash flows. The margin can then be explicitly related to the expected holding period in the projection. For example, assume that a stock portfolio is expected to yield 10% and a projection of the asset and liability cash flows indicated that one third of the stock portfolio would need to be liquidated in each of one, five and ten years. The margins may then be as follows:

<b>Expected holding period</b>	<b>%-age sold</b>	<b>Expected yield</b>	<b>MAD</b>	<b>Net yield</b>
1	33.3%	10%	10%	0%
5	33.3%	10%	6%	4%
10	33.3%	10%	2%	8%

### Approach 3

The final approach for determining the appropriate margin for adverse deviations is to assume an immediate drop in market value of the stock portfolio. By examining the quarterly stock declines over the past 75 years, the size of the drop may be selected to cover at least 90% or 95% of the observations. Alternatively, an appropriate statistical distribution may be used. This approach to evaluating equity risk is used in the Department of Trade and Industry financial statements in the U.K., and the approach is recommended in the June 1996 *Report of the Minimum Guaranteed Death Benefit Reserve* for the Work Group Committee on Life Insurance of the American Academy of Actuaries.

## **IX SPECIFIC CONSIDERATIONS FOR EQUITY REAL ESTATE**

### **IX.1 NATURE OF C-1 RISK IN REAL ESTATE**

One may characterize the real estate market as follows:

- Each parcel is unique
- Few buyers and sellers at one time
- Relatively large economic units
- Many government controls (tax, zoning, environmental regulations)
- No organized market

Unlike stocks, real estate is not traded on public exchanges, and, therefore, no publicly listed market values are available. Instead, real estate market values are determined by professional real estate appraisers. C-1 risk in real estate is intimately linked to changes in these appraised values. Under Canadian insurance regulations, a property must be valued at least every three years. If there is reason to believe that market values have changed substantially since the last appraisal, the actuary should, if feasible, get a revised appraisal before beginning the determination of the future expected real estate return. Failing this, the actuary should use a conservative estimate of the values that he/she believes an appraisal would put on the properties. Because actuaries may not be familiar with the techniques commonly used to determine real estate market values, these are summarized below.

### **IX.2 HOW REAL ESTATE MARKET VALUES ARE SET**

There are three commonly recognized approaches to determining a market value of real estate holdings. It is valuable to use all three approaches, although their reliability varies with the availability of data. The third approach described, called the income approach, is likely to be the most practical approach as a starting point to define both cash flow projections for dynamic solvency testing and the valuation interest rate.

#### **Replacement Cost Approach**

Under the replacement cost approach, the appraisal value is the cost of replacing a building in its current condition. It is the cost of developing a facility from the ground up. This means valuing a site as though vacant based upon comparable sales and adding the replacement cost of the improvements (i.e., the physical site development). The major weakness of the approach is the difficulty in estimating accrued depreciation. Depreciation must be deducted from the “cost when new” to derive the present worth of the improvements to which the land value is added. Depreciation is attributable to both physical deterioration and obsolescence.

The replacement cost approach is most commonly employed on proposed/new facilities. It is rarely the sole method used in an appraisal since market values are more typically driven by what a facility will sell for, which is itself a reflection of a facility’s earnings capability. As a result, the two methods that follow are typically given more weight in determining a final appraised market value.

#### **Sales Comparison Approach**

This approach to real estate valuation involves comparing a property to similar properties which have recently been sold or are currently for sale. This is done by dividing the stabilized market income of the property being valued by the appropriate current market “overall” capitalization rate for similar properties. Several firms calculate and regularly publish current market capitalization rates with splits by type of building/size/location, etc. These capitalization rates are basically just the stabilized market income for properties recently sold divided by their sale value. The capitalization rate is analogous to the reciprocal of price earnings (P/E) ratios for stocks. As for growth stocks that have higher P/E ratios, expectations of higher future income is shown by lower cap rates, (discount rate minus growth rate) which serves to increase the value.

Similar properties could be defined by the following factors:

- Same location and type of property
- Same income potential
- Same lease structure
- Same expenses
- Same tax benefits to the typical investor
- Same risk
- Same ability to finance
- Similar property rights
- Sold under the same market conditions

Typically, the market value determined by this method will then be adjusted for the present value of any short term deviations of property income from the market norm (e.g., lease guarantees).

This approach is not without its weaknesses:

- Appropriate market capitalization rates are difficult to determine. The impact of older sales/ distressed sales on capitalization rates, must be understood. This leads to using a small sample of the market.
- The approach is not useful when major income disruptions such as renovations are expected in the foreseeable future, since market capitalization rates would not reflect this.

### **Income Approach To Valuation**

This is the approach which most actuaries would intuitively consider the logical approach. Typically, the expected net income on a property is projected forward period-by-period over a finite time horizon, with a residual sale value assumed at the end.

The income projection would need to take into account:

- Income projected for each lease
- Projected expenses
- Lease renewals at the market rate
- Vacancy based on market conditions
- Tenant improvements
- Free rent and other concessions
- Financing
- Taxes

There are two main problems with the approach. First, what are reasonable estimates for future values (i.e., projecting market rents requires demand forecasts, inflation forecasts, etc.)? Secondly, what is an appropriate discount rate?

There are three approaches for determining a discount rate:

1. Estimating the implicit discount rate in recent sales of similar properties; this is fraught with difficulty because of the need to estimate the cash flow items used
2. Inquiring in the market from key players as to the current level of market discount rates
3. Systematically trying to build up a discount rate by formula as the risk-free rate plus factors for various risks/items (region, type of property, strength of lease, etc.)

i.e.,  $I = i+r+rp$

where:

$I$  = expected annual total rate of return on market value

$i$  = inflation rate

$r$  = real return on a risk-free bond

$rp$  = risk premium for ownership interest (excess spread)

### **IX.3 DETERMINATION OF EXPECTED CASH FLOWS**

For determining the income support from real estate assets backing liabilities, projection of cash flows on a property-by-property basis consistent with the income approach to valuation is conceptually the most logical approach.

