



REPORT

**RESULTS OF THE SURVEY ON
ASSET LIABILITY MANAGEMENT PRACTICES OF
CANADIAN LIFE INSURANCE COMPANIES**

**COMMITTEE ON INVESTMENT PRACTICE –
WORKING GROUP ON ASSET LIABILITY MANAGEMENT**

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MEMORANDUM

TO: All Fellows, Associates, and Correspondents of the Canadian Institute of Actuaries
FROM: Charles L. Gilbert, Chairperson
Working Group on Asset Liability Management
DATE: May 31, 2002
SUBJECT: **Results of the Survey on Asset Liability Management Practices of Canadian Life Insurance Companies**

In March 2000, the Committee on Investment Practice formed a Working Group on Asset Liability Management (ALM) with the following mandate:

- review the ALM practices of life insurance companies operating in Canada;
- identify areas where there exists a wide range of practice or where techniques are not well developed;
- promote ALM best practices; and
- further education and research in the area of ALM.

The focus of the working group, to date, has been on life insurance. The Committee on Investment Practice is in the process of forming a separate working group to focus on ALM for the pension area.

There has been some debate as to whether standards of practice are needed for ALM. A number of opinions have been voiced that further guidance is required and that a narrower range of practice with respect to how risk is measured is desirable. However, there is no consensus view on whether standards of practice are needed in this area.

The ALM working group has been focused on conducting a survey of industry practice to collect information on the ALM practices of life insurance companies operating in Canada. This survey involves three stages. The first stage consisted of the ALM Questionnaire that was completed last spring and early this year. A series of follow-up telephone interviews was then conducted with a number of the respondents. In the third and final stage which has yet to be carried out, interested parties will be invited to participate in focus group discussions that will be conducted with ALM practitioners from life insurance companies and banks.

Attached is a copy of the Results of the Survey on ALM Practices of Canadian Life Insurance Companies drawn from the responses to the ALM Questionnaire and updated with the information gathered in the follow-up telephone interviews.

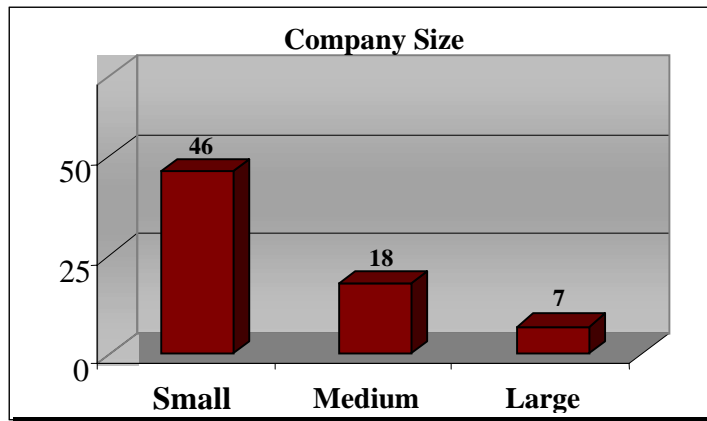
The members of the working group are:

Craig Fowler, FSA, FCIA, MAAA, CFA
Charles L. Gilbert, FSA, FCIA, CFA (Chairperson)
David C. Gilliland, FSA, FCIA, CFA
Catherine Murphy, FSA, FCIA
Christian-Marc Panneton, FSA, FCIA, CFA
Ted Steven, FSA, FCIA

RESULTS OF THE SURVEY ON ASSET LIABILITY MANAGEMENT PRACTICES OF CANADIAN LIFE INSURANCE COMPANIES

The Working Group on ALM sent out a questionnaire on ALM practices to all life insurance companies operating in Canada in March 2001. Nearly all companies responded to the survey. In total, 71 completed questionnaires were returned. Most of these were received in May 2001 with two submissions received in early 2002.

The results of this survey are broken down by size of company. Companies were classified as small (46), medium (18), or large (7) based on the amount of assets reported on their balance sheet.



Company size was determined as follows:

Company Size	Assets
Small	Less than 1 billion
Medium	Greater than 1 billion and less than 10 billion
Large	Greater than 10 billion

There were a number of questions such as specific ALM strategies for various products that were considered either proprietary in nature or too detailed for this initial survey and were purposefully not included. The intention of the working group is that we would delve into these (non-proprietary) topics through the focus group discussions.

