RISK POSITION REPORTING

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ABSTRACT

Risk management is central to running a successful insurance operation. This means that insurers must be able to measure and monitor their risks in a way that in turn allows them to choose risk management tools which will effectively help them manage and/or exploit these risks. In late 1999, a working group was set up by the Society of Actuaries' Finance Practice Area to look at how the insurance industry measures and monitors risk through risk position reporting. This paper reports on the findings of this working group. In this paper the working group establishes industry standard practices in risk position reporting and determines a number of areas in which insurance industry practitioners believe risk position reporting in the insurance industry can be improved.

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1. INTRODUCTION

For as long as they have existed, insurers have used risk quantification techniques for many purposes including premium setting, financial forecasting and reserving. After so long, then, one might expect that insurers would have risk quantification down to a fine art. Yet insurance operations do run into financial difficulties, and in some instances the outcome is calamitous. This indicates that there is room for improvement in the risk management process.

It is with this back-drop that, in late 1999, the Society of Actuaries' Finance Practice Area set out to investigate the state of risk position reporting in the insurance industry. By definition, this clearly focuses on the risk measurement and risk monitoring stages of the risk management process. Although it was hoped that the study would highlight areas for potential improvements and perhaps hint at how such improvements could be made, it was also thought that a survey of current industry practices in itself would be a useful benchmarking tool.

This paper presents the results of the research performed by a working group set up under the guidance of the Society of Actuaries' Finance Practice Area. Central to the work is an extensive study of life and property and casualty ("P/C") insurers in North America. Reference is made to the survey throughout this paper. Although banks were not specifically covered by the survey, this paper also includes an appendix which provides a high level comparison of risk position reporting practices in the insurance industry to those believed by the authors to be used in the banking industry.

The survey results establish areas where risk position reporting practices in the insurance industry are good and, alternatively, areas in need of some improvement. For example, it is clear that so far as interest rate risk position reporting is concerned, the insurance industry produces a variety of reports which are actively used by senior management and appear to be effective. On the other hand, it is also clear that in the area of operational risks, although clearly many of these risks are material to the insurance industry, risk position reporting could be substantially improved.

This paper is structured to essentially follow the format of the survey:

- Section 2, Background and Objective, expands on what the working group has endeavored to achieve, and provides some background details on the survey.
- Section 3, Survey Structure, then elaborates on the meaning of each of the broad survey headings.
- Section 4, Detailed Analysis, presents the detailed results under each of the broad survey headings (Section 4.1 covers Asset Risk Position Reports; Section 4.2 covers Liability Risk Position Reports; Section 4.3 covers Asset-Liability Risk Position Reports, and Section 4.4 covers Operational Risk Position Reports).
- Section 5, Looking Forward, mentions the concept of a "Total Company Risk Exposure Report" and completes the paper with a few concluding remarks.

2. BACKGROUND AND OBJECTIVE

The primary objective of the working group was to develop an understanding of current insurance industry practices in the area of risk position reporting. This involved performing a detailed survey of the insurance industry specifically addressing the following areas:

- Types of risk position reports being used, and for which asset categories and lines of business
- Turnaround time and frequency of reports
- Who typically receives these reports
- What the reports typically encompass
- The efficiency (accuracy/ease of collection) of the data collected for these reports
- How the industry believes these reports will change and evolve

This survey was comprised of a detailed questionnaire in electronic format (accompanied by various hard-copy documents as a guide) which was mailed to 164 insurance companies. The targets for the mail-out were those companies that the working group perceived to be major insurers in the U.S., Canada and Bermuda. The target companies were defined using various criteria, including book value of assets, market capitalization, earnings growth, and other less objective measures such as market reputation.

The survey response rate was high given the large size of the questionnaire. Of the 164 companies solicited, 44 responded. A good spread of responses by life versus P/C was also achieved. The responses received indicate that of the participant companies, ten are "life only," ten are "P/C only," and 24 are "all other" (which can mean a mix of life insurance, P/C, mutual funds and banking). All results have been carved into these three categories.

Of the 44 respondents, there was also a good spread by type of company. In response to the question "what type of company are you?", to which respondents could indicate more than one category, 20 indicate public stock, 8 private stock, 9 mutual, 2 mutual holding company, 2 owned by reinsurance parent, and 8 "other" which includes co-operative, fraternal and reciprocal. In addition, there is a good spread by primary distribution channel (7 employee agents/sales force, 11 exclusive agents, three MGA, 18 independent agents/brokers, one financial institution other than bank, and four "other" which includes direct response and telephone marketing).

In the area of performance metrics, 75% of respondents identify GAAP as their primary measure, or one of their primary measures, of earnings, with 32% using statutory earnings (respondents could indicate more than one measure). Nine percent (four companies) state economic value added earnings as a primary measure of earnings. All four of the companies indicating economic value-added earnings as a primary measure of earnings have multi-line operations.

The vast majority (91%) of respondents indicate that uniform performance metrics are used across different divisions of the corporation. One of the other companies indicates that different metrics are used across different divisions because of a "balanced scorecard" approach, with performance metrics being tailored to different departments and divisions.

3. SURVEY STRUCTURE

The broad structure of the survey and the analysis of the working group was essentially to split risk position reports into one of four risk categories: asset risks, liability risks, asset-liability risks and operational risks.

3.1 Asset Risk Position Reports

For asset risk position reports, respondents were asked for information on risk position reports under each of the following categories of analytical approach[1]:

- Duration
- Liquidity
- Convexity
- Performance measurement and attribution analysis
- Value at Risk
- The Greeks
- Other asset risk position reports

Then, within each of these categories, the survey addressed the following asset classes:

- In aggregate, for the portfolio as a whole
- Fixed Interest
- Equities
- Derivative Instruments
- Real Estate
- Other investments

3.2 Liability Risk Position Reports

For liability risk position reports, respondents were asked for information on risk position reports under each of the following categories of analytical approach[2]:

- Experience studies
- Embedded value added and variance analysis

Then, within each of these catgories, the survey addressed the following liability categories:

- In aggregate, for all liability categories
- General Account Life and Accumulation Annuity
- Equity Indexed

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[1] See Appendix 1 for a glossary of asset risk analytical approaches defined for purposes of this survey.

[2] See Appendix 1 for a glossary of liability risk analytical approaches defined for purposes of this study.

- Variable
- Payout Annuity
- Health: Short-tail
- Health: Long-tail
- P/C Personal Lines: Short-tail
- P/C Personal Lines: Long-tail
- P/C Commercial Lines: Short-tail
- P/C Commercial Lines: Long-tail

3.3   Asset-Liability Risk Position Reports

For asset-liability risk position reports, respondents were asked for information on risk positon reports under each of the following categories of analytical approach[1]:

- Stochastic scenario testing
- Deterministic scenario or stress testing
- Mismatch risk (cash flow mismatch; duration mismatch; convexity mismatch; liquidity mismatch)
- Transfer pricing

Then, within each of these categories, the survey addressed in detail the same liability categories as described above for liability risk position reports.

3.4   Operational Risk Position Reports

For operational risk position reports, respondents were asked for information on risk position reports under each of the following categories of analytical approach[2]:

- Empirical evaluation based on historical data
- Evaluation using a probability function with analysis used to derive parameters
- Regression analysis on the risk variable
- Influence diagrams
- Delphi method

Because operational risks tend to affect the corporation as a whole, and in the interests of keeping the survey to a managable size, no further sub-division of feedback on operational risk position reports was attempted.

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[1] See Appendix 1 for a glossary of asset-liability risk analytical approaches defined for purposes of this study.

[2] See Appendix 1 for a glossary of operational risk analytical approaches defined for purposes of this study.

4. DETAILED ANALYSIS

This section of the paper presents the detailed analysis for each of Asset Risk Position Reports (Section 4.1), Liability Risk Position Reports (Section 4.2), Asset-Liability Risk Position Reports (Section 4.3) and Operational Risk Position Reports (Section 4.4).

4.1   Asset Risk Position Reports

Asset-specific risks primarily arise from the following categories:

- Credit risk (downgrade/default risk, currency risk)
- Market risk (asset pre-payment, return volatility, asset market values, and liquidity).

4.1.1. Risk Materiality

Both credit and market risks represent significant exposure for any financial institution. For insurance companies, the risks can differ greatly between life and P/C (e.g., life companies tend to have higher proportions of their portfolios in mortgage-backed securities).

The survey posed questions on asset risk materiality, using a rating scale of 1 to 5, where 5 is high. Table 1 presents the results of this by category of company.

TABLE 1: ASSET RISK MATERIALITY (BY CATEGORY OF COMPANY)

	Credit Risk				Market Risk			
	All Participants	P/C Only	Life Only	All Others	All Participants	P/C Only	Life Only	All Others
No. of Survey Participant Companies	44	10	10	24	44	10	10	24
Materiality Level								
1-Low	34%	70%	30%	21%	18%	40%	10%	13%
2	30%	20%	30%	33%	27%	30%	40%	21%
3	27%	10%	40%	29%	36%	20%	30%	46%
4	9%	0%	0%	17%	14%	0%	20%	17%
5-High	0%	0%	0%	0%	5%	10%	0%	4%
N/A	0%	0%	0%	0%	0%	0%	0%	0%
	100%	100%	100%	100%	100%	100%	100%	100%
Average Materiality Rating	2.11	1.40	2.10	2.42	2.59	2.10	2.60	2.79

As would be expected, "P/C only" companies indicate a much lower average materiality rating for credit risk than "life only" companies (1.40 versus 2.10). This is likely due to the latter's greater weighting in corporate bonds, and the need to go into relatively lower grade bonds in order to pick up yield and be competitive in the asset sensitive product area. Similarly, market risk is more of a concern for "life only" versus "P/C only".