In order to help the actuary be satisfied as to the appropriateness of the expected cash flows derived from application of this method, the following steps can be undertaken:

1. Compare the discounted cash flow value determined from the income approach to market values using the replacement cost and sales comparison approaches for all major properties to ensure consistency.
2. Compare the discounted cash flow value to the current appraised value for statutory reporting purposes on all properties. Ensure that all differences can be satisfactorily explained. If these values are materially different, the actuary should consider getting a revised appraisal, or failing this, use the more conservative of the two values as the base market value.
3. Compare the historical return on properties to the projected future return.

Note that in doing a liability valuation, amortization of the deferred gain/loss account balance should be reflected appropriately for the valuation technique:

- For a cash flow valuation, projected real estate cash flows should not reflect amortization of this balance.
- For a discounting approach, amortization of this balance needs to be added to the real estate yield based on the expected cash flows to determine the total real estate yield to be used in setting the discount rate.

### **IX.4 DETERMINATION OF MARGINS FOR ADVERSE DEVIATIONS**

#### **Factors To Consider**

The actuary should pay specific attention to all the following factors:

- Accuracy of real estate appraisals
  - reliance on investment staff to do projections
  - degree of comfort with determination of expected cash flows
  - time since appraisals were done
  - presence of properties under development
  - margin should increase with degree of uncertainty and/or potential optimism of the appraisal
- Degree of diversification
  - number of holdings/average size
  - type of development
  - geographic distribution
  - maturity of lease agreements
  - margin should increase with lack of diversification
- Major vulnerabilities
  - current leasing rates in excess of market rates
  - poor financial condition of major tenants
  - leases of major tenants coming up for renewal
  - environmental concerns
  - significant amounts of vacant space
  - escape clauses
  - preferred rate extension clauses
  - expected redevelopment costs
  - margin should increase with degree of vulnerabilities

- Level of expertise
  - lack or loss of expertise
  - changing profile of real estate holdings
  - margin should increase with reduced levels of expertise
- Matching liabilities
  - margin should increase if real estate is matched with a short-term liability (i.e., residual sale value should be more conservatively calculated)
- Deterioration
  - margin should increase if economic conditions are deteriorating or have deteriorated
- Leveraging
  - margin should increase if real estate is leveraged without long-term leases that immunize the level of risk

Calculations for undeveloped land/properties under development involve more judgment than those for developed properties. This is because more assumptions are needed to develop the income stream on the property. It should be noted that considerably different expertise is required to develop properties from land than to manage the acquisition/trading of developed properties.

### **Determining Appropriate Margins For Adverse Deviations**

There are basically two approaches that could be used to determine the level of margins.

The first approach is simply to deduct a percentage of the risk premium from the expected real estate return.

The second approach is directly related to the whole concept of sensitivity-testing, that is, to modify some assumptions behind the expected yield. One might consider, for example, reducing both the growth rate of income and expenses for the first  $x$  years after the valuation date.

The first approach is practical for determining a minimum margin of 25% of the long-term risk premium.

The second approach is, in fact, the only appropriate approach under a substantial or high margin situation, and is the preferred method. In these circumstances, review of both internal and external appraisals is necessary. Moreover, direct discussions with professional real estate appraisers would help the actuary to determine the level of margins that is necessary to ensure that at least, say, 90% or 95% of the time, future experienced returns will be greater than the expected return net of margins.

### **Projection of Real Estate Sales**

Real estate is generally an illiquid asset. Whenever an expected cash flow projection assumes a sale of some or all of a real estate portfolio, particularly in the short to medium term, a conservative value should be used for the residual sale value.

## **X SPECIFIC CONSIDERATIONS FOR DERIVATIVES**

### **X.1 NATURE OF C-1 RISK IN DERIVATIVES**

Derivative C-1 risk is the risk that loss will be incurred in consequence of a failure of the derivative counterparty to make payments when due, in accordance with the full financial terms of the contract.

Derivatives may be exchange-listed, standardized contracts such as Canada bond futures or stock options. Derivatives transacted off organized exchanges are referred to as over-the-counter. Over-the-counter arrangements use customized contracts in which parties to the contract negotiate all terms and conditions.

Exchange-traded products have an advantage over over-the-counter products by the fact that daily marking to market and counterparty guarantees of clearing by the exchange substantially reduce credit risk. The



exchange will make good any default, unless the exchange exhausts the total margin on deposit and the total capital of the exchange, and its members are unwilling to support the exchange further.

Prior to the late 1980's, relatively little attention was paid to the counterparty credit risk of over-the-counter derivatives. The derivative cost was the same whether the counterparty was BBB or AAA. This may have been, in part, because early derivative activity primarily related to interest rate swaps, where relatively little of the notional principal amount would ever be placed at stake by interest rate movements. However, end users have become much more credit rating sensitive.

End users need to ensure that counterparties have appropriate risk management capabilities and have an acceptable level of capital for the risks involved. Dealers with lower investment grade ratings, or financial and management controls and expertise that are suspect, find it very difficult, if not impossible, to transact with higher credit end users. Special purpose vehicles have been developed to provide credit enhancements and reassurance as to a high level of management and financial controls and expertise to those making a market in derivative transactions.

It is important to remember that for derivative transactions involving swaps, the C-1 risk on the underlying assets whose cash flows are being swapped is still present, and is not eliminated.

## **X.2 MANAGING DERIVATIVE C-1 RISK**

### **Overall Management**

Management of derivative C-1 risk starts with the need for good documentation and reporting practices. This is particularly important for derivatives, where the structures can be complicated and difficult to understand. Because insurers are generally end users of derivatives and not market makers, the separation of the trading and credit functions, which is essential for a market maker, is generally not necessary for insurers.