SUMMARY OF FINDINGS

- Scope of ALM is not confined to interest rate risk. In addition to interest rate risk, the majority of large and medium companies included equity market risk and liquidity as part of the ALM process.
- The majority of large and medium companies have a separate risk management function and almost half of these companies reported having a Chief Risk Officer.
- Combined, 76% of large and medium companies have an independent ALM function.
- Responsibility for the ALM function lies predominantly within the Corporate Actuarial area.
- Combined, 64% of large and medium companies have a formal ALM Committee.
- Companies generally focus on both the economic and accounting results for ALM purposes. However, incentive compensation is largely based on accounting earnings.
- For the majority of small companies, Internal Audit plays no role in the independent verification of ALM.
- The majority of companies perform ALM at a total company level. Many of the large and medium companies also perform ALM at the product line and individual product level.
- For most products (other than segregated funds) companies tend to manage risk monthly.
- There appears to be a wide range of practice in how companies quantify their interest rate risk exposure. While almost all companies perform deterministic scenario testing and measure modified duration, a significant number of companies do not use more sophisticated metrics for quantifying their interest rate risk profile.
- Half of all companies use internally developed systems (either exclusively or in conjunction with other systems) to calculate risk measures and generate ALM reports.
- The majority of companies performing stochastic modeling use models based on p-measure or real-world probabilities.
- The log-normal model is the most prevalent model used for stochastic modeling.
- There appears to be significant differences in practice in how companies model the asset and liability cash flows for ALM purposes. For example, just over half of the companies modeled the asset cash flows including margins for adverse deviations, while just under half did not. Similar differences in practice were observed for the treatment of taxes. And while most companies do not assume renewals when projecting asset and liability cash flows, some include renewals.
- Most companies in total and all large and medium companies rebalance their portfolios by trading assets to keep within the ALM guidelines. All of the large companies use derivatives to hedge exposures.
- Reinsurance is the most common risk management strategy used for segregated funds. Two companies are using dynamic hedging. Three companies are managing the risk through product design and by limiting the guarantees.

The detailed survey results follow.

DEFINITION OF ALM

Asset Liability Management (ALM) is a subset of the overall risk management of a company and typically focuses on financial risks. The SOA Task Force on ALM Principles provides the following working definition for ALM:

“Asset Liability Management is the on-going process of formulating, implementing, monitoring, and revising strategies related to assets and liabilities in an attempt to achieve financial objectives for a given set of risk tolerances and constraints.”

SCOPE OF ALM

1. Within the context of the definition provided above, indicate the risks that are included as part of the ALM process:

Table 1.1: Risks deemed material for company

Is this Risk Material for your company?	Total (71 Co.)	Large Companies (7 Co.)	Medium Companies (18 Co.)	Small Companies (46 Co.)
Interest rate risk	86%	100%	89%	83%
Foreign exchange risk	30%	71%	17%	28%
Credit risk	44%	100%	56%	30%
Counterparty credit risk	21%	86%	33%	7%
Sovereign risk	6%	43%	6%	0%
Equity market risk	35%	100%	44%	22%
Liquidity risk	45%	86%	50%	37%
Operational risk	31%	100%	28%	22%
Insurance risk (product design & pricing)	52%	100%	78%	35%
Insurance risk (underwriting & liability)	51%	100%	72%	35%
Legal and regulatory risk	32%	100%	39%	20%
Strategic risk	27%	86%	22%	20%
Other	1%	14%	0%	0%

Table 1.2: Risks managed by a formal process

Does your company have a formal process to manage this risk?	Total (71 Co.)	Large Companies (7 Co.)	Medium Companies (18 Co.)	Small Companies (46 Co.)
Interest rate risk	80%	100%	100%	70%
Foreign exchange risk	27%	86%	44%	11%
Credit risk	54%	100%	83%	35%
Counterparty credit risk	28%	86%	56%	9%
Sovereign risk	7%	43%	11%	0%
Equity market risk	37%	100%	50%	22%
Liquidity risk	51%	86%	78%	35%
Operational risk	32%	86%	39%	22%
Insurance risk (product design & pricing)	48%	100%	72%	30%
Insurance risk (underwriting & liability)	48%	100%	72%	30%
Legal and regulatory risk	31%	86%	44%	17%
Strategic risk	18%	86%	11%	11%
Other	1%	14%	0%	0%

Table 1.3: Risks considered as part of the scope of ALM

Is this risk considered a part of ALM in your company?	Total (71 Co.)	Large Companies (7 Co.)	Medium Companies (18 Co.)	Small Companies (46 Co.)
Interest rate risk	85%	86%	94%	80%
Foreign exchange risk	28%	71%	22%	24%
Credit risk	37%	43%	50%	30%
Counterparty credit risk	8%	14%	11%	7%
Sovereign risk	4%	14%	11%	0%
Equity market risk	31%	86%	44%	17%
Liquidity risk	54%	86%	56%	48%
Operational risk	3%	14%	0%	2%
Insurance risk (product design & pricing)	18%	57%	39%	4%
Insurance risk (underwriting & liability)	4%	0%	6%	4%
Legal and regulatory risk	1%	0%	0%	2%
Strategic risk	3%	0%	0%	4%
Other	1%	14%	0%	0%

STRUCTURE AND RESOURCES**2. Does your company have a separate risk management function?****Table 2.1: Companies with a separate risk management function**

	Total (71 Co.)	Large Companies (7 Co.)	Medium Companies (18 Co.)	Small Companies (46 Co.)
Companies with a separate risk management function	28%	57%	56%	13%

3. Does your company have a Chief Risk Officer?**Table 3.1: Chief Risk Officer**

	Total (71 Co.)	Large Companies (7 Co.)	Medium Companies (18 Co.)	Small Companies (46 Co.)
Companies with a Chief Risk Officer	23%	43%	44%	11%

4. How many people are dedicated to the risk management and ALM functions in total?

Table 4.1: Resources dedicated to risk management and ALM functions

	Total (71 Co.)	Large Companies (7 Co.)	Medium Companies (18 Co.)	Small Companies (46 Co.)
Maximum # of people dedicated to risk management and ALM functions	20	20	9	15
Average # of people dedicated to risk management and ALM functions	2.6	8.6	3.4	1.4
Average # of people dedicated to risk management and ALM functions, given the existence of a separate risk management function	6.0	15.0	3.6	4.0

It should be noted that the resources dedicated to risk management and ALM functions is likely overstated for small companies. Some companies classified as small within a Canadian context included staff working on global ALM instead of Canadian ALM only.