An "outlier" P/C company reports a market risk as having "high materiality". This is likely due to that one company running a significant equity portfolio backed with high levels of reserves. Note that generally in the P/C industry, equity exposure is something of a "bar-bell", with a small number of companies with relatively high equity exposure, and a large number of companies with relatively low exposure.

4.1.2. Analysis and Reporting Methodology

Sixteen percent of participants (seven companies) indicate that they do not prepare any of the asset risk position reports specified in the questionnaire (see Appendix 1), of which the majority are P/C companies (five companies). Additionally, there is one other "P/C only" company that indicates "don't know" for asset risk reporting. This is probably best explained by the P/C industry's lower exposure to asset credit and market risk. Of the 10 "life only" participants, nine indicate that they prepare at least one of the asset risk position reports specified, with one indicating "don't know", while of the 24 "all others," 22 indicate they use at least one of the asset risk position reports specified.

As would be expected, the asset risk position reports prepared, especially in the life insurance industry, focus on interest rate sensitivity measures, such as duration and convexity. An overview of the types of analysis performed by respondents is shown in Table 2. Note that no "life only" participant indicates preparing Value at Risk reports.

TABLE 2: For those companies producing at least one of the asset risk position reports specified in the questionnaire, what types of analysis are performed? (Percentages are % of those companies producing at least one of the asset risk reports specified in the questionnaire)

	All Participants	P/C Only	Life Only	All Others
No. of participating companies	44	10	10	24
Companies doing at least one of the asset risk reports specified in the questionnaire	35	4	9	22
Duration	100%	100%	100%	100%
Liquidity	80%	25%	78%	91%
Convexity	80%	50%	67%	91%
Performance Measurement and Attribution Analysis	83%	75%	67%	91%
Value at Risk	29%	25%	0%	41%

Along with asking generally what reports are produced, the survey also collected information about a break-down of reports by asset category, as shown in Table 3.

TABLE 3: ANALYSIS OF ASSET RISK REPORTING BY ASSET CATEGORY

	No. of Companies Doing this Report	The asset portfolio in aggregate	Fixed Interest Securities	Equities	Derivative Instruments	Real Estate	Other Investments
Duration	35	66%	94%	17%	57%	9%	6%
Liquidity	28	86%	82%	18%	25%	11%	11%
Convexity	28	39%	93%	0%	36%	4%	4%
Performance Measurement and Attribution Analysis	29	66%	93%	55%	48%	24%	14%
Value at Risk	10	80%	60%	40%	50%	20%	10%
The Greeks	6	33%	N/A	N/A	100%	N/A	17%

In addition to the asset risk reports specified in the questionnaire, five participants each indicate that there is another report that is important to them. Collectively, these reports include:

- Credit/counterparty exposure (three companies)
- Concentration and diversification risk
- Aggregate portfolio risk report, including standard deviation of returns on a portfolio basis

A number of questions specific to each type of report were asked to obtain further insight. Each type of report will now be discussed in detail (Section 4.1.2.1 covers Duration; 4.1.2.2 covers Liquidity; 4.1.2.3 covers Convexity; 4.1.2.4 covers Performance Measurement and Attribution Analysis; 4.1.2.5 covers Value at Risk, 4.1.2.6 covers The Greeks; and 4.1.2.7 covers Other Important Asset Risk Reports).

4.1.2.1.   Duration

Participants were posed a series of "closed ended" questions on duration, including turnaround time, frequency, who receives the reports, and the level of influence of these reports. The following tables (Tables 4a, 4b, 4c and 4d) present the feedback from these questions, split by category of asset (the portfolio in aggregate; fixed interest securities; equities; derivative instruments; real estate; and other investments).

TABLE 4a TURNAROUND TIME OF DURATION REPORTS

	The asset portfolio in aggregate	Fixed Interest Investments	Equities	Derivative Instruments	Real Estate	Other Investments
Of those companies doing this report, percentage turning around the report in…						
No. of companies doing this report	23	33	6	20	3	2
Overnight	9%	18%	17%	15%	0%	0%
About 2 days	9%	6%	0%	15%	0%	0%
3 days to 1 week	26%	30%	33%	30%	0%	100%
Between 1 week and 1 month	44%	36%	33%	35%	33%	0%
More than 1 month	9%	6%	17%	0%	67%	0%
Don't Know	4%	3%	0%	5%	0%	0%

TABLE 4b FREQUENCY OF DURATION REPORTS

	The asset portfolio in aggregate	Fixed Interest Investments	Equities	Derivative Instruments	Real Estate	Other Investments
Of those companies doing this report, percentage producing the report at a frequency of…						
No. of companies doing this report	23	33	6	20	3	2
Monthly or more often	44%	64%	50%	85%	0%	50%
Quarterly	48%	30%	17%	15%	67%	50%
Annually	4%	3%	17%	0%	0%	0%
Once every 5 years	0%	0%	0%	0%	0%	0%
Ad Hoc	4%	3%	17%	0%	33%	0%
Don't Know	0%	0%	0%	0%	0%	0%

TABLE 4c WHO RECEIVES DURATION REPORTS

	The asset portfolio in aggregate	Fixed Interest Investments	Equities	Derivative Instruments	Real Estate	Other Investments
Of those companies doing this report, percentage where the report is received by…						
No. of companies doing this report	23	33	6	20	3	2
Line managers	52%	61%	50%	50%	33%	0%
Senior management	91%	91%	83%	80%	33%	100%
Board members	39%	39%	33%	35%	0%	100%
Regulators	4%	3%	0%	0%	0%	0%
Rating agencies	35%	27%	17%	30%	0%	50%
External auditors	9%	12%	0%	10%	0%	0%
Risk (or ALM) committee	70%	61%	67%	75%	67%	50%
None of the above	0%	3%	17%	0%	33%	0%
Don't know	0%	0%	0%	0%	0%	0%

TABLE 4d LEVEL OF INFLUENCE OF DURATION REPORTS

	The asset portfolio in aggregate	Fixed Interest Investments	Equities	Derivative Instruments	Real Estate	Other Investments
Of those companies doing this report, percentage indicating this level of influence…						
No. of companies doing this report	23	33	6	20	3	2
High	44%	42%	50%	35%	0%	50%
Medium	39%	42%	0%	50%	67%	0%
Low	13%	15%	33%	15%	33%	50%
Don't know	4%	0%	17%	0%	0%	0%

Participants were asked to provide a brief description of the asset duration reports that they think are most effective. Asset duration reports are generally seen as being very effective, especially in the context of asset-liability duration matching – this is returned to in Section 4.3, where matching is considered specifically.

As might be expected, a recurring response is that the most effective asset duration reports are those for fixed income securities – one participant specifically noted that fixed income duration reports are very important and better understood than newer concepts such as Value at Risk. While effective duration reports are certainly the most prevalent, key rate and partial duration reports are also of importance. Moreover, a number of companies slice reports in ways other than by asset category, e.g., sector, credit quality, maturity, and also line of business, the latter

being important for duration matching purposes (see Section 4.3). Other reports mentioned include:

- Trend graphs, on a monthly basis, with over 2 years history, which includes liability duration and asset-liability duration mismatch.
- Potential change in duration analysis.
- Report of swap equivalent interest rates and credit exposures across the yield curve.
- Aggregate (company-wide) duration positions, option-adjusted (stress test).
- Duration reports in the form of balance sheets or partial duration reports by major asset and liability type.
- Estimated fair value of assets, liabilities and surplus at different interest rates.

Participants were asked to provide some indication as to what they may want out of asset duration reports in the future and how they expect their asset duration reports to look in the future. Most participant companies generally appear to be satisfied with their duration reports, do not want to get much more out of these reports in the future in addition to what they are currently getting, and expect duration reports to be no different in five years time to what they are today. This reflects a perception of duration as a mature technology. Having said this, a number of companies indicate that they are looking forward to being able to prepare faster, more accurate calculations as more accurate methodologies and relatively inexpensive computer resources become available (especially on the liabilities side).

Specifically with regard to what companies want to get out of asset duration reports in the future, other interesting feedback includes:

- Effective analysis of the variation of investment returns caused by changes in interest rates.
- Information to assist with solvency and surplus volatility management and to fulfill rating agency requests.
- A guide for investment strategy decisions going forward.
- Measurement of asset/liability matching for all lines of business.
- Ability to make risk/reward trade offs.
- Ability to project earnings and balance sheets at future dates under varying business conditions.
- Ability to manage the risk of interest rate changes by distributing investments between short, medium, long, etc.
- Ability to use duration reports to better manage the fixed income portfolio and measure risk.
- Integrated credit and market risk over multiyear horizon. Better integration with liability side.

Regarding how companies expect asset duration reports to look in five years time, other interesting feedback includes:

- May be based on swap curve shocks rather than Treasury shocks. May emphasize the impact of non-parallel shifts.