In managing the C-1 risk, a number of avenues can be used to control the credit exposure. Guidelines and limits can be imposed on each type of derivative taking into account the circumstances of their use. Constraints can be imposed on who can be used as a counterparty (e.g., only banks with AA or higher credit ratings). Maximum market and credit risk threshold control exposures, both in total and to single counterparties, might be specified in terms of replacement or market value, notional principal amount and potential exposure.

C-1 risk exposure can also be reduced by dealing with a diversified set of highly rated counterparties, say, banks rated AA or better. Counterparties should also be required to demonstrate a high level of financial and operational controls and expertise. Concentration with any one counterparty should be carefully monitored and steps taken to increase portfolio diversity where appropriate. Concentration should be measured in terms of both current and potential future credit exposure.

Exposure to any one counterparty can be reduced by diversifying the derivatives using that counterparty. The fact that counterparty exposure (where legally enforceable netting arrangements apply) can actually be reduced by doing more transactions with that counterparty is a peculiarity which differentiates derivative C-1 risk management from the cash market. The simplest example would be to choose a counterparty, where the greatest exposure is to decreases in rates, to do a swap to receive fixed payments. This will reduce potential exposure to this counterparty arising from a drop in rates.

C-1 risk exposure can be reduced by a number of contractual features including collateral requirements and credit enhancing clauses. The use of collateral might be triggered by a large price movement in the underlying asset or index or a credit rating downgrade. Needless to say, high quality liquid collateral is preferable. A wide variety of credit enhancing clauses are also used. An amount equal to the change in the market value (replacement cost) might be required to be paid at regular intervals, possibly daily, or such a payment might be required to be paid if the change in the market value exceeded some specific amount. The contract could be automatically terminated, with payment of replacement cost, in the event of a counterparty credit downgrade or a default on any debt obligation of the counterparty. Payment and

close-out netting can be required. The contract could be guaranteed by a parent or third party with a strong credit rating or a letter of credit could be provided.

### **Credit Ratings for Derivative Counterparties**

Although derivative C-1 risk exposures should be managed consistently with the C-1 risk exposure from on-balance-sheet assets and liabilities, it is critical to understand that rating agency debt ratings cannot be relied upon to assess the credit risks of derivative obligations. The capacity to meet debt obligations can differ markedly from the capacity to meet derivative obligations because of legal issues, the junior status of derivative obligations, or the existence of bond covenants and third-party guarantees of bond payments.

If the derivative counterparty is an unrated and perhaps unsupported affiliate, a rating cannot be imputed from rated affiliates. Wide differences in credit quality can, and do, exist between affiliates. If some form of guarantee or letter of comfort is provided by a highly rated affiliate, the extent of the guarantee or comfort must be subjected to thorough and rigorous legal review.

The derivatives activity of the counterparty must be part of the credit analysis. A major derivatives-related loss may hit a counterparty, however creditworthy they might otherwise be. This is especially true if their activity is voluminous and not well-understood by their management and they lack appropriate policies, standards, controls and management information systems. Special scrutiny is required, since public financial statement disclosures are not very helpful in assessing derivative risk exposures.

### **Special Purpose Vehicles**

Special purpose derivatives vehicles have been created as stand-alone legal entities in order to address credit concerns associated with their parents. Before relying on special purpose vehicle AAA ratings, the nature and significance of these ratings should be clearly understood, for they are quite distinct both from debt ratings and insurance company claims paying ability ratings. Some market participants do not take such AAA ratings at face value, and do not rely on them as a kind of safe harbour.

Alternative approaches to C-1 risk management that combine debt credit ratings, collateral and credit enhancements are often employed.

### **X.3 Measuring Derivative C-1 Exposure**

Measuring derivative C-1 risk exposure involves measuring both the current exposure (current replacement cost) and the potential future exposure. This is necessary because the current exposure may give limited or no indication of the potential future C-1 risk exposure.

#### **Current C-1 Risk Exposure of a Single Derivative Transaction**

Current derivative C-1 risk is related to the market value or cost of replacing the derivative in the market. If the counterparty defaults, the company can be made at this replacement cost. C-1 risk cannot be measured by notional principal amount. C-1 risk fluctuates over time as a function of the net cash flows that must be paid or received on the contract. If the derivative has negative replacement value, there is no current counterparty risk.

Forward-type contracts involve no, or very little, initial counterparty exposure since they could be replaced at origin at no, or little, cost. Option-type contracts involve an initial counterparty exposure to the purchaser equal to the option premium. Structured investments have an initial counterparty exposure similar to that of the cash market instrument in which the option is embedded.

Forward-type contracts entail bilateral credit risk, since either party may be exposed to credit losses depending on movements in the price of the underlying asset or index. Interest rate, commodity and equity swaps do not involve the exchange of principal. They are executory contracts, which need to be performed only if the counterparty performs.

The method of calculating the replacement cost can be illustrated for interest rate and currency swaps. A current “zero coupon” swap curve analogous to a zero coupon or spot bond curve is calculated from current Banker Acceptance rates (overnight spot, 1, 2, 3, 6 and 12-month terms) and current swap rates (2, 3, 4, 5, 7, 10, 15, 20 and 30 years). The present value of the fixed payments on the existing interest rate swap, less the present value of the fixed payments on a new interest rate swap, with the same remaining term, floating index and rate reset frequency, is calculated using the zero coupon swap curve. This difference is the replacement cost to the counterparty receiving the fixed payments.

In the case of a currency swap, zero coupon swap curves are developed for both currencies. The present value of the payments in each currency is calculated using its zero coupon swap curve. The spot exchange rate is applied to convert the present value of the foreign currency payments into Canadian dollars. The converted present value is subtracted from the present value of the Canadian dollar payments. This difference is the replacement cost of the currency swap to the counterparty receiving the Canadian dollar payments.

### **Potential C-1 Risk of a Single Derivative Transaction**

Potential C-1 risk is an important but difficult consideration in assessing derivative counterparty exposure. In the case of traditional investments in bonds and stocks, the current market value gives a reasonable indication of the potential credit exposure. Thus, consideration of the potential exposure separately from the current exposure is not usually an important consideration. Assessing the C-1 risk of any fixed income instrument, such as a zero coupon bond, in which there can be a material accrual of interest income, would require consideration of potential C-1 risk.