5. Does your company have an independent ALM function?

Table 5.1: Companies with an independent ALM function

	Total (71 Co.)	Large Companies (7 Co.)	Medium Companies (18 Co.)	Small Companies (46 Co.)
Companies with an independent ALM function	35%	86%	72%	13%

6. How many people are dedicated to the ALM function?

Table 6.1: Resources dedicated to ALM function

	Total (71 Co.)	Large Companies (7 Co.)	Medium Companies (18 Co.)	Small Companies (46 Co.)
Maximum # of people dedicated to ALM function	18	18	7	15
Average # of people dedicated to ALM function	2.2	9.4	2.6	1.0
Average # of people dedicated to ALM function, given the existence of an independent ALM function	5.0	10.3	3.0	4.3

As noted above, the resources dedicated to the ALM functions are likely overstated for small companies. Some companies classified as small within a Canadian context included staff working on global ALM instead of Canadian ALM only.

7. If there is an independent ALM area, where does that group report (e.g., Corporate Actuarial, Investment Department, other)?

Table 7.1: Reporting body for the ALM area

	Total (25 Co.)	Large Companies (6 Co.)	Medium Companies (13 Co.)	Small Companies (6 Co.)
Corporate Actuarial/ Appointed Actuary	48%	33%	62%	33%
Investments	20%	33%	23%	
Finance	12%	33%		17%
Board	8%			33%
Other	12%		15%	17%

There are 25 companies that reported having an independent ALM function. Table 7.1 above shows results only for these 25 companies.

8. Does your company have a formal ALM Committee?

Table 8.1: ALM Committee

	Total (71 Co.)	Large Companies (7 Co.)	Medium Companies (18 Co.)	Small Companies (46 Co.)
Companies with a formal ALM Committee	38%	57%	67%	24%

9. How frequently does the ALM Committee meet?

Table 9.1 indicates the frequency with which the ALM Committee meets. Some companies will have more frequent and/or *ad hoc* meetings as well depending on markets conditions and events.

Table 9.1: Meeting frequency for ALM Committee

ALM Committee meets:	Total (71 Co.)	Large Companies (7 Co.)	Medium Companies (18 Co.)	Small Companies (46 Co.)
Annually	3%	0%	0%	4%
Quarterly	18%	14%	33%	13%
Monthly	18%	43%	28%	11%
Weekly	6%	43%	6%	0%
<i>Ad hoc</i>	7%	0%	6%	9%
n/a	48%	0%	28%	63%

Some companies answered “N/A” for ALM Committee meeting frequency, since they do not have an “official” ALM Committee; however, they have an ALM group that meets with investment management weekly.

10. Does your company have a statement of principles and objectives with respect to ALM?**Table 10.1: Statement of principles and objectives for ALM**

	Total (71 Co.)	Large Companies (7 Co.)	Medium Companies (18 Co.)	Small Companies (46 Co.)
Companies with a statement of principles and objectives with respect to ALM	63%	100%	89%	48%

11. Indicate the measure that the ALM financial objectives is based on:**Table 11.1: Focus for ALM**

	Total (71 Co.)	Large Companies (7 Co.)	Medium Companies (18 Co.)	Small Companies (46 Co.)
Economic Value	41%	86%	67%	24%
Accounting Earnings	37%	71%	56%	24%
Other	23%	14%	17%	26%

The measure that the ALM financial objectives are based on defines the focus for the ALM function. Most ALM objectives are driven by interest rate risk. "Other" included the following specific measures:

- Yield
- Embedded value
- Capital, Risk Adjusted Return on Capital (RAROC)
- Conditional Tail Expectation (CTE)
- Duration, modified duration, dollar duration, convexity, key rate duration, level of C-3 risk
- Cash flow mismatch
- Market value

All of these are economic value based with the exception of the first two measures.

12. Indicate the measure that the incentive bonus structure for senior management is based on:**Table 12.1: Incentive bonus structure for senior management**

	Total (71 Co.)	Large Companies (7 Co.)	Medium Companies (18 Co.)	Small Companies (46 Co.)
Economic Value	11%	43%	22%	2%
Accounting Earnings	59%	100%	89%	41%
Other	20%	57%	17%	15%

The bonus structure is mostly based on accounting earnings. “Other” included the following components:

- Customer retention, customer satisfaction
- Sales, premium growth
- Earnings per share, share price growth,
- Embedded value
- Expenses
- Ratings from rating agencies

INDEPENDENT VERIFICATION

13. Indicate the role Internal Audit plays in the independent verification of ALM

Table 13.1: Role of Internal Audit

Role of Internal Audit	Total (71 Co.)	Large Companies (7 Co.)	Medium Companies (18 Co.)	Small Companies (46 Co.)
Ensures ALM policies and procedures are being adhered to	41%	100%	67%	22%
Ensures effective controls apply to managing risk exposure	25%	57%	50%	11%
Verifies the adequacy and accuracy of management information reports	23%	71%	50%	4%
Internal Audit plays no role in the independent verification of ALM	42%	0%	22%	57%

RISK MEASUREMENT

14. Indicate the level at which ALM is performed:

Table 14.1: Level at which ALM is performed

Level at which ALM performed:	Total (71 Co.)	Large Companies (7 Co.)	Medium Companies (18 Co.)	Small Companies (46 Co.)
For each product/asset segment separately	28%	100%	33%	15%
Product line level (may involve more than one asset segment)	24%	43%	44%	13%
At the total company/business unit level	58%	57%	50%	61%
Other	7%	43%	6%	2%

“Other” refers to a level within a product/asset segment (e.g., a sub-segment or special block).