- Greater integration of results to act as a building block for Earnings at Risk and Value at Risk calculations.
- More timely generation and better recognition of duration drift.
- Supporting detail available through drill-down capability; more what-if scenarios.

In general, participants report that the data collected for asset duration analysis is quite robust. However, the range of responses is wide, with some respondents indicating "adequate" and others indicating "very robust," but with a weighting towards the better end of this range. As expected, the satisfaction with data varies by asset category, with data regarded as very strong for fixed income assets. In addition, data is stronger for asset duration computations than it is for liability duration purposes.

4.1.2.2.   Liquidity

Participants were posed a series of "closed ended" questions on liquidity, including turnaround time, frequency, who receives the reports, and the level of influence of these reports. The following tables (Tables 5a, 5b, 5c, and 5d) present the feedback from these questions, split by category of asset (the portfolio in aggregate; fixed interest securities; equities; derivative instruments; real estate; and other investments).

TABLE 5a TURNAROUND TIME OF LIQUIDITY REPORTS

	The asset portfolio in aggregate	Fixed Interest Investments	Equities	Derivative Instruments	Real Estate	Other Investments
Of those companies doing this report, percentage turning around the report in…						
No. of companies doing this report	24	23	5	7	3	3
Overnight	4%	9%	20%	0%	0%	0%
About 2 days	0%	4%	0%	14%	0%	0%
3 days to 1 week	21%	22%	40%	29%	33%	67%
Between 1 week and 1 month	58%	52%	20%	43%	67%	33%
More than 1 month	13%	13%	20%	14%	0%	0%
Don't Know	4%	0%	0%	0%	0%	0%

TABLE 5b FREQUENCY TIME OF LIQUIDITY REPORTS

	The asset portfolio in aggregate	Fixed Interest Investments	Equities	Derivative Instruments	Real Estate	Other Investments
Of those companies doing this report, percentage producing the report at a frequency of…						
No. of companies doing this report	24	23	5	7	3	3
Monthly or more often	33%	35%	40%	14%	33%	33%
Quarterly	42%	44%	60%	86%	33%	67%
Annually	13%	17%	0%	0%	33%	0%
Once every 5 years	0%	0%	0%	0%	0%	0%
Ad Hoc	13%	4%	0%	0%	0%	0%
Don't Know	0%	0%	0%	0%	0%	0%

TABLE 5c WHO RECEIVES LIQUIDITY REPORTS

	The asset portfolio in aggregate	Fixed Interest Investments	Equities	Derivative Instruments	Real Estate	Other Investments
Of those companies doing this report, percentage where the report is received by…						
No. of companies doing this report	24	23	5	7	3	3
Line managers	50%	44%	20%	43%	33%	33%
Senior management	92%	91%	100%	100%	67%	100%
Board members	50%	48%	100%	57%	100%	100%
Regulators	8%	4%	0%	0%	0%	0%
Rating agencies	38%	35%	40%	43%	100%	67%
External auditors	13%	9%	20%	14%	33%	33%
Risk (or ALM) committee	54%	44%	40%	57%	67%	33%
None of the above	0%	0%	0%	0%	0%	0%
Don't know	0%	0%	0%	0%	0%	0%

TABLE 5d LEVEL OF INFLUENCE OF LIQUIDITY REPORTS

	The asset portfolio in aggregate	Fixed Interest Investments	Equities	Derivative Instruments	Real Estate	Other Investments
Of those companies doing this report, percentage indicating this level of influence…						
No. of companies doing this report	24	23	5	7	3	3
High	46%	39%	60%	43%	33%	67%
Medium	50%	52%	0%	43%	0%	0%
Low	4%	9%	40%	14%	67%	33%
Don't know	0%	0%	0%	0%	0%	0%

There is a great variety in the type of effective asset liquidity reports used by insurers. A recurring theme is the use of liquidity scenario analysis, e.g., asset liquidity less liquidity required by liabilities under various scenarios, where the types of scenario tested include "run-on-the-bank" situations. The rating agency liquidity formulas, especially S&P, are also mentioned quite frequently as being effective. The following are some of the other reports specifically mentioned:

- Lists of highly liquid securities that can be sold without triggering a realized capital loss.
- Maximum cash that can be raised in 30 days.
- Short-term cash match between assets and liabilities.

- Comparison of expected market value of assets to surrender values over a variety of scenarios.
- Ratio of liquid assets to projected surrenders under 3 scenarios (base, stressed and panic).
- Assessment of primary and secondary asset liquidity, in connection with liability considerations.
- Maturity and investment income reports are effective tools when performing liquidity analysis.
- Operating and crisis liquidity reporting by segment.
- Liquidity information split by operating needs, corporate needs and amounts available for investment.

Most participant companies are neither hoping for nor anticipating many changes in their asset liquidity reports in the next few years. Those that do see changes are looking forward to improvements from greater accuracy and from the ability to test more scenarios, rather than from changes in reporting format.

Specifically, with regard to what companies want to get out of asset liquidity reports in the future, other interesting feedback includes:

- Provide better information on how much liquidity risk should be taken and more realism.
- Ability to pinpoint areas subject to liquidity risk.
- Indication that asset liquidity will cover potential near-term surrenders.
- Reports used to manage the cash flow of the portfolio.
- Should be done with greater frequency, over longer time horizons and in more detail.
- Provide daily cash flow availability for trading purposes, with short-term projections of cash flow.

Regarding how companies expect asset liquidity reports to look in five years time, other interesting feedback includes:

- More of an ALM context to them, as currently the reports are primarily asset-based while liability reports are broad in nature.
- Reports will be more dynamic, in response to changing market conditions.
- Report will become more customized to recognize each individual company's own perception of liquidity needs.

In general, participants feel that data collected for asset liquidity analysis is very robust.

4.1.2.3. Convexity

Participants were posed a series of "closed ended" questions on convexity, including turnaround time, frequency, who receives the reports, and the level of influence of these reports. The following tables (Tables 6a, 6b, 6c and 6d) present the feedback from these questions, split by category of asset (the portfolio in aggregate; fixed interest securities; equities; derivative instruments; real estate; and other

investments). As convexity is a close relation to duration, it is not surprising to see that the turnaround time and frequency of convexity reports closely matches those for duration reports.

TABLE 6a TURNAROUND TIME OF CONVEXITY REPORTS

	The asset portfolio in aggregate	Fixed Interest Investments	Equities	Derivative Instruments	Real Estate	Other Investments
Of those companies doing this report, percentage turning around the report in…						
No. of companies doing this report	11	26	0	10	1	1
Overnight	0%	23%	0%	10%	0%	0%
About 2 days	9%	8%	0%	10%	0%	0%
3 days to 1 week	18%	39%	0%	50%	0%	100%
Between 1 week and 1 month	55%	15%	0%	30%	100%	0%
More than 1 month	18%	15%	0%	0%	0%	0%
Don't Know	0%	0%	0%	0%	0%	0%

TABLE 6b FREQUENCY OF CONVEXITY REPORTS

	The asset portfolio in aggregate	Fixed Interest Investments	Equities	Derivative Instruments	Real Estate	Other Investments
Of those companies doing this report, percentage producing the report at a frequency of…						
No. of companies doing this report	11	26	0	10	1	1
Monthly or more often	18%	58%	0%	70%	0%	0%
Quarterly	73%	35%	0%	30%	100%	100%
Annually	0%	4%	0%	0%	0%	0%
Once every 5 years	0%	0%	0%	0%	0%	0%
Ad Hoc	9%	4%	0%	0%	0%	0%
Don't Know	0%	0%	0%	0%	0%	0%

TABLE 6c WHO RECEIVES CONVEXITY REPORTS

	The asset portfolio in aggregate	Fixed Interest Investments	Equities	Derivative Instruments	Real Estate	Other Investments
Of those companies doing this report, percentage where the report is received by...						
No. of companies doing this report	11	26	0	10	1	1
Line managers	36%	58%	0%	50%	0%	0%
Senior management	82%	89%	0%	70%	0%	100%
Board members	36%	31%	0%	30%	0%	100%
Regulators	0%	4%	0%	0%	0%	0%
Rating agencies	27%	27%	0%	20%	0%	0%
External auditors	0%	4%	0%	0%	0%	0%
Risk (or ALM) committee	55%	54%	0%	70%	100%	0%
None of the above	0%	0%	0%	0%	0%	0%
Don't know	0%	0%	0%	0%	0%	0%

TABLE 6d LEVEL OF INFLUENCE OF CONVEXITY REPORTS

	The asset portfolio in aggregate	Fixed Interest Investments	Equities	Derivative Instruments	Real Estate	Other Investments
Of those companies doing this report, percentage indicating this level of influence...						
No. of companies doing this report	11	26	0	10	1	1
High	9%	15%	0%	30%	0%	100%
Medium	64%	50%	0%	50%	0%	0%
Low	27%	35%	0%	20%	100%	0%
Don't know	0%	0%	0%	0%	0%	0%

As might be expected, most companies use their asset duration and convexity reports in tandem. Again, responses indicated that the most effective reports are those for fixed income securities. Participants view convexity calculation as being important for assets that are heavily interest rate sensitive, especially mortgage backed securities. However, not only is convexity reporting less prevalent than duration reporting, consistent with this there appears to be an underlying view that convexity reports are of less use than duration reports. One participant indicates that convexity reports are of limited value at a high level – another does not prepare specific reports but calculates convexity for the asset portfolio in aggregate as an adjunct to asset-liability management work. Other reports mentioned include:

■ Convexity of the bond portfolio monitored daily, broken down by asset class.