In the case of derivatives, the current replacement cost may not give any indication of the potential C-1 risk loss exposure. A negative replacement value indicates nothing at all about the potential for C-1 risk exposure if the underlying asset or index values shift unexpectedly.

The potential for C-1 risk exposure varies considerably between the different kinds of derivatives. The potential exposure of a currency swap or structured medium-term note is many times the potential of an interest rate swap with the same notional principal amount, for example.

Potential C-1 risk exposure increases with the term of the exposure. The counterparty has a longer time to get into trouble and the derivative replacement cost exposure has a longer time to increase in value. For this reason, steps taken to control potential counterparty exposure should increase with the term of the exposure. A company willing to deal with AA counterparties might only deal with AAA counterparties beyond five years. Only certain sovereign counterparties might be accepted for terms beyond ten years.

An actual loss because of default depends not only on price movements in the underlying asset or index, but also on the financial distress of the counterparty. The potential C-1 risk exposure can be combined with counterparty derivative credit quality information to obtain information on expected losses and an appropriate provision for adverse deviation. Credit enhancing features should be reflected in assessing the potential for loss only to the extent that they are legally enforceable.

### **Measuring C-1 Risk Exposure**

- **Monte Carlo Methods**

The best measure of the potential C-1 risk exposure uses Monte Carlo simulations to determine what would be the largest replacement cost of the derivative over a specific time horizon at a defined probability level. For example, this could be at the 99% confidence level over the remaining time to contract maturity, with the value based on the current value and a stochastic model of changes in the underlying asset or index values and resulting derivative replacement cost exposure. Option valuation models are also used to assess potential C-1 risk.

- **BIS or “Factor” Method**

The Bank for International Settlement (BIS) issued a Capital Accord that established capital requirements for the C-1 risk of both balance sheet assets and derivatives. The Accord asserts that the best way to assess C-1 risk of derivatives is to determine the current replacement cost by marking contracts to market and then adding a factor (the “add-on”) to reflect the potential future exposure over the remaining contract life. The add-on amount for a particular transaction is calculated by multiplying the notional principal amount by the appropriate add-on factor. There is an adjustment to recognize netting (discussed in the next two pages). The credit equivalent amount is the sum of the replacement cost and add-on.

**Add-on Factors Effective 1995 Year-End**

Residual Maturity	Interest Rate	Exchange Rate and Gold	Equity	Precious Metals Except Gold	Other Commodities
One year or less	0.0%	1.0%	6.0%	7.0%	10.0%
Over one yr to five	0.5%	5.0%	8.0%	7.0%	12.0%
Over 5 years	1.5%	7.5%	10.0%	8.0%	15.0%

Banks are required to hold 8% capital against the credit weighted BIS credit equivalent amount. For selected countries, the credit weights are 0%, for OECD banks, 20% and for other credits, 50%. The OSFI MCCR capital formula follows the BIS formula for derivatives.

Interest rate contracts include single-currency interest rate swaps, basis swaps, forward rate agreements, interest rate futures, interest rate options purchased and similar instruments. Exchange rate contracts include cross-currency interest rate swaps, forward foreign exchange contracts, currency futures, currency options purchased and similar instruments. Equity contracts include forwards, swaps, purchased options and similar contracts based on individual equities or equity indices. The residual maturity can be set equal to the time until the next contract reset date at which the contract mark to market value is reduced to zero by settlement of outstanding exposures. The add-on for single currency floating/floating interest rate swaps is zero. The effective notional amount is to be used for leveraged derivatives rather than the nominal amount.

The BIS measures, and similar measures that apply a set of factors that vary by remaining term and derivative type to the notional principal amount, do not reflect the price volatilities of the underlying asset or index and the term of the contracts in a precise fashion. The use of such measures of potential C-1 risk may be adequate for an end user involved in a relatively small exposure of plain vanilla interest rate and currency swaps to high quality counterparties. The greater the exposure, the more complex the derivatives and the higher the counterparty credit risk, the less satisfactory are such measures. Certainly, such measures are inadequate for market makers.

**Close-out Netting and the Measurement of C-1 Risk in a Portfolio of Derivatives**

The total current and potential C-1 risk exposure to a particular counterparty, where more than one derivative transaction is in place, depends on whether payment netting applies to payments on settlement dates and close-out netting applies to replacement costs in the event of default or bankruptcy.

Payment netting applies if same currency payments from the same office on the same day are netted so that only one payment is made between the counterparties. Legally, this is referred to as novation. Close-out netting provides that in the event of a default or other termination event, all swap agreements are valued and netted and one payment is made between the counterparties to close-out all derivative contracts. With a legally enforceable bilateral close-out netting agreement, one counterparty cannot simultaneously default on negatively valued derivative contracts, while demanding payments on positively valued contracts.

Every possible step should be taken to put in place contractual netting arrangements across the entire derivative exposure to each counterparty and to ensure legal enforceability of these netting provisions.

Standardized master netting agreements, such as the International Swaps and Derivatives Association, Inc. 1992 (Multi-currency - Cross Border) ISDA Master Agreement should be used.

If payment netting does not apply, there may be substantial settlement risk. If close-out netting does not apply, then the current C-1 risk exposure is the sum of all the positive exposures of individual transactions. If close-out netting applies, then the current C-1 risk exposure to any one counterparty is the sum of all positive and negative current exposures. Naturally, positive and negative exposures cannot be netted across counterparties.

The aggregate potential exposure to a counterparty is likely to be considerably less than the sum of the potential exposures calculated on a transaction-by-transaction basis. This is true whether or not close-out netting applies. Some transactions will have a negative value if and only if other transactions have a positive value and vice versa, as with same, or similar, term interest rate swaps, in which the company pays fixed interest on one and receives fixed on the other. Some will have peak potential exposures at different times, as with interest swaps with materially different terms to maturity. Correlations of price changes between derivatives of the same or different type may need to be taken into account. To avoid overstating the potential aggregate exposure, the impact of each scenario should be assessed simultaneously on the entire portfolio, and not on a seriatim basis.