15. For each major line of business, indicate the metrics used in determining the exposure to the risks in question 1. For each metric, indicate the frequency of determination (more than one choice should be entered if the frequency varies by product type):

METRICS USED

Table 15.1 below shows the percentage of companies that use each metric for all lines of business combined.

Table 15.1: Metrics by company

	Total	Large Companies	Medium Companies	Small Companies
Number of companies	68	7	18	43
Deterministic scenario testing	94%	100%	100%	91%
Modified duration	79%	100%	94%	70%
Convexity	51%	86%	67%	40%
Dollar duration	40%	57%	33%	40%
Liquidity ratio	37%	86%	67%	16%
Partial duration/key rate sensitivity analysis	28%	57%	39%	19%
Stochastic scenario testing	25%	100%	28%	12%
Economic capital under longer term	15%	57%	17%	7%
Value at risk	13%	57%	6%	9%
Other	13%	29%	22%	7%

Three small companies did not respond to this question.

The most common metrics used across almost all company sizes and lines of business are deterministic scenario testing and modified duration followed by convexity.

A number of key measures are not used by many companies. Small companies use fewer metrics and analytics than large and medium companies.

Table 15.1 includes metrics for segregated fund business and, as a result, reflects a higher percentage of companies using stochastic scenario testing than is in fact the case for other lines of business.

Tables 15.2 through 15.5 show the results separately for the Life, Annuity, Group and A&H lines of business.

The breakdown by line of business was created by mapping the various lines of business provided by each company into a few standard lines of business. The tables below do not include all companies or lines of business from the survey because some companies combined a number of lines together or included company specific items.

Table 15.2: Metrics by line of business – Life

	Total	Large Companies	Medium Companies	Small Companies
Number of occurrences of this line of business	41	5	10	26
Deterministic scenario testing	95%	100%	100%	92%
Modified duration	71%	100%	100%	54%
Convexity	49%	60%	60%	42%
Dollar duration	39%	60%	10%	46%
Liquidity ratio	34%	60%	70%	15%
Partial duration/key rate sensitivity analysis	17%	0%	40%	12%
Stochastic scenario testing	12%	20%	20%	8%
Economic capital under longer term	17%	80%	20%	4%
Value at risk	20%	60%	10%	15%
Other	10%	40%	10%	4%

Table 15.3: Metrics by line of business – Annuity

	Total	Large Companies	Medium Companies	Small Companies
Number of occurrences of this line of business	26	6	9	11
Deterministic scenario testing	100%	100%	100%	100%
Modified duration	96%	100%	100%	91%
Convexity	69%	83%	67%	64%
Dollar duration	23%	67%	22%	0%
Liquidity ratio	58%	67%	67%	45%
Partial duration/key rate sensitivity analysis	46%	67%	44%	36%
Stochastic scenario testing	38%	67%	22%	36%
Economic capital under longer term	27%	50%	11%	27%
Value at risk	23%	67%	0%	18%
Other	12%	33%	11%	0%

Table 15.4: Metrics by line of business – Group

	Total	Large Companies	Medium Companies	Small Companies
Number of occurrences of this line of business	10	4	3	3
Deterministic scenario testing	100%	100%	100%	100%
Modified duration	90%	100%	100%	67%
Convexity	50%	75%	67%	0%
Dollar duration	40%	75%	0%	33%
Liquidity ratio	40%	50%	67%	0%
Partial duration/key rate sensitivity analysis	10%	25%	0%	0%
Stochastic scenario testing	40%	75%	33%	0%
Economic capital under longer term	20%	50%	0%	0%
Value at risk	40%	100%	0%	0%
Other	20%	50%	0%	0%

Table 15.5: Metrics by line of business – A & H

	Total	Large Companies	Medium Companies	Small Companies
Number of occurrences of this line of business	14	3	5	6
Deterministic scenario testing	93%	100%	100%	83%
Modified duration	79%	100%	100%	50%
Convexity	50%	67%	60%	33%
Dollar duration	50%	67%	20%	67%
Liquidity ratio	71%	100%	100%	33%
Partial duration/key rate sensitivity analysis	21%	33%	40%	0%
Stochastic scenario testing	7%	33%	0%	0%
Economic capital under longer term	21%	100%	0%	0%
Value at risk	29%	67%	0%	33%
Other	14%	67%	0%	0%

“Other” included cash flow matching, tracking error and valuation interest rate.

FREQUENCY OF DETERMINATION

Tables 15.6 to 15.9 show the frequency with which each metric is determined by size of company. In some cases, the percentages for each metric do not add up to 100% as multiple frequencies were indicated.