- Convexity measures included on daily portfolio reports.
- Convexity calculations as part of asset-liability analysis (see also Section 4.3.2.3 on Mismatch Risk), including:
  — Price behavior curves by product line, business unit, company and enterprise
  — Weekly convexity reports by variable funds
  — Partial convexities by category of asset and line of business.

Participants were asked to provide some indication as to what they may want out of asset convexity reports in the future. A number of participant companies have a "wish list" of what they would like to see going forward, but on the other hand few expect any change in the reports in practice over the next five years.

Specifically, with regard to what companies want to get out of asset convexity reports in the future, interesting feedback includes:

- Illustration of asset-liability convexity mismatches at various levels of detail.
- A more accurate method of quantifying optionable risk (e.g., prepayments and excess lapses).
- Supplement current reports with demonstration of the impact of changes in the asset-liability structure.
- Reporting that helps drive implementable strategies.

Regarding how companies expect asset convexity reports to look in five years time, interesting feedback includes:

- Reporting of convexity of individual investments.
- Additional research may lead to new reports on equity duration and convexity.
- More focus on optionality (asset and liability).
- The development of regular convexity reports if there is heightened concern about matching durations.
- Reports will be linked more closely to duration analyses.
- Potential expansion to cover more product lines.

In general, participants feel that the data collected for asset convexity is quite robust, in many cases being based on the same data used for duration calculations. One company indicates that data is reasonably robust, but not as much as for duration.

4.1.2.4. Performance Measurement and Attribution Analysis

Participants were posed a series of "closed ended" questions on performance measurement and attribution analysis, including turnaround time, frequency, who receives the reports, and the level of influence of these reports. The following tables (Tables 7a, 7b, 7c and 7d) present the feedback from these questions, split by category of asset (the portfolio in aggregate; fixed interest securities; equities; derivative instruments; real estate; and other investments).

TABLE 7a TURNAROUND TIME OF PERFORMANCE MEASUREMENT AND ATTRIBUTION ANALYSIS REPORTS

	The asset portfolio in aggregate	Fixed Interest Investments	Equities	Derivative Instruments	Real Estate	Other Investments
Of those companies doing this report, percentage turning around the report in…						
No. of companies doing this report	19	27	16	14	7	4
Overnight	11%	11%	38%	14%	0%	0%
About 2 days	0%	7%	0%	0%	0%	0%
3 days to 1 week	21%	22%	38%	43%	57%	50%
Between 1 week and 1 month	42%	41%	13%	36%	14%	25%
More than 1 month	21%	15%	13%	7%	14%	25%
Don't Know	5%	4%	0%	0%	14%	0%

TABLE 7b FREQUENCY OF PERFORMANCE MEASUREMENT AND ATTRIBUTION ANALYSIS REPORTS

	The asset portfolio in aggregate	Fixed Interest Investments	Equities	Derivative Instruments	Real Estate	Other Investments
Of those companies doing this report, percentage producing the report at a frequency of…						
No. of companies doing this report	19	27	16	14	7	4
Monthly or more often	47%	59%	69%	57%	29%	50%
Quarterly	37%	22%	31%	36%	57%	50%
Annually	11%	4%	0%	0%	14%	0%
Once every 5 years	0%	4%	0%	0%	0%	0%
Ad Hoc	0%	4%	0%	7%	0%	0%
Don't Know	5%	7%	0%	0%	0%	0%

TABLE 7c WHO RECEIVES PERFORMANCE MEASUREMENT AND ATTRIBUTION ANALYSIS REPORTS

	The asset portfolio in aggregate	Fixed Interest Investments	Equities	Derivative Instruments	Real Estate	Other Investments
Of those companies doing this report, percentage where the report is received by…						
No. of companies doing this report	19	27	16	14	7	4
Line managers	53%	59%	44%	43%	43%	75%
Senior management	95%	85%	100%	86%	71%	100%
Board members	53%	41%	56%	50%	43%	75%
Regulators	0%	4%	0%	7%	0%	0%
Rating agencies	11%	15%	13%	14%	14%	25%
External auditors	5%	4%	6%	7%	14%	25%
Risk (or ALM) committee	53%	41%	44%	71%	43%	50%
None of the above	0%	4%	0%	7%	0%	0%
Don't know	0%	0%	0%	0%	0%	0%

TABLE 7d LEVEL OF INFLUENCE OF PERFORMANCE MEASUREMENT AND ATTRIBUTION ANALYSIS REPORTS

	The asset portfolio in aggregate	Fixed Interest Investments	Equities	Derivative Instruments	Real Estate	Other Investments
Of those companies doing this report, percentage indicating this level of influence…						
No. of companies doing this report	19	27	16	14	7	4
High	16%	19%	13%	29%	29%	0%
Medium	58%	59%	75%	57%	43%	75%
Low	26%	22%	13%	14%	14%	25%
Don't know	0%	0%	0%	0%	14%	0%

Asset performance measurement and attribution reports are balanced between reports that use "total return" and those that use "yield" as the basic performance metric. Among some of the effective reports mentioned by participants are:

- Total return of fixed income investments compared to an appropriate benchmark.
- Quarterly rates of return compared against policy and industry broken out by asset category.
- Attribution reports are most effective for equities.

- Analysis of GAAP investment income versus projection, and not traditional total return.
- Value added and source of variance analysis.
- Run scenarios to project expected ROE and analyze how this is affected by adverse scenarios.
- Quarterly reports that show short and long term earnings at risk by percentile.
- Attribution analysis of company investment performance versus industry average.
- Attribution by sector allows for insight into the value of manager and asset class over time.
- Returns versus benchmarks with analysis of alpha creation and tracking error.
- Reports comparing fixed income sectors or equity styles to designated benchmarks is most effective.
- Analyses showing total rate of return by asset class and divisional portfolio, each versus benchmarks.
- Potential exposure reports for derivatives, stressed mortgage performance, credit default analysis.
- Measure performance across sectors; attribution allows for the analysis of trader performance.

Participants were asked to provide some indication as to what they may want out of performance measurement and attribution analyses reports in the future. Many participants indicate that they are currently satisfied with their existing reports, subject to reports being more timely and more complete. Other specific comments include:

- Proper measurement of total returns compared to an appropriate benchmark.
- To be more detailed and monitor performance against policy constraints.
- Better quantification of how excess returns are generated.
- More quantitative measures of risk.
- Help managers produce alphas and implement strategies.
- Integrated credit and market risk over multiyear horizon. Better integration with liability side.

Participants were asked to provide an indication as to how they expect asset performance measurement and attribution analyses reports to be different in five years. Consistent with many participants indicating they are currently satisfied with their existing reports, many participants do not expect reports to change in five years. However, some expected changes include:

- Easier to produce/more automated. Better and more attribution (non-fixed income).
- Will have additional metrics.
- More rigorous analyses that take advantage of inexpensive computer resources and stochastic techniques.
- Value at Risk exposures and attribution.
- Expect greater utilization throughout the organization. More scheduled, rather than ad hoc.

- In the future, daily calculation of performance and attribution reports will be common.
- Expect turnaround time to be greatly reduced.
- Analysis will be more sophisticated and able to be done in a more timely manner.

In general, participants feel that data collected for performance and attribution reporting is quite robust, with some responses indicating "adequate" with others indicating "very robust" but with a weighting towards the better end of this range. Specific comments worthy of mention:

- Very robust – performed by external supplier and then compared against internally generated numbers.
- Very strong – AIMR compliant.
- Very robust, covers every individual investment.
- Data is acceptable – continuous system improvements are being made.
- Market prices are provided by an external supplier. Data available is very basic.
- Data challenges remain, but this does not affect the materiality and helpfullness of the results.
- Information is accurate and generally available.

4.1.2.5.   Value at Risk

Participants were posed a series of "closed ended" questions on Value at Risk, including turnaround time, frequency, who receives the reports, and the level of influence of these reports.   In general, fewer companies use Value at Risk compared to some of the other asset risk position reports, with only 8 reporting that they use Value at Risk tools. The following tables (Tables 8a, 8b, 8c and 8d) present the feedback from these questions, split by category of asset (the portfolio in aggregate; fixed interest securities; equities; derivative instruments; real estate; and other investments).