To refer again to the BIS capital accord, netting of off-setting exposures is allowed in the calculation if contracts are subject to novation (payment netting) or legally binding close-out netting of replacements costs. No reduction for netting applies if there is any chance that a liquidator could demand performance on those contracts favourable to the failed counterparty, while defaulting on unfavourable contracts. Netting is not allowed if the non-defaulting counterparty is required to make only limited or no payments to the defaulter, even if the defaulter is a net creditor.

The BIS add-on for netted transactions (A net) is a weighted average of the gross add-on (A gross) and the gross add-on adjusted by the ratio of net current replacement cost to gross replacement cost (NGR). The gross add-on is the sum of the add-on amounts for individual transactions.

$$A \text{ net} = .4 \times A \text{ gross} + .6 \times \text{NGR} \times A \text{ gross}$$

where NGR = level of net replacement cost divided by level of gross replacement cost for contracts subject to legally enforceable netting agreements.

NGR can be calculated counterparty by counterparty or on an aggregate basis, if done consistently. Net negative current exposure to a single counterparty must be set to zero in calculating the aggregate net replacement cost.

#### **X.4 DETERMINATION OF MARGINS FOR ADVERSE DEVIATIONS**

The most significant consideration requiring a larger provision for adverse deviations than would otherwise be the case is a lack of familiarity (i.e., experience or understanding) within an organization in a derivative asset class that is being used.

Other significant risks that would require a larger provision for adverse deviation would include the following:

- Use of non-exchange-traded (i.e., over the counter) derivatives
- Counterparty credit concerns (including lack of knowledge of counterparty credit exposure)
- A lack of diversity in derivative counterparties
- An absence of credit enhancing features in derivative contracts
- An absence of netting of aggregate exposures with a counterparty
- An inability to measure potential derivative exposure accurately using a proven stochastic modelling tool (this could be caused by one or more of lack of expertise, lack of a modelling tool, or the analysis not being assigned a high priority)

## **XI SPECIFIC CONSIDERATIONS FOR ASSET- AND MORTGAGE- BACKED SECURITIES**

### **XI.1 NATURE OF C-1 RISK IN SECURITIZED INVESTMENTS**

Securitized investments involve the pooling of cash flows from a group of assets, which are then packaged and sold to investors. There are two common structures to consider: “pass-through” structures and “non-pass-through structures.”

#### **Pass-Through Structures**

In a pass-through securitization, each security owner receives a *pro rata* share of the pool’s cash flows after payment of servicing and guarantee fees, if any. From a C-1 risk perspective, the risk is evenly distributed across all security holders in proportion to their holdings. The pooling of many underlying investments reduces the specific risks associated with owning a single investment, leaving only the systemic risks to be born by the investor.

Securitization on a pass-through basis may not be entirely satisfactory to all investors. Some investors may find the systemic credit, interest rate and other risks involved in a pass-through security to be too great for their purposes, or the expected cash flows may not meet their requirements. This has led to a second general structure, called “non-pass-through” securities.

#### **Non-Pass-Through Structures**

Securitization on a non-pass-through basis involves the repackaging of the cash flows and the associated risks from a securitized pool. This repackaging can allow the securities to satisfy the investment requirements of a wider group of investors, and, therefore, can improve the liquidity of the investments.

The repackaging of cash flows arising from a pool of assets does not create new risks. It simply redistributes the already existing risks across all the different securities supported by the pool. If the pool is securitized on a pass-through basis, the risks are distributed evenly across all securities. If the pool is not securitized on a pass-through basis, the risks are spread unevenly across the securities. Some securities will have less risk than the underlying pool of assets at the expense of other securities that have more risk. These securities with different levels of risk are commonly called “tranches.” Both C-1 risk (credit risk) and C-3 risk (interest rate risk) can be repackaged and redistributed.

Securitized assets have been divided into two general classes for the discussion on C-1 risk that follows below based on the type of underlying asset that has been securitized: mortgage securitizations versus securitizations of other asset forms (most commonly credit card receivables or auto loans).

### **XI.2 OVERVIEW OF ASSET-BACKED SECURITIES**

#### **General Structure**

Asset securitization, as distinguished from mortgage-backed securitization, has grown quickly in the United States since 1985 and more recently in Europe.

A typical asset-backed security involves the creation of a trust by a seller/servicer to which a pool of assets is sold with or without recourse. Investors purchase securities issued by the trust and backed by the cash flows generated by the pool of assets held by the trust. A trustee makes the payment of principal and interest to the investors. The seller/servicer receives a servicing fee.

Asset-backed security structures depend on the legal opinion that:

- The trust issuing the security will not be drawn into the bankruptcy of the seller.
- The transfer of the underlying loans (receivables) from the seller to the trust is a “true sale.”
- The investor has a first preferred security interest in the loans.

There is a legal risk that these opinions will be challenged and challenged successfully. This leads to an additional risk that the bankruptcy/receivership of the servicer may lead to interruption of payments.

The rating agencies assign credit ratings to all tranches of any publicly traded asset-backed security. To do this, they look at both the quality of the underwriter, servicer and trustee, and the quality and diversity of the collateral (including historical pool performance and pool seasoning, legal structure and credit enhancements).

It must be emphasized that the ratings on asset-backed securities relate solely to the likelihood of principal repayment by the time the trust matures, and not the timeliness of this repayment. This maturity date is a legal date that may be well after the expected final maturity.

The most common forms of asset-backed securities are securitized auto loans (CARS) and credit card receivables (CARDS), although many other asset classes have been securitized, including home equity loans and residential second mortgages. CARS and CARDS are described in more detail later in this section.