Table 15.6: Frequency of determination – All companies

	Number	Annual	Quarterly	Monthly	Weekly	Daily	Real Time
Deterministic scenario testing	64	77%	25%	13%	2%	0%	0%
Modified duration	54	30%	50%	22%	9%	4%	4%
Convexity	35	20%	46%	29%	11%	3%	6%
Dollar duration	27	48%	22%	19%	7%	7%	7%
Liquidity ratio	25	28%	60%	24%	0%	0%	0%
Partial duration/key rate sensitivity analysis	19	5%	47%	42%	11%	5%	0%
Stochastic scenario testing	17	47%	47%	18%	0%	6%	0%
Economic capital under longer term	10	50%	50%	0%	0%	0%	0%
Value at risk	9	22%	33%	33%	22%	22%	0%
Other	9	11%	44%	0%	44%	0%	0%

Scenario testing and economic capital are predominantly performed annually or quarterly. Value at risk is typically performed monthly.

Table 15.7: Frequency of determination – Large companies

	Number	Annual	Quarterly	Monthly	Weekly	Daily	Real Time
Deterministic scenario testing	7	86%	43%	14%	0%	0%	0%
Modified duration	7	29%	43%	29%	57%	29%	0%
Convexity	6	0%	50%	33%	50%	17%	0%
Dollar duration	4	0%	25%	50%	50%	50%	0%
Liquidity ratio	6	17%	50%	33%	0%	0%	0%
Partial duration/key rate sensitivity analysis	4	0%	25%	75%	25%	25%	0%
Stochastic scenario testing	7	57%	57%	14%	0%	14%	0%
Economic capital under longer term	4	0%	100%	0%	0%	0%	0%
Value at risk	4	25%	0%	50%	50%	25%	0%
Other	2	0%	0%	0%	100%	0%	0%

Table 15.8: Frequency of determination – Medium companies

	Number	Annual	Quarterly	Monthly	Weekly	Daily	Real Time
Deterministic scenario testing	18	56%	44%	17%	6%	0%	0%
Modified duration	17	12%	47%	35%	6%	0%	12%
Convexity	12	8%	33%	42%	8%	0%	17%
Dollar duration	6	17%	33%	17%	0%	0%	33%
Liquidity ratio	12	42%	50%	33%	0%	0%	0%
Partial duration/key rate sensitivity analysis	7	0%	57%	29%	14%	0%	0%
Stochastic scenario testing	5	20%	40%	40%	0%	0%	0%
Economic capital under longer term	3	67%	33%	0%	0%	0%	0%
Value at risk	1	0%	0%	0%	0%	100%	0%
Other	4	0%	75%	0%	25%	0%	0%

Table 15.9: Small companies

	Number	Annual	Quarterly	Monthly	Weekly	Daily	Real Time
Deterministic scenario testing	39	85%	13%	10%	0%	0%	0%
Modified duration	30	40%	53%	13%	0%	0%	0%
Convexity	17	35%	53%	18%	0%	0%	0%
Dollar duration	17	71%	18%	12%	0%	0%	0%
Liquidity ratio	7	14%	86%	0%	0%	0%	0%
Partial duration/key rate sensitivity analysis	8	13%	50%	38%	0%	0%	0%
Stochastic scenario testing	5	60%	40%	0%	0%	0%	0%
Economic capital under longer term	3	100%	0%	0%	0%	0%	0%
Value at risk	4	25%	75%	25%	0%	0%	0%
Other	3	33%	33%	0%	33%	0%	0%

Tables 15.10 to 15.13 show the frequency with which each metric is determined by line of business.

Table 15.10: Line of business – Life

	Number	Annual	Quarterly	Monthly	Weekly	Daily	Real Time
Deterministic scenario testing	39	79%	18%	8%	3%	0%	0%
Modified duration	29	28%	48%	17%	10%	0%	0%
Convexity	20	25%	45%	15%	15%	0%	0%
Dollar duration	16	63%	25%	0%	13%	0%	0%
Liquidity ratio	14	14%	50%	36%	0%	0%	0%
Partial duration/key rate sensitivity analysis	7	0%	71%	14%	14%	0%	0%
Stochastic scenario testing	5	60%	20%	20%	0%	0%	0%
Economic capital under longer term	7	43%	57%	0%	0%	0%	0%
Value at risk	8	25%	38%	0%	25%	13%	0%
Other	4	25%	25%	0%	50%	0%	0%

Table 15.11: Frequency of determination by line of business – Annuities

	Number	Annual	Quarterly	Monthly	Weekly	Daily	Real Time
Deterministic scenario testing	26	65%	23%	23%	4%	0%	0%
Modified duration	25	8%	48%	28%	20%	8%	0%
Convexity	18	11%	39%	28%	22%	6%	0%
Dollar duration	6	0%	33%	17%	33%	33%	0%
Liquidity ratio	15	20%	60%	27%	0%	0%	0%
Partial duration/key rate sensitivity analysis	12	8%	50%	25%	17%	8%	0%
Stochastic scenario testing	10	40%	50%	10%	0%	10%	0%
Economic capital under longer term	7	57%	43%	0%	0%	0%	0%
Value at risk	6	0%	17%	33%	33%	17%	0%
Other	3	0%	0%	0%	100%	0%	0%