TABLE 8a TURNAROUND TIME OF VALUE AT RISK REPORTS

	The asset portfolio in aggregate	Fixed Interest Investments	Equities	Derivative Instruments	Real Estate	Other Investments
Of those companies doing this report, percentage turning around the report in…						
No. of companies doing this report	8	6	4	5	2	1
Overnight	13%	33%	25%	20%	0%	0%
About 2 days	13%	17%	25%	40%	50%	0%
3 days to 1 week	0%	17%	0%	20%	0%	0%
Between 1 week and 1 month	25%	17%	25%	20%	0%	0%
More than 1 month	50%	17%	25%	0%	50%	100%
Don't Know	0%	0%	0%	0%	0%	0%

TABLE 8b FREQUENCY OF VALUE AT RISK REPORTS

	The asset portfolio in aggregate	Fixed Interest Investments	Equities	Derivative Instruments	Real Estate	Other Investments
Of those companies doing this report, percentage producing the report at a frequency of…						
No. of companies doing this report	8	6	4	5	2	1
Monthly or more often	25%	67%	50%	100%	50%	0%
Quarterly	50%	33%	50%	0%	50%	100%
Annually	13%	0%	0%	0%	0%	0%
Once every 5 years	0%	0%	0%	0%	0%	0%
Ad Hoc	13%	0%	0%	0%	0%	0%
Don't Know	0%	0%	0%	0%	0%	0%

TABLE 8c WHO RECEIVES VALUE AT RISK REPORTS

	The asset portfolio in aggregate	Fixed Interest Investments	Equities	Derivative Instruments	Real Estate	Other Investments
Of those companies doing this report, percentage where the report is received by…						
No. of companies doing this report	8	6	4	5	2	1
Line managers	38%	50%	0%	40%	0%	0%
Senior management	100%	100%	100%	100%	100%	100%
Board members	63%	50%	50%	20%	50%	100%
Regulators	0%	0%	0%	0%	0%	0%
Rating agencies	0%	17%	0%	0%	0%	0%
External auditors	0%	17%	0%	0%	0%	0%
Risk (or ALM) committee	75%	83%	75%	100%	100%	100%
None of the above	0%	0%	0%	0%	0%	0%
Don't know	0%	0%	0%	0%	0%	0%

TABLE 8d LEVEL OF INFLUENCE OF VALUE AT RISK REPORTS

	The asset portfolio in aggregate	Fixed Interest Investments	Equities	Derivative Instruments	Real Estate	Other Investments
Of those companies doing this report, percentage indicating this level of influence…						
No. of companies doing this report	8	6	4	5	2	1
High	50%	33%	50%	40%	50%	0%
Medium	50%	50%	50%	60%	50%	100%
Low	0%	17%	0%	0%	0%	0%
Don't know	0%	0%	0%	0%	0%	0%

Participants were asked to provide a brief description of the asset Value at Risk reports that they think are most effective. Value at Risk is one of the newer risk reporting approaches being adopted by the insurance industry, and the following is some of the feedback with regard to this question.

■ Quarterly reports that show short and long term earnings at risk by percentile.
■ Value at Risk for each product portfolio for interest rates, mortality, defaults and other assumptions.
■ Aggregate Value at Risk for both assets and liabilities.
■ Probability distribution of performance of the largest asset class over a defined timeframe.
■ List of major components of risk and amount of capital held for those risks.
■ Value at Risk reports that provide probabilities for an x% drop in surplus in any given year.
■ Duration is still better understood than Value at Risk. Trend reports and marginal Value at Risk usually causes discussion.

Participants were asked to provide some indication as to what they may want out of asset Value at Risk reports in the future and how they expect their asset Value at Risk reports to look in the future. The feedback in response to these questions is as might be expected for a relatively new approach to risk reporting.

Specifically, with regard to what companies want to get out of Value at Risk asset reports in the future, the following feedback is noted:

■ Understanding of potential outcomes.
■ Implementable strategies.
■ Ability to independently work with the variables and update more frequently.
■ Integrated credit and market risk over multiyear horizon, and better integration with liablity side.

Specifically, with regard to how companies expect Value at Risk asset reports to look in five years time, the following feedback is noted:

- More rigorous analyses that take advantage of inexpensive computer resources and stochastic techniques.
- Value at Risk will evolve in terms of its definition.
- Reports may get more robust.
- Much more sophistication.
- Expect reports to be more widely used when evaluating company risk and less costly to produce.

Participants were asked as to how robust is the data collected for asset Value at Risk analyses. As might be expected, there are challenges around collecting data for Value at Risk computations. The following is some of the feedback with regard to this question.

- The difficulties with computing Value at Risk are numerous, including getting accurate volatilities.
- Only includes bond portfolio.
- Data collection processes need to be improved – several projects planned for the future.
- The data in the Value at Risk analysis is collected by a third party.

4.1.2.6. The Greeks

Participants are posed a series of "closed ended" questions on The Greeks, including turnaround time, frequency, who receives the reports, and the level of influence of these reports. The following tables (Tables 9a, 9b, 9c and 9d) present the feedback from these questions, split by category of asset (the portfolio in aggregate; fixed interest securities; equities; derivative instruments; real estate; and other investments). Not surprisingly, the feedback focuses on derivative exposure.

TABLE 9a TURNAROUND TIME OF THE GREEKS REPORTS

	The asset portfolio in aggregate	Fixed Interest Investments	Equities	Derivative Instruments	Real Estate	Other Investments
Of those companies doing this report, percentage turning around the report in…						
No. of companies doing this report	2	NA	NA	6	NA	1
Overnight	0%	NA	NA	17%	NA	0%
About 2 days	0%	NA	NA	17%	NA	0%
3 days to 1 week	50%	NA	NA	50%	NA	0%
Between 1 week and 1 month	0%	NA	NA	17%	NA	0%
More than 1 month	50%	NA	NA	0%	NA	100%
Don't Know	0%	NA	NA	0%	NA	0%

TABLE 9b FREQUENCY OF THE GREEKS REPORTS

	The asset portfolio in aggregate	Fixed Interest Investments	Equities	Derivative Instruments	Real Estate	Other Investments
Of those companies doing this report, percentage producing the report at a frequency of…						
No. of companies doing this report	2	NA	NA	6	NA	1
Monthly or more often	50%	NA	NA	100%	NA	0%
Quarterly	50%	NA	NA	0%	NA	100%
Annually	0%	NA	NA	0%	NA	0%
Once every 5 years	0%	NA	NA	0%	NA	0%
Ad Hoc	0%	NA	NA	0%	NA	0%
Don't Know	0%	NA	NA	0%	NA	0%

TABLE 9c WHO RECEIVES THE GREEKS REPORTS

	The asset portfolio in aggregate	Fixed Interest Investments	Equities	Derivative Instruments	Real Estate	Other Investments
Of those companies doing this report, percentage where the report is received by…						
No. of companies doing this report	2	NA	NA	6	NA	1
Line managers	0%	NA	NA	33%	NA	0%
Senior management	100%	NA	NA	83%	NA	100%
Board members	50%	NA	NA	17%	NA	100%
Regulators	0%	NA	NA	0%	NA	0%
Rating agencies	0%	NA	NA	0%	NA	0%
External auditors	0%	NA	NA	0%	NA	0%
Risk (or ALM) committee	100%	NA	NA	83%	NA	100%
None of the above	0%	NA	NA	17%	NA	0%
Don't know	0%	NA	NA	0%	NA	0%

TABLE 9d LEVEL OF INFLUENCE OF THE GREEKS REPORTS

	The asset portfolio in aggregate	Fixed Interest Investments	Equities	Derivative Instruments	Real Estate	Other Investments
Of those companies doing this report, percentage indicating this level of influence…						
No. of companies doing this report	2	NA	NA	6	NA	1
High	0%	NA	NA	33%	NA	0%
Medium	50%	NA	NA	50%	NA	100%
Low	50%	NA	NA	17%	NA	0%
Don't know	0%	NA	NA	0%	NA	0%

Participants were asked to provide a brief description of The Greeks reports that they think are most effective. The following is some of the feedback with regard to this question.

- Vega is estimated, but not disseminated. Delta and Rho come through duration.
- Derivative and convertible assets and their comparison versus equity indexed annuity liabilities.
- Weekly reports showing Delta, Vega, Gamma and Rho by variable funds.
- A report showing the Greek measures against predetermined limits.

Participants were asked to provide some indication as to what they may want out of The Greeks reports in the future. Specifically, respondents expressed interest in:

- Better asset/liability comparable "Greeks".
- Ability to make risk/reward trade offs. Hedge out risk with minimal basis risk.

Participants were asked to provide an indication as to how they expect The Greeks reports to be different in five years. The following is some of the feedback with regard to this question.

- A better quantification of the liability "Greeks."
- More rigorous analyses that take advantage of inexpensive computer resources and stochastic techniques.

Participants were asked as to how robust is the data collected for The Greeks analyses. Generally, companies feel the data to be reasonable. One company notes that data is only as good as the models available. Asset models are reasonable, while liability models have a way to go.

4.1.2.7. Other Important Asset Risk Position Reports

Participants were posed a series of "closed ended" questions on "Other Important Asset Risk Position Reports". As already discussed in the introduction to Section 4.1.2, only five participants indicate that an "Other" report is produced, with a focus on credit analysis.

With regard to what might be wanted from these reports in the future, the following is some of the feedback received:

- A better understanding of how credit risk in one asset can affect other assets.
- The ability to receive reports more frequently, so that the information is timely.

With regard to what might be different in five years, the following is some of the feedback received:

- Incorporate the inter-relationship between various credit risks.
- Improvements to enhance effectiveness.
- Considering the use of a portfolio credit assessment approach.
- It will be another tool used to determine the risk profile for the fixed income portfolio.

With regard to how robust is the data collected, virtually all respondents to this question feel that their data is very good.