### **Credit Risk Control/Enhancement Features**

There are several techniques used to control the C-1 risk (credit risk) in asset-backed securities and their different tranches. The first is to use a senior/subordinated tranche structure for credit risk purposes. The cash flows from the asset pools are stratified into a senior (Class A) security and a subordinated (Class B) security. All losses are absorbed by the subordinated security until it is completely exhausted. The higher quality security is impacted by credit losses only if they exceed those that can be borne by the lower quality tranche. If the issuer is subject to the Bankruptcy Code and the issuer retains the lower quality tranche, there is a legal concern that, in the event of the issuer's bankruptcy, a court will rule that the pool assets have not been truly sold.

Initially, all prepayments will usually be directed to the higher quality tranche. While this enhances credit quality for the high quality tranche, it increases the prepayment risk of the tranche. The rating agencies may assign a AAA or AA rating to the high quality tranche and a rating of A or lower to the low quality tranche.

A second approach is to use a cash reserve fund, where effectively the most subordinated tranche is retained by the issuing trust from the outset.

A third approach is to place more assets in the pool than will be needed to meet the payments on the securities backed by the pool. Any excess interest earned on the collateral over that paid on the securities plus servicing fees, plus credit enhancement fees, can be set aside to build a credit risk reserve (i.e., C-1 risk reserve) account or to accelerate pay-down of the principal. This excess spread would revert back to the seller, if and only if, it was not needed to cover C-1 risk losses. In this way, the pool assets can experience a degree of credit losses without impacting the payments promised on the securities, and so be rated as high quality by rating agencies.

A fourth approach is a credit guarantee from a top rated bank or a bond guarantee insurance company. These would typically provide for reimbursement of pool loans written off up to some amount such as 5% to 30% of loan balances. To obtain a AAA rating on the basis of a letter of credit, the guarantor would need to be an AAA bank and the guarantee would need to provide coverage against losses at least several times historical loss levels. An issuer may provide a similar guarantee with the security receiving the same rating as the issuer. This form of credit enhancement, however, creates C-1 risk exposure to the guarantor.

### **CARS**

Asset-backed securities backed by a pool(s) of automobile and light truck loans are called CARS. CARS use one or more of subordinated tranche structures, reserve funds, and letters of credit to control C-1 risk.

Typically, CARS are rated AA or AAA on the basis of letters of credit or other guarantees from entities rated AA or better. CAR ratings reflect loan quality, the pool selection process, the payment structure and the credit support. If the rating derives from a letter of credit (LOC), then the CAR ratings will be impacted by the rating of the LOC provider. Rating downgrades arising from downgrades in the credit

support are the primary risk. Consideration should be given to the credit quality of the supporting entity. Loss of principal due to net losses in excess of the credit support is unlikely.

CARS are composed of a great many loans (at least 10,000 to over 150,000) and so provide better C-1 risk and prepayment risk diversification than straight corporate debt. Pool characteristics vary by issuer type. Bank pools tend to contain seasoned loans and up to 30% used car loans. Finance company pools tend to contain more recently originated loans from a wide geographic area. These characteristics impact C-1 risk loss and prepayment rates.

Pass-through CARS give certificate holders an equity interest in a fixed pool of loans. The loans are sold to a grantor trust that issues the CAR. Investors are entitled to all cash flows from the loans. In a pay-through CAR, the originator sells the loans to a limited purpose finance company that issues the CARS notes. The notes are supported by the cash flows from the loans, but do not entitle the note holders to any residual value. The notes are the issuer's liability and are non-recourse to the originator.

## **CARDS**

CARDS are asset-backed securities issued by banks and retailers and backed by receivables of credit cards. Credit receivables may be general purpose revolving credit cards issued by banks or private label credit card receivables issued by retailers. Such loans have no specific amortization schedule or final maturity date. They are extended and repaid repeatedly over time. The retail category is theoretically of slightly lower quality than the bank sector, with the quality gap increasing for weaker retailers.

The C-1 risk in these securities and the different tranches is fully rated by the rating agencies. C-1 risk typically exists through exposure to the credit risk in the underlying loans, which are not secured. Credit quality is typically managed through subordination of tranches for credit purposes, or, less frequently, letter of credit guarantees. There is also usually excess servicing within the trust itself; in other words, the portfolio revenue itself exceeds the total planned disbursements and expenses. Ultimately, any excess servicing that is realized is returned to the issuer.

The credit enhancements usually mean that senior tranches are rated AAA or AA with subordinated tranches rated A or lower. Credit enhancements for CARDS are designed to provide protection against default rates as much as five to eight times the worst case historical experience. Characteristics of the underlying credit card debt heavily impact credit ratings (as well as prepayment risk).

In the typical security structure, the servicer of the credit card receivables (typically the originator) sells specific credit card account balances to a trust or special purpose subsidiary that conveys ownership of the balances to investors through sale of certificates. All new receivables originating from these accounts are sold as created. Accounts are selected so as to be representative of the issuer's eligible pool. Issuer's counsel must provide a number of legal opinions, for example, that the transfer of receivables is a "true sale" receives accounting treatment as a sale, and so on.

"Early amortization" or "payout" events such as the bankruptcy of the seller, a decline in the yield on the receivables below a certain rate, or a rise in the charge-off rate above a certain level trigger a quicker paydown of principal. While this provides credit protection, it does mean CARDS may pay much sooner than expected in a less favourable interest rate environment.

Finally, while the receivables backing CARDS are unsecured, whereas the receivables backing CARS are secured by new and used autos (with consequent lower delinquency rates and net losses), credit enhancement features make this distinction a non-issue from a credit perspective.

## **XI.3 OVERVIEW OF MORTGAGE-BACKED SECURITIES**

### **U.S. Agency-Backed Mortgage-Backed Securities**

Agency MBS issues consist of pools of residential mortgages guaranteed by a U.S. government agency. The volume is split about evenly between three agencies. Securities issued by the Government National



Mortgage Association (GNMA or Ginnie Mae) are backed by the full faith and credit of the U.S. government through the credit support of the Federal Housing and Veterans Administrations. Securities issued by the Federal National Mortgage Association (FNMA or Fannie Mae) and the Federal Home Loan Mortgage Corporation (FHLMC or Freddie Mac) are guaranteed by FNMA and FHLMC, respectively.