Table 15.12: Frequency of determination by line of business – Group

	Number	Annual	Quarterly	Monthly	Weekly	Daily	Real Time
Deterministic scenario testing	10	80%	20%	20%	0%	0%	0%
Modified duration	9	22%	22%	44%	22%	0%	0%
Convexity	5	0%	0%	60%	40%	0%	0%
Dollar duration	4	25%	0%	25%	50%	0%	0%
Liquidity ratio	4	0%	25%	75%	0%	0%	0%
Partial duration/key rate sensitivity analysis	1	0%	0%	100%	0%	0%	0%
Stochastic scenario testing	4	25%	25%	50%	0%	0%	0%
Economic capital under longer term	2	0%	100%	0%	0%	0%	0%
Value at risk	4	25%	0%	25%	50%	0%	0%
Other	2	0%	0%	0%	100%	0%	0%

Table 15.13: Frequency of determination by line of business – A & H

	Number	Annual	Quarterly	Monthly	Weekly	Daily	Real Time
Deterministic scenario testing	13	62%	46%	8%	8%	0%	0%
Modified duration	11	0%	55%	9%	36%	0%	0%
Convexity	7	0%	43%	14%	43%	0%	0%
Dollar duration	7	29%	43%	0%	29%	0%	0%
Liquidity ratio	10	10%	50%	40%	0%	0%	0%
Partial duration/key rate sensitivity analysis	3	0%	33%	33%	33%	0%	0%
Stochastic scenario testing	1	0%	0%	0%	0%	0%	0%
Economic capital under longer term	3	0%	100%	0%	0%	0%	0%
Value at risk	4	0%	50%	0%	50%	0%	0%
Other	2	0%	0%	0%	0%	0%	0%

16. What system or software is used for modeling asset cash flows?

Table 16.1: System/software used for modeling asset cash flows

System or software used for modeling asset cash flows	Total (71 Co.)	Large Companies (7 Co.)	Medium Companies (18 Co.)	Small Companies (46 Co.)
Internal – exclusively	39%	29%	50%	37%
Internal in combination with other	13%	43%	17%	7%
AVE – exclusively	6%	0%	11%	4%
AVE combined with internal / other	3%	0%	6%	2%
AXIS – exclusively	10%	14%	6%	11%
AXIS combined with internal / other	10%	43%	11%	4%
TAS	8%	0%	6%	11%
EASY	3%	0%	0%	4%
RIMCON	3%	0%	6%	2%
PTS	1%	0%	0%	2%
Asset Manager Proprietary	3%	0%	0%	4%
Other third party	13%	29%	6%	13%
No response provided	7%	0%	0%	11%

Internal systems range from large integrated proprietary mainframe systems to APL systems and Excel or Lotus spreadsheets. Eighty-three percent of TAS use is exclusive. “Other third party software or systems” include Bond Edge, FMC, ALMA, ALPM, CAMRA, Bloomberg, INTEX and Derivative Solutions.

17. What system or software is used for modeling liability cash flows?

Table 17.1: System or software used for modeling liability cash flows

System or software used for modeling liability cash flows	Total (71 Co.)	Large Companies (7 Co.)	Medium Companies (18 Co.)	Small Companies (46 Co.)
Internal – exclusively	25%	0%	22%	30%
Internal in combination with other	21%	57%	44%	7%
AVE – exclusively	6%	0%	11%	4%
AVE combined with internal / other	10%	29%	22%	2%
AXIS – exclusively	17%	29%	6%	20%
AXIS combined with internal / other	24%	71%	39%	11%
TAS	8%	0%	6%	11%
EASY	4%	0%	0%	7%
RIMCON	0%	0%	0%	0%
PTS	4%	14%	0%	2%
Asset Manager Proprietary	0%	0%	0%	0%
Other third party	8%	14%	11%	7%
No response provided	7%	0%	0%	11%

Internal systems are primarily associated with administrative or valuation systems or extracts. Internal DCAT models are used by 11% of companies (17% of small companies). Sixty-seven percent of TAS use is exclusive. Other third party software or systems include PROPHET, CAPSIL, SOBECO, ALMA, MERCER and ALFA.

18. What system or software is used for calculating risk measures and generating the ALM reports?

Table 18.1: System or software used for calculating risk measures and generating the ALM reports

System or software used for calculating risk measures and generating the ALM reports	Total (71 Co.)	Large Companies (7 Co.)	Medium Companies (18 Co.)	Small Companies (46 Co.)
Internal – exclusively	30%	43%	56%	17%
Internal – combined with other	21%	57%	33%	11%
AVE – exclusively	0%	0%	0%	0%
AVE combined with internal / other	4%	0%	11%	2%
AXIS – exclusively	1%	0%	6%	0%
AXIS combined with internal / other	6%	29%	11%	0%
TAS	8%	0%	6%	11%
EASY	3%	0%	0%	4%
RIMCON	4%	0%	6%	4%
PTS	3%	0%	0%	4%
Asset Manager Proprietary	7%	0%	6%	9%
Other third party	8%	29%	0%	9%
No response provided	31%	0%	0%	48%

Internal systems range from large integrated proprietary mainframe systems to APL systems and Excel workbooks. Sixty-seven percent of TAS use is exclusive. “Other third party software or systems” include PC Bond, Yield Book, ABACUS, Bond Edge, ALMA, ALPM, ALFA and an external consultant.

19. If you are using scenario testing which economic and market values are modeled?

Table 19.1: Stock market returns

Company Size	Deterministic	Stochastic
Large	2 (33%)	4 (67%)
Medium	7 (41%)	1 (6%)
Small	3 (7%)	1 (2%)

Almost all large companies perform scenario testing on stock market returns compared to less than half of the medium companies and very few of the small companies.