4.2   Liability Risk Position Reports

Liability risks primarily arise from the following categories:
- Claim costs
- Expenses
- Reserve adequacy and adequacy of pricing elements other than claim costs and expenses
- Catastrophe (P/C)
- Failure of reinsurance

4.2.1. Risk Materiality

Unexpectedly increasing claim costs and reserve/pricing inadequacies can quickly destroy the profitability of a line of business or even an entire company. These two liability risk elements are such a large part of the liability stream that they usually dwarf the expense and credit risks. Catastrophe risks, while certainly not insignificant, are frequently managed through reinsurance, so that they become less material than other risks.

One of the questions in the survey asked the participants to rate the liability risk elements according to their materiality.   Table 10 below presents the results of this question.

TABLE 10: LIABILITY RISK MATERIALITY (BY CATEGORY OF COMPANY)

	Claim Costs				Expenses			
	All Participants	P/C Only	Life Only	All Others	All Participants	P/C Only	Life Only	All Others
No. of Survey Participant Companies	44	10	10	24	44	10	10	24
Materiality Level								
1-Low	14%	10%	20%	13%	18%	20%	20%	17%
2	23%	20%	20%	25%	39%	50%	40%	33%
3	25%	10%	20%	33%	27%	20%	30%	29%
4	18%	10%	30%	17%	16%	10%	10%	21%
5-High	18%	50%	0%	13%	0%	0%	0%	0%
N/A	2%	0%	10%	0%	0%	0%	0%	0%
	100%	100%	100%	100%	100%	100%	100%	100%
Average Materiality Rating	3.05	3.70	2.67	2.92	2.41	2.20	2.30	2.54

	Reserve / Pricing Adequacy				Catastrophe			
	All Participants	P/C Only	Life Only	All Others	All Participants	P/C Only	Life Only	All Others
No. of Survey Participant Companies	44	10	10	24	44	10	10	24
Materiality Level								
1-Low	11%	20%	10%	8%	14%	20%	10%	13%
2	25%	0%	10%	42%	9%	10%	0%	13%
3	25%	10%	50%	21%	11%	30%	0%	8%
4	21%	30%	30%	13%	7%	10%	0%	8%
5-High	18%	40%	0%	17%	7%	20%	0%	4%
N/A	0%	0%	0%	0%	52%	10%	90%	54%
	100%	100%	100%	100%	100%	100%	100%	100%
Average Materiality Rating	3.09	3.70	3.00	2.88	2.67	3.00	1.00	2.55

TABLE 10: LIABILITY RISK MATERIALITY (BY CATEGORY OF COMPANY) (CONT.)

	Failure of Reinsurance			
	All Participants	P/C Only	Life Only	All Others
No. of Survey Participant Companies	44	10	10	24
Materiality Level				
1-Low	34%	40%	20%	38%
2	27%	20%	40%	25%
3	25%	30%	30%	21%
4	2%	0%	0%	4%
5-High	2%	0%	0%	4%
N/A	9%	10%	10%	8%
	100%	100%	100%	100%
Average Materiality Rating	2.03	1.89	2.11	2.05

Not surprisingly, the companies in the survey give claim costs and reserve adequacy/pricing the highest materiality ratings. Reflecting the differences in their basic businesses, there are significant differences between the ratings of "P/C only" companies and those of "life only" companies. "P/C only" companies tend to assign significantly higher ratings to claim costs, reserve/pricing adequacy, and catastrophe categories than do "life only" companies. The ratings for expenses and failure of reinsurance are virtually identical across company types.

4.2.2. Analysis and Reporting Methodology

The existence and materiality of liability risks has brought about the development of tools to analyze these risks. The survey found that 43 of 44 respondents perform some sort of liability risk analysis. The survey gathered information regarding what types of analysis was performed by the respondents. Note that no "P/C only" company indicates use of embedded value and variance analysis.

TABLE 11: For those companies producing at least one of the liability risk position reports specified in the questionnaire, what types of analysis are performed? (Percentages are % of those companies producing at least one of the liability risk reports specified in the questionnaire)

	All Participants	P/C Only	Life Only	All Others
No. of participating companies	44	10	10	24
Companies doing at least one of the liability risk reports specified in questionnaire	43	9	10	24
Experience Studies	95%	100%	90%	96%
Embedded Value and Variance Analysis	29%	0%	30%	39%
Other	16%	30%	20%	9%

Additional detail was requested regarding the analysis performed for various lines of business. The following tables (Tables 12a, 12b, and 12c) below provides this detail. Note that these numbers should be interpreted with care, in that a low percentage may simply be because not many companies even write this line of business (the survey does not link back results to whether a company actually writes this business).

TABLE 12a: ANALYSIS OF LIABILITY RISK REPORTING BY LINE OF BUSINESS – P/C ONLY*

	P / C Only Companies					
	No. of P / C Companies Doing this Report	All liabilities in aggregate	Short-Tail P / C Personal Lines	Long-Tail P / C Personal Lines	Short-Tail P / C Commercial Lines	Long-Tail P / C Commercial Lines
Experience Studies	9	56%	89%	67%	78%	78%
Embedded Value and Variance Analysis	0	N/A	N/A	N/A	N/A	N/A

* Companies may not write an indicated line of business, hence would not do a report for this line of business

TABLE 12b: ANALYSIS OF LIABILITY RISK REPORTING BY LINE OF BUSINESS – LIFE ONLY*

	No. of Life Only Companies Doing this Report	Life Only Companies						
		All liabilities in aggregate	General Account Life and Accumulation Annuity	Equity Indexed	Variable	Payout Annuity	Short-Tail Health	Long-Tail Health
Experience Studies	9	11%	89%	11%	11%	56%	22%	22%
Embedded Value & Variance Analysis	3	67%	100%	0%	33%	33%	0%	0%

* Companies may not write an indicated line of business, hence would not do a report for this line of business

TABLE 12c: ANALYSIS OF LIABILITY RISK REPORTING BY LINE OF BUSINESS – MULTI-LINE*

	No. of Multi-Line Companies Doing this Report	All liabilities in aggregate	Life and Health Lines						P / C Lines			
			General Account Life and Accumulation Annuity	Equity Indexed	Variable	Payout Annuity	Short-Tail Health	Long-Tail Health	Short-Tail P / C Personal Lines	Long-Tail P / C Personal Lines	Short-Tail P / C Commercial Lines	Long-Tail P / C Commercial Lines
Experience Studies	23	44%	83%	17%	52%	48%	30%	44%	14%	5%	9%	14%
Embedded Value	9	78%	89%	33%	67%	44%	11%	44%	0%	0%	0%	11%

In addition to the risk reports specified in the questionnaire, seven participants indicated that there are other important reports generated. Reports mentioned include:

- Actuarial valuation report reviewing claims liabilities at year end; Reserve review and earthquake exposure analysis for "P/C only companies"
- Approximate value of inforce by investment segment using cash flows
- Surrender charge analysis, guaranteed minimum credited rates
- Value at Risk, Earnings at Risk analysis and Protection of Capital Analysis

Additional questions in the survey were directed at the specific liability risk reports types in order to gain further insights. Each type of report is discussed in the following sections. Section 4.2.2.1 covers Experience Studies; Section 4.2.2.2 covers Embedded Value Analysis and Variance Analysis; and Section 4.2.2.3 covers Other Important Liability Risk Reports.

4.2.2.1. Experience Studies

The insurance industry has a long history of performing experience studies to monitor liability risk elements. The survey's very high percentage response for experience studies and quite low responses for other approaches evidences this history. Please refer to Table 14 above.

Most large and medium-sized companies make extensive use of experience studies to track mortality, morbidity, expenses and termination rates (e.g. lapse, surrender and not taken rates). Also monitored have been other pricing elements that contribute to the overall profitability of a given plan, such as the level and frequency of withdrawal and loan activity and the distributions by policy size, issue age, sex, premium class and mode of payment. For flexible premium plans, premium discontinuation rates have also typically been monitored.

The types of products on which experience studies are performed are quite consistent in the insurance industry. Life companies typically perform experience studies on their general account life and accumulation annuity products. Many of these plans have non-guaranteed elements in the product design, so that changes in experience can be passed on to the policyholders. Thus, in addition to giving company management information about how these lines are performing, the experience studies also are used to support changes in non-guaranteed elements.

"P/C only" companies tend to perform experience studies on all of their significant product lines.

Experience studies on life and annuity product lines have typically been performed at least annually, and many companies monitoring mortality and termination rates quarterly or monthly.

There frequently are fewer resources available to perform exhaustive experience studies at small and some medium-sized companies, and the results are less credible due to less data. Mortality and morbidity studies may be performed annually or only

on an ad hoc basis for many smaller blocks of business. Studies of other risk elements may be ad hoc or not at all.

The results of the survey regarding turnaround time of reports, frequency, who receives the reports and the level of influence of the reports are presented in the tables below (Tables 13a, 13b, 13c, and 13d).