Although obligations of FNMA and FHLMC are not backed by the full faith and credit of the U.S. government, it is accepted that the U.S. government would not allow these agencies to fail. Their status as a government sponsored enterprise (GSE) is based on the facts that they are:

- Established by acts of Congress
- Have five presidential appointees on their board of directors
- They are exempt from state and local taxes
- They may borrow \$2.5 billion from the U.S. Treasury
- Their debt obligations may be held by federally supervised thrifts, banks and credit unions and by national banks (without limit)
- Their debt obligations are exempt from SEC provisions
- There is a financial regulator that is responsible for ensuring that FHLMC and FNMA operate soundly and are well-capitalized

The important economic, political and social functions played by these agencies provide a strong incentive for continued government support.

GNMA, FNMA and FLHMC mortgage-backed securities all carry AAA credit ratings from the major rating agencies. Provisions in some of the structures may allow for some modest delay of principal repayments beyond the contractual due dates in the underlying mortgages.

Agency mortgage-backed securities exist in both pass-through and non-pass-through structures. The often very complicated tranche structure of the non-pass-through securities is designed solely to manage interest rate risk, which may be substantial for these securities because of full book value prepayment provisions.

### **U.S. Commercial Mortgage-backed Securities**

Commercial mortgage-backed securities are a new and growing class of securitized asset. They present the opposite risk profile from the agency mortgage-backed securities. The inherent call protection in the underlying mortgages tends to minimize interest rate risk, at least for a significant number of years from issue. Conversely, C-1 risk can be significant.

Commercial mortgage-backed securities use tranche structures to regulate the C-1 risk and assign different target average lives for assets. The different tranches are rated by the rating agencies for credit risk. The tranche structure basically prioritizes the credit losses to the subordinated credit classes (i.e., all credit losses are assigned to the most subordinated credit class until the class has zero value, then are assigned to the next most subordinated credit class etc.).

### **Canadian Residential Mortgage-Backed Securities**

Securitization in Canada has centred on securitizations of pools of NHA insured mortgages where the CMHC guarantees the timely payment on their due dates of principal and interest on MBS certificates. Loans guaranteed by the CMHC carry the same credit risk as agencies of the Government of Canada. As a result, from a C-1 risk perspective, these are high quality assets.

Under contractual arrangements between the issuer of a pool and CMHC, the issuer is responsible for servicing and administering the mortgages which constitute the pool in accordance with generally accepted practices in the mortgage lending industry. The issuer is liable for ineligible loans where title is defective. The issuer must pay various administrative and processing fees. The issuer must make regular monthly payments to the Central Paying Agent, whether or not the mortgage payments are received from the borrower. The issuer must also pay off the investor at maturity, whether or not the loans have been repaid or recovery made in the event of default.

The amount of each payment to the MBS certificate holder is the scheduled amount plus some adjustments. The primary adjustments are the prepayment penalties and additional unscheduled principal payments or other early or unscheduled recoveries of principal on the pooled mortgage during the preceding month.

The average MBS pool size in Canada is \$12 million. About 3% of residential housing has been securitized in Canada in comparison with about 50% in the U.S. A primary reason for this is that Canadian banks fund 60% to 70% of residential housing, and, to date, they have only securitized nonprofit social housing mortgages. Banks find the risk/return trade-off of residential mortgages ideal for retention on their balance sheet as a match to GIC deposits.

#### **XI.4 C-1 RISK VERSUS C-3 RISK**

Within securitized assets, C-1 risk (credit risk) and C-3 risk (interest rate and option risk) are often confused. C-1 risk relates fundamentally to the potential failure of the investor to receive promised cash flows when due, as set out in the terms and conditions of the security. C-3 risk refers to variability in the timing and amount of these payments due to differences in the actual versus expected timing of the cash flows in the underlying assets. It is possible, for example, for a CMO tranche supported by government guaranteed residential mortgages to lose some or all of its value because of a reduction in the expected principal or interest payments. An extreme example is an "IO" tranche, where the security holder expects only to receive interest payments from the underlying assets, but no principal payments. In a very rapid prepayment scenario, the security holder may receive substantially less payments or conceivably no payments. However, this reduction is not a result of a failure of the investor to receive all promised payments as per the terms and conditions of the security. Therefore, the loss of value is not correctly characterized as a C-1 risk loss. Rather, the loss of value arises from the increased or decreased exercise of prepayment options or rights by individual borrowers or from payments under government guarantees. These losses are inherently losses arising from cash flow uncertainty and are best classified as C-3 risk-related losses.

#### **XI.5 DETERMINATION OF MARGINS FOR ADVERSE DEVIATIONS**

The most significant risk that would require higher margins is inexperience or lack of familiarity in the asset class. This is a significant risk for the new and emerging securitized asset classes.

There are several other significant C-1 risks for securitized obligations that should lead to higher margins being held:

- There is concern regarding the credit quality of the underlying assets.
- There is concern regarding the credit enhancement techniques used for an asset (e.g., strength of letter of credit guarantee).
- The asset held is from a non-pass-through structure with a complicated repackaging of the credit risk that is difficult to fully understand.
- The asset held is from a lower quality tranche of a non-pass-through structure that repackages credit risk.
- The securitized asset is a new class of asset-backed security where the credit quality and dynamics of the class are not fully understood (i.e., lack of credible historical data for credit assessments to be made).
- There is no rating agency rating of the security.
- The rating agency rating for the asset being held is low.
- The trust structure and legal responsibilities of the different parties for a securitized asset are not clearly understood in a practical and/or legal sense.
- The asset held is from a structure that is composed of a limited number of underlying assets (i.e., concentration risk).
- The underlying assets in a structure are new as opposed to being "seasoned."
- For mortgage-backed securities, there is no government or government agency guarantee on the payment of principal.