Table 19.2: Term structure of interest rates

Company Size	Deterministic	Stochastic
Large	5 (83%)	4 (67%)
Medium	14 (82%)	6 (35%)
Small	22 (48%)	4 (9%)

All large and medium companies perform scenario testing on the term structure of interest rates.

Table 19.3: Credit spreads

Company Size	Deterministic	Stochastic
Large	6 (100%)	1 (17%)
Medium	7 (41%)	0 (0%)
Small	12 (26%)	1 (2%)

Table 19.4: Inflation

Company Size	Deterministic	Stochastic
Large	5 (83%)	5 (83%)
Medium	9 (53%)	1 (6%)
Small	10 (22%)	2 (4%)

20. Describe the type of stochastic model used

Table 20.1: Arbitrage Free

Company Size	Risk Neutral (Q measure)	Real-world (P measure)
Large	2 (29%)	4 (57%)
Medium	2 (11%)	1 (6%)
Small	5 (11%)	1 (2%)

Table 20.2: Equilibrium

Company Size	Risk Neutral (Q measure)	Real-world (P measure)
Large	1 (14%)	6 (86%)
Medium	2 (11%)	2 (11%)
Small	1 (2%)	3 (7%)

Most insurance companies use models based on P measure or real-world probabilities.

21. Indicate the specific models used:

Table 21.1 shows that few companies appear to use historical sampling.

Table 21.1: Historical sampling

Company Size	Interest Rates	Equities
Large	0 (0%)	0 (0%)
Medium	2 (11%)	0 (0%)
Small	4 (9%)	0 (0%)

Table 21.2: Log-normal model (Black-Scholes)

Company Size	Interest Rates	Equities
Large	1 (17%)	4 (67%)
Medium	0 (0%)	2 (11%)
Small	0 (0%)	0 (0%)

Table 21.3: Log-normal with mean reversion

Company Size	Interest Rates	Equities
Large	3 (50%)	1 (17%)
Medium	2 (11%)	1 (6%)
Small	2 (5%)	1 (2%)

Table 21.4: Non-constant volatility model

Company Size	Interest Rates	Equities
Large	1 (17%)	0 (0%)
Medium	0 (0%)	0 (0%)
Small	1 (2%)	1 (2%)

Table 21.5: Stochastic volatility model

Company Size	Interest Rates	Equities
Large	0 (0%)	0 (0%)
Medium	0 (0%)	0 (0%)
Small	1 (2%)	0 (0%)

Table 21.6: ARCH, GARCH type models

Company Size	Interest Rates	Equities
Large	0 (0%)	0 (0%)
Medium	0 (0%)	0 (0%)
Small	0 (0%)	0 (0%)

Table 21.7: Regime switching log-normal

Company Size	Interest Rates	Equities
Large	0 (0%)	3 (50%)
Medium	0 (0%)	0 (0%)
Small	0 (0%)	0 (0%)

Table 21.8: Other models

Company Size	Interest Rates	Equities
Large	2 (33%)	3 (50%)
Medium	1 (6%)	1 (6%)
Small	0 (0%)	0 (0%)

The predominant 'Other' model used is the Wilkie model.

22. For stochastic interest rate model, indicate what is simulated:

Table 22.1: Variable simulated for interest rate model

Company Size	Bond Prices	Short-Term Rates	Yield Curves	Forward Rates
Large	1 (14%)	4 (57%)	5 (71%)	4 (57%)
Medium	0 (0%)	2 (11%)	5 (28%)	1 (6%)
Small	1 (2%)	1 (2%)	3 (7%)	2 (4%)

There does not appear to be one consistent method of modeling interest rates.

23. Indicate how asset cash flows are modeled for ALM purposes.**Table 23.1: Approach to modeling asset cash flows**

	Total (71 Co.)	Large Companies (7Co.)	Medium Companies (18 Co.)	Small Companies (46 Co.)
Cash flows that vary directly with interest rates reflect the interest rate sensitivity of those cash flows (i.e., embedded options such as prepayment or call options, etc.)	30%	86%	33%	20%
Cash flows that vary indirectly with interest rates reflect the interest rate sensitivity of those cash flows (i.e., lapse, inflation, expenses)	17%	71%	28%	4%
Cash flows are based on expected assumptions	42%	29%	56%	39%
Cash flows include margins for adverse deviation	52%	86%	61%	43%
Cash flows are before tax	55%	86%	83%	39%
Cash flows are after tax	24%	14%	17%	28%
Expected asset defaults are modeled as:				
A reduction in the cash flow from maturity payment only	0%	0%	0%	0%
A reduction in the cash flow from coupon and maturity payments	39%	43%	56%	33%
A monthly or annual basis point charge	49%	71%	44%	48%
Cash flows do not assume renewals	58%	71%	78%	48%
Cash flows assume renewals	11%	0%	17%	11%

24. Indicate how liability cash flows are modeled for ALM purposes.**Table 24.1: Approach to modeling liability cash flows**