TABLE 13a TURNAROUND TIME OF EXPERIENCE STUDIES

	All liabilities in aggregate	General Account Life and Accumulation Annuity	Equity Indexed	Variable	Payout Annuity	Short-tail Health	Long-tail Health	Short-tail P/C Personal Lines	Long-tail P/C Personal Lines	Short-tail P/C Commercial Lines	Long-tail P/C Commercial Lines
Of those companies doing this report, percentage turning around the report in…											
No. of companies doing this report	16	28	5	14	16	10	12	11	7	9	10
Overnight	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
About 2 days	0%	4%	0%	7%	0%	0%	8%	9%	14%	11%	10%
3 days to 1 week	6%	0%	20%	7%	0%	0%	0%	18%	0%	11%	10%
Between 1 week and 1 month	63%	46%	60%	36%	44%	80%	33%	55%	71%	67%	70%
More than 1 month	25%	39%	20%	43%	50%	20%	58%	18%	14%	11%	10%
Don't Know	6%	11%	0%	7%	6%	0%	0%	0%	0%	0%	0%

TABLE 13b FREQUENCY OF EXPERIENCE STUDIES

	All liabilities in aggregate	General Account Life and Accumulation Annuity	Equity Indexed	Variable	Payout Annuity	Short-tail Health	Long-tail Health	Short-tail P/C Personal Lines	Long-tail P/C Personal Lines	Short-tail P/C Commercial Lines	Long-tail P/C Commercial Lines
Of those companies doing this report, percentage producing the report at a frequency of…											
No. of companies doing this report	16	28	5	14	16	10	12	11	7	9	10
Monthly or more often	25%	11%	40%	29%	13%	40%	25%	18%	14%	0%	10%
Quarterly	44%	21%	40%	36%	19%	10%	8%	64%	71%	78%	70%
Annually	25%	46%	20%	21%	50%	40%	50%	9%	14%	22%	20%
Once every 5 years	0%	4%	0%	7%	0%	0%	0%	0%	0%	0%	0%
Ad Hoc	6%	11%	0%	7%	13%	10%	17%	9%	0%	0%	0%
Don't Know	0%	7%	0%	0%	6%	0%	0%	0%	0%	0%	0%

TABLE 13c WHO RECEIVES EXPERIENCE STUDIES

Of those companies doing this report, percentage where the report is received by…	All liabilities in aggregate	General Account Life and Accumulation Annuity	Equity Indexed	Variable	Payout Annuity	Short-tail Health	Long-tail Health	Short-tail P/C Personal Lines	Long-tail P/C Personal Lines	Short-tail P/C Commercial Lines	Long-tail P/C Commercial Lines
No. of companies doing this report	16	28	5	14	16	10	12	11	7	9	10
Line managers	69%	86%	80%	93%	81%	90%	92%	64%	71%	78%	80%
Senior management	94%	75%	80%	71%	50%	60%	58%	100%	100%	89%	90%
Board members	44%	11%	60%	21%	13%	10%	8%	18%	14%	0%	0%
Regulators	13%	0%	0%	0%	0%	0%	0%	9%	14%	22%	20%
Rating agencies	13%	4%	20%	0%	13%	0%	0%	0%	0%	0%	0%
External auditors	31%	4%	0%	7%	0%	10%	0%	36%	57%	56%	50%
Risk (or ALM) committee	31%	14%	60%	36%	6%	10%	17%	18%	14%	11%	10%
None of the above	0%	0%	0%	0%	0%	10%	0%	0%	0%	0%	0%
Don't know	6%	11%	0%	0%	6%	0%	0%	0%	0%	0%	0%

TABLE 13d LEVEL OF INFLUENCE OF EXPERIENCE STUDIES

	All liabilities in aggregate	General Account Life and Accumulation Annuity	Equity Indexed	Variable	Payout Annuity	Short-tail Health	Long-tail Health	Short-tail P/C Personal Lines	Long-tail P/C Personal Lines	Short-tail P/C Commercial Lines	Long-tail P/C Commercial Lines
Of those companies doing this report, percentage indicating this level of influence…											
No. of companies doing this report	16	28	5	14	16	10	12	11	7	9	10
High	56%	43%	40%	50%	19%	30%	58%	36%	57%	56%	70%
Medium	38%	46%	60%	36%	63%	60%	42%	46%	29%	11%	10%
Low	6%	4%	0%	14%	13%	10%	0%	18%	14%	33%	20%
Don't know	0%	7%	0%	0%	6%	0%	0%	0%	0%	0%	0%

Respondents were asked to provide a brief description of the experience study reports they think are most effective. "P/C only" companies look to quarterly loss ratios, frequency and severity versus expected along with comparing quarterly IBNR with expected development.

"Life only" and "all other" companies consistently look to mortality and lapse studies for life and accumulation annuity. Many also mention expense studies versus pricing or plan expenses. Also mentioned are:

- FAS97 source of earnings analysis
- Spread analysis on interest sensitive products

Most respondents appear to be satisfied with the general content of the experience reports they are currently receiving, but want them to be more timely and more granular. They also want the development of the reports to be focused less on data collection and more on analysis. They expect these reports to allow them to make better decisions and pinpoint potential problem areas quickly.

In five years most companies expect to have more detailed, quicker and more frequent reports. Interesting specific technologies mentioned are the availability of reports on-line and performing the experience reporting within a data warehouse. One "P/C only" company mentions having more accurate premium analysis by using exposure extension; another expects to focus more on customer market segments.

Respondents were asked how robust is the data collected for experience studies. "P/C only" companies generally believe the data to only be somewhat robust, with four companies reporting the data to be "fair" or "adequate", one reporting data is "good" and two reporting data is "very robust".

"Life only" and "all others" generally find their data to be "good" or "very robust", with nine companies reporting data to be very robust, six report data to be "good" and one reports data is only fair.

4.2.2.2. Embedded Value Added and Variance Analysis

In recent years, Embedded Value Added ("EVA") has begun to be used by insurance companies as a tool for measuring the growth in the value of a company. Although this can be a very useful addition to a company's management reports, Embedded Value Added is used by 29% of the survey's respondents. Please refer to Table 11 above.

EVA itself does not serve as a tool for monitoring changes in individual liability risks. However, an extension of the EVA process is to do variance analysis on the individual risk elements. This additional step allows the company to understand how each risk element has contributed to the overall change in value.

The survey indicates that multi-line companies are most likely to perform EVA variance analysis. None of the "P/C only" respondents report the use of EVA. Please refer to Tables 12a, 12b, and 12c above.

The results of the survey regarding turnaround time of reports, frequency, who receives the reports and the level of influence of the reports are presented in the tables below (Tables 14a, 14b, 14c and 14d).

TABLE 14a TURNAROUND TIME OF EMBEDDED VALUE ANALYSIS AND VARIANCE ANALYSIS

Of those companies doing this report, percentage turning around the report in…	All liabilities in aggregate	General Account Life and Accumulation Annuity	Equity Indexed	Variable	Payout Annuity	Short-tail Health	Long-tail Health	Short-tail P/C Personal Lines	Long-tail P/C Personal Lines	Short-tail P/C Commercial Lines	Long-tail P/C Commercial Lines
No. of companies doing this report	9	11	3	7	5	1	4	0	0	0	1
Overnight	11%	9%	0%	14%	20%	0%	0%	NA	NA	NA	0%
About 2 days	0%	0%	0%	0%	0%	0%	0%	NA	NA	NA	0%
3 days to 1 week	11%	0%	0%	14%	0%	0%	0%	NA	NA	NA	0%
Between 1 week and 1 month	33%	36%	33%	29%	20%	0%	50%	NA	NA	NA	100%
More than 1 month	44%	55%	67%	43%	60%	100%	50%	NA	NA	NA	0%
Don't Know	0%	0%	0%	0%	0%	0%	0%	NA	NA	NA	0%

TABLE 14b FREQUENCY OF EMBEDDED VALUE ANALYSIS AND VARIANCE ANALYSIS

Of those companies doing this report, percentage producing the report at a frequency of…	All liabilities in aggregate	General Account Life and Accumulation Annuity	Equity Indexed	Variable	Payout Annuity	Short-tail Health	Long-tail Health	Short-tail P/C Personal Lines	Long-tail P/C Personal Lines	Short-tail P/C Commercial Lines	Long-tail P/C Commercial Lines
No. of companies doing this report	9	11	3	7	5	1	4	0	0	0	1
Monthly or more often	11%	9%	0%	14%	20%	0%	0%	NA	NA	NA	0%
Quarterly	44%	27%	0%	29%	20%	0%	25%	NA	NA	NA	100%
Annually	44%	64%	100%	57%	60%	100%	75%	NA	NA	NA	0%
Once every 5 years	0%	0%	0%	0%	0%	0%	0%	NA	NA	NA	0%
Ad Hoc	0%	0%	0%	0%	0%	0%	0%	NA	NA	NA	0%
Don't Know	0%	0%	0%	0%	0%	0%	0%	NA	NA	NA	0%