The above considerations deal only with significant C-1 risks requiring higher margins. There are also many C- 3 risk considerations that could also require higher margins to be held.

## **XII SPECIFIC CONSIDERATIONS FOR STRATEGIC AND NON-TRADITIONAL INVESTMENTS**

### **XII.1 OVERVIEW OF OTHER ASSETS**

The other asset class specific sections of this document are concerned with evaluating the C-1 risk of bonds, mortgages, securitized obligations, derivatives, real estate and shares. Periodically, the actuary may encounter other assets not covered by these sections. This section describes the general thought processes the actuary should go through when working with an unfamiliar asset class.

The most common asset of this type may be termed “strategic investments.” Examples are investments in trust companies, property and casualty insurance companies, banks and mutual fund sales organizations. Strategic investments have been dealt with in more detail by the Task Force on Strategic Investments which published a *Guidance Note on Strategic Investments* in September 1994.

Other examples might be new forms of assets with which the industry has little experience such as oil and gas assets or some innovative form of securitised asset-backed security.

### **XII.2 HOW ASSET VALUES ARE ESTABLISHED**

The first step is to understand the accounting rules used for the asset in the annual statement. The asset values in the balance sheet will be defined by the accounting profession. The actuary should, therefore, review with the accountant the accounting rules used to determine the statement value of the asset.

For marketable investments, the CICA Handbook is specific as to the statement value that should be held on the asset side of the balance sheet. For example, for stock, a moving market is used; for bonds and mortgages, original cost or amortized value is used. For non-marketable investments, particularly for real estate and certain types of strategic investments, the value to be used may not be as clearly determinable.

In these situations, values for investments may be based on information or an opinion supplied by a third party. In some cases, the materiality is such that the validity of the opinion is critical in fairly representing the financial health of the company. Examples of such investments are not limited to life insurance or property and casualty insurance companies, but can also include trust companies, banks, real estate, mutual fund companies, and companies which have no relationship to the financial services business.

The carrying value of the investment on the balance sheet is important both from a materiality perspective as well as from the perspective of the implied underlying investment return. In doing a valuation, the actuary should take into consideration:

- The method of reporting investment return and valuing assets in the government statement
- The method by which he/she expects the company to allocate investment return and explicitly or implicitly to allocate assets among classes of policies

Under generally accepted accounting principles, the methodology to establish asset values is the same for all corporate enterprises and focusses on the control exerted by the entity on the investment.

In simple terms:

#### **Level of Control**

- No significant influence
- Significant influence but not control
- Active or effective control

#### **Accounting Methodology**

- Portfolio method (i.e., cost or amortized cost)
- Equity accounting method
- Consolidation method

It should be noted that investment in real estate normally involves control. Direct investment in real estate requires the application of accounting for capital assets as set out in the CICA Handbook, Section 3060. However, because of the nature of life insurance enterprises (but not property and casualty insurance

enterprises), the portfolio method which involves measurement of the assets on a moving-to-average market basis is permitted.

The determination of which category a particular investment would fall into requires judgment to be applied. Consideration would be given to how similar investments would customarily be accounted for by other entities.

### **XII.3 DETERMINATION OF PROJECTED RETURNS/FUTURE CASH FLOWS**

The company investment department needs to be consulted to determine the reasons for the investment and the projected return from the investment as well as the controls which are in place to monitor its performance.

Other professionals should also be consulted (e.g., real estate appraisers or industry analysts) in order to obtain a more complete picture of projected experience on the investment. Specifically, the actuary will need to understand the assumptions made by the other professionals.

The actuary should discuss with these professionals the cash flows which could be expected under different scenarios. This would include, but not be limited to, the standard scenarios appropriate for DST. The specialist professionals should be encouraged to suggest reasonable and plausible scenarios which could be unique to the investment or which could create unusual volatility in the cash flows.

The actuary will be using information or an opinion supplied by others, but ultimately should form his/her own opinion about the future cash flows from the investment.

## **XIII GLOSSARY OF KEY TERMINOLOGY**

### **C-1 Risk**

C-1 risk refers to economic losses arising from defaults in fixed income investments and from decreases in the market values of equity investments. (See also Section I.)

### **Counterparty**

A counterparty is a participant in a synthetic asset transaction. For C-1 risk purposes, it is important to identify the counterparties who have legal obligations to make the promised payments under the transaction.

### **Credit Risk Event**

A credit risk event includes failure, inability or refusal of the borrower to meet the terms of the instrument, and/or an actual or anticipated downgrade to credit rating or internal quality rating.

### **Economic Loss**

Economic loss represents the total financial loss (realized or unrealized) resulting from a credit risk event. Depending on the asset, economic loss may include loss of principal, loss of interest (including interest losses on reinvestment), and all expenses incurred since the credit loss event.

### **Horizon Period**

The horizon period is the period over which the cash flows/yields from an asset are being projected before liquidation or maturity of the asset is assumed.

### **Margin and Provision**

In this note, “margin” refers to the addition to the expected assumption to provide for adverse deviations, while “provision” means the resulting dollar increase in liabilities (or decrease in the value of the assets).

**Vulnerable Assets**

Assets should be regarded as vulnerable if they have experienced a deterioration in their soundness or a widening of spread since they were purchased, to the extent that there has been a significant increase in the probability of a credit risk event occurring.

**Watchlist**

A watchlist refers to those assets that have been earmarked as having inherent credit weaknesses, and, as a result, have a higher than normal probability of experiencing credit risk events and economic losses.

**Yield Spread**

A yield spread is the current yield on a fixed income instrument less the current yield on a benchmark risk-free security, which is represented by a highly liquid federal government option-free bond of the same term and cash flow structure. The most accurate way to determine yield spreads is to measure these with respect to zero-coupon yield curves. For instruments with embedded options, the option-adjusted spread should be used, since option-adjusted spread is intended to exclude the value of the option, which is related to C-3 risk.