	Total (71 Co.)	Large Companies (7Co.)	Medium Companies (18 Co.)	Small Companies (46 Co.)
Cash flows that vary directly with interest rates reflect the interest rate sensitivity of those cash flows (i.e., embedded options such as interest rate guarantees, IIT, prepayment or call options, etc.)	27%	29%	50%	17%
Cash flows that vary indirectly with interest rates reflect the interest rate sensitivity of those cash flows (i.e., lapse, inflation, expenses)	21%	71%	33%	9%
Cash flows are based on expected assumptions	32%	29%	28%	35%
Cash flows include margins for adverse deviation	65%	86%	83%	54%
Cash flows are before tax	58%	86%	89%	41%
Cash flows are after tax	10%	14%	6%	11%
Cash flows do not assume renewals	49%	100%	56%	39%
Cash flows assume renewals	23%	14%	39%	17%

25. Indicate the risk management tools/strategies used:**Table 25.1: Risk management tools/strategies used**

	Total (71 Co.)	Large Companies (7 Co.)	Medium Companies (18 Co.)	Small Companies (46 Co.)
Hedge exposures at transaction/contract level	10%	43%	11%	4%
Hedge exposures at product line level	23%	57%	39%	11%
Hedge exposures at line of business level	24%	71%	39%	11%
Hedge exposures at total company level	44%	71%	56%	35%
Rebalance portfolio by trading assets to keep within ALM guidelines	77%	100%	100%	65%
Use inter-segment notes as a tool for ALM purposes	11%	29%	28%	2%
Use derivatives to hedge exposures	28%	100%	56%	7%
Hedge embedded options in Liabilities (e.g., min credited rate guarantees)	11%	43%	11%	7%

The level at which hedging is done depends on the product and the risk: some hedging can be done both at the product/line of business level or at the total company level.

For companies using derivatives, the instruments used are: swaps (interest rate, currency, equity), futures, forwards, swaptions and put options.

Table 25.2: Risk management of segregated fund investment guarantees:

	Total (71 Co.)	Large Companies (7 Co.)	Medium Companies (18 Co.)	Small Companies (46 Co.)
Reinsurance	15%	29%	28%	9%
Dynamic hedging	3%	14%	6%	0%
Static hedging using long-dated put options	4%	0%	6%	4%
Other: Product design – limited guarantees	4%	43%	0%	0%
Other: Assuming the risk	1%	0%	6%	0%

26. What do you plan to work on in the next one to three years?

Table 26.1 provides the list responses.

Table 26.1: Future projects

Planned development	No. of Companies
Do nothing	23
CALM implementation and related issues	15
Stochastic scenario generators	13
Segregated fund hedging strategy	8
Tightening of ALM	6
Risk management/quantification	6
Tools for monitoring	5
Universal Life	3
Credit risk/asset defaults	3
Liability cash flow projections	3
General enhancements	3
ALM Committee role	2
Risk management process, structure and systems	2
ALM strategies	2
Inter-segment notes – elimination	1
Inter-segment notes – implementation	1
Other	13

APPENDIX A**PARTICIPATING COMPANIES IN THE ALM SURVEY**

Acadie Vie
Actra Fraternal Benefit Society
Association d'Hospitalisation Canassurance
Association protectrice des policiers municipaux de Québec
Assurance Vie Desjardins-Laurentienne
Blue Cross Life Insurance Company of Canada
Canadian Premier Life Insurance Company
Canassurance, compagnie d'assurance-vie inc.
Cigna Life Insurance Company of Canada
Clarica
CNA Life of Canada
Co-operators Life Insurance Company
Commercial Union Life
Concordia Life
Connecticut General Life Insurance Company
Croatian Catholic Union of USA and Canada
Crown Life Insurance Company
CT Financial Assurance Company
Empire Life
Employers Reassurance Company
Equitable Life Assurance Society of the U.S.
Equitable Life of Canada
ERC Frankona Ruckversicherungs-Aktien-Gesellschaft
Federated Life Insurance Company of Canada
General American
Grand Orange Lodge of British America
Independent Order of Foresters
Industrielle-Alliance
Ingle Life & Health Assurance Company
Knights of Columbus
L'Alternative, compagnie d'assurance sur la vie
L'impériale, compagnie d'assurance-vie
La Survivance, compagnie mutuelle d'assurance-vie
Liberty Life Assurance Company of Boston
Life Insurance Company of North America
London Life Insurance Company

Lutheran Life Insurance Company of Canada
Manulife Financial
Maritime Life Assurance Company
Massachusetts Mutual Life – Canadian Branch
Metropolitan Life Insurance Company
Munich Re
Penncorp Life Insurance Company
Pennsylvania Life Insurance Company
Phoenix Home Life Mutual Insurance Company
Provident Life and Accident
Prudential Insurance Company of America
RBC Life Insurance Company
RGA
Royal and Sun Alliance Financial
Security Life
Serb National Federation
Sons of Scotland Benevolent Association
SSQ, Société d'assurance-vie inc.
Standard Life
Sun Life Financial Services of Canada Inc.
Swiss Re – Canada
Teachers Life Insurance Society
The Canada Life Assurance Company
The Great-West Life Assurance Company
The National Life Assurance Company of Canada
Toronto Dominion Life Insurance Company
Transamerica Life Canada
Ukrainian Fraternal Society
Ukrainian Mutual Benefit Association
Ukrainian National Aid Association of America
Ukrainian National Association
Wawanesa Life
Winterthur Life
Workers Benevolent Association
Zurich Life Insurance Company of Canada