TABLE 14c WHO RECEIVES EMBEDDED VALUE ANALYSIS AND VARIANCE ANALYSIS

	All liabilities in aggregate	General Account Life and Accumulation Annuity	Equity Indexed	Variable	Payout Annuity	Short-tail Health	Long-tail Health	Short-tail P/C Personal Lines	Long-tail P/C Personal Lines	Short-tail P/C Commercial Lines	Long-tail P/C Commercial Lines
Of those companies doing this report, percentage where the report is received by…											
No. of companies doing this report	9	11	3	7	5	1	4	0	0	0	1
Line managers	67%	73%	100%	86%	60%	100%	75%	NA	NA	NA	0%
Senior management	89%	100%	100%	100%	100%	100%	100%	NA	NA	NA	100%
Board members	44%	46%	67%	29%	80%	100%	25%	NA	NA	NA	0%
Regulators	11%	0%	0%	0%	0%	0%	0%	NA	NA	NA	0%
Rating agencies	22%	18%	0%	0%	20%	0%	0%	NA	NA	NA	0%
External auditors	0%	0%	0%	0%	0%	0%	0%	NA	NA	NA	0%
Risk (or ALM) committee	67%	46%	67%	29%	40%	0%	25%	NA	NA	NA	0%
None of the above	0%	0%	0%	0%	0%	0%	0%	NA	NA	NA	0%
Don't know	0%	0%	0%	0%	0%	0%	0%	NA	NA	NA	0%

TABLE 14d LEVEL OF INFLUENCE OF EMBEDDED VALUE ANALYSIS AND VARIANCE ANALYSIS

	All liabilities in aggregate	General Account Life and Accumulation Annuity	Equity Indexed	Variable	Payout Annuity	Short-tail Health	Long-tail Health	Short-tail P/C Personal Lines	Long-tail P/C Personal Lines	Short-tail P/C Commercial Lines	Long-tail P/C Commercial Lines
Of those companies doing this report, percentage indicating this level of influence…											
No. of companies doing this report	9	11	3	7	5	1	4	0	0	0	1
High	44%	55%	33%	29%	40%	0%	25%	NA	NA	NA	0%
Medium	56%	46%	67%	57%	60%	100%	75%	NA	NA	NA	100%
Low	0%	0%	0%	14%	0%	0%	0%	NA	NA	NA	0%
Don't know	0%	0%	0%	0%	0%	0%	0%	NA	NA	NA	0%

Respondents were asked to provide a brief description of the embedded value added and variance analysis reports that they think are most effective. While the responses are quite varied, three of the eight responses provide somewhat similar descriptions of a present value of distributable earnings report for the enterprise. Two others find a report that splits the value calculation by line of business or by major product lines most effective. Another effective report is an analysis of the value of sales compared to the cost of running the distribution channel.

Respondents were asked to provide some indication as to what they may want out of an embedded value added and variance analysis report in the future. Most responses here are focused on the general use of this analysis. These comments indicate that future use will be:

- to indicate the drivers of profitability
- to provide more effective feedback on the performance of lines of business
- to monitor and explain, rather than to help make decisions
- to make risk/reward trade offs
- to identify implementable strategies.

One company believes there will be no change from today, and one company notes that reports will involve stochastic scenarios rather than deterministic.

Respondents were asked to provide an indication as to how they expect embedded value added and variance analysis reports to be different in five years. These comments are actually quite unified in their focus on "more sophisticated" reports. Specific comments include "stochastic methods", "more detailed", "more rigorous computer analysis", "inclusive of more lines of business", "easier to product" and "refined discount rate methodology".

Respondents were asked how robust is the data collected for embedded value added and variance analysis. The responses regarding quality of data collected are not at all unified, with the seven responses split 2/2/3 for very good/strong/above average; good/fairly robust; and medium/needs work/not very, respectively.

4.2.2.3. Other Important Reports

Seven companies mention other important reports. "P/C only" companies mention reserve reviews, actuarial valuation report by an external actuary, reviews of claim liabilities at year end, and earthquake exposure analysis for reinsurance purposes.

"Life only" companies mention surrender charge analysis; guaranteed minimum credited rates analysis; and the calculation of the approximate value of in force by investment segment using cash flows.

The "All others" category of companies lists Value at Risk and Earnings at Risk reporting, and protection of capital analysis.

Respondents were asked to provide some indication as to what they may want out of other important reports in the future. The responses are quite short and bland. Three of six respondents indicate they expect nothing different than today. One "P/C only" company expects more accurate reserve levels as a result of these reports. One expects the reports to be more timely, and one expects to gain a better sense of the performance and economic/business conditions that will most adversely affect earnings.

Respondents were asked to provide an indication as to how they expect other important reports to be different in five years. There is some variety, with two of seven respondents indicating "no change", and the following responses coming from one respondent each:

- depends on regulators
- underlying claims driven off of common factors to more precisely measure impact of correlations
- more real-time information resulting in less time between problem and corrective action
- more analysis of surplus accounts
- more analysis of specific variables affecting reserves (P/C only company)

4.3. Asset-Liability Risk Position Reports

Asset-liability specific risks primarily arise from the following categories:

- Duration mismatch risk
- Cash flow mismatch risk
- Crediting spreads
- Product guarantees (minimum interest rates)
- Disintermediation

4.3.1. Risk Materiality

Mismatch risk can represent a significant risk for certain product lines, especially those where there is inherent optionality.

The survey posed questions on asset-liability risk materiality, using a rating scale of 1 to 5, where 5 is high. Table 15 presents the results of this by category of company. Note the relatively low asset-liability risk materiality scores for the "P/C only" category of respondents.

TABLE 15: ASSET-LIABILITY RISK MATERIALITY (BY CATEGORY OF COMPANY)

	Duration Mismatch Risk				Cash Flow Mismatch Risk			
	All Participants	P/C Only	Life Only	All Others	All Participants	P/C Only	Life Only	All Others
No. of Survey Participant Companies	44	10	10	24	44	10	10	24
Materiality Level								
1-Low	25%	50%	0%	25%	27%	50%	10%	25%
2	27%	20%	40%	25%	41%	30%	60%	38%
3	32%	20%	30%	38%	18%	10%	10%	25%
4	14%	10%	30%	8%	14%	10%	20%	13%
5-High	2%	0%	0%	4%	0%	0%	0%	0%
N/A	0%	0%	0%	0%	0%	0%	0%	0%
	100%	100%	100%	100%	100%	100%	100%	100%
Average Materiality Rating	2.41	1.90	2.90	2.42	2.18	1.80	2.40	2.25

TABLE 15: ASSET-LIABILITY RISK MATERIALITY (BY CATEGORY OF COMPANY) (CONT.)

	Risks from Crediting Spreads				Risks from Product Guarantees			
	All Participants	P/C Only	Life Only	All Others	All Participants	P/C Only	Life Only	All Others
No. of Survey Participant Companies	44	10	10	24	44	10	10	24
Materiality Level								
1-Low	32%	40%	10%	38%	25%	40%	30%	17%
2	27%	20%	40%	25%	25%	0%	20%	38%
3	23%	10%	20%	29%	30%	0%	40%	38%
4	9%	0%	30%	4%	2%	0%	10%	0%
5-High	0%	0%	0%	0%	5%	0%	0%	8%
N/A	9%	30%	0%	4%	14%	60%	0%	0%
	100%	100%	100%	100%	100%	100%	100%	100%
Average Materiality Rating	2.10	1.57	2.70	2.00	2.26	1.00	2.30	2.46

TABLE 15: ASSET-LIABILITY RISK MATERIALITY (BY CATEGORY OF COMPANY) (CONT.)

	Disintermediation Risk			
	All Participants	P/C Only	Life Only	All Others
No. of Survey Participant Companies	44	10	10	24
Materiality Level				
1-Low	25%	50%	0%	25%
2	36%	10%	40%	46%
3	11%	0%	10%	17%
4	16%	0%	50%	8%
5-High	2%	0%	0%	4%
N/A	9%	40%	0%	0%
	100%	100%	100%	100%
Average Materiality Rating	2.28	1.17	3.10	2.21

4.3.2. Analysis and Reporting Methodology

Surprisingly, 18% of participants (eight companies) indicate that they do not do any of the asset-liability risk position reports specified in the questionnaire (see Appendix 1), of which the majority of these are P/C companies (six companies). Additionally, there is one other "P/C only" company that indicates "don't know" for asset-liability reporting. All 10 of the "life only" companies indicate doing some type of asset-liability risk position reporting, while of the 24 "all others," 22 indicate they do at least one of the asset-liability risk position reports specified.

An overview of the types of analysis performed by respondents is shown in Table 16.

TABLE 16: For those companies producing at least one of the asset-liability risk position reports specified in the questionnaire, what types of analysis are performed? (Percentages are % of those companies producing at least one of the asset-liability risk reports specified in the questionnaire)

	All Participants	P/C Only	Life Only	All Others
No. of participating companies	44	10	10	24
Companies doing at least one of the asset-liability risk reports specified in the questionnaire	35	3	10	22
Stochastic Scenario Testing	74%	0%	80%	82%
Deterministic Scenario Testing	77%	33%	90%	77%
Mismatch Risk	91%	100%	80%	96%
Transfer Pricing	9%	0%	20%	5%

In addition to asking generally what reports are produced, the questionnaire also asked about a break-down of reports by line of business, as shown in the following tables (Tables 17a, 17b and 17c). Note that these numbers should be interpreted with care, in that a low percentage may simply be because not many companies even write this line of business (the survey does not link back results to whether a company actually writes this business).

TABLE 17a: ANALYSIS OF ASSET-LIABILITY RISK REPORTING BY LINE OF BUSINESS – P/C ONLY*

	P / C Only Companies					
	No. of P / C Companies Doing this Report	All liabilities in aggregate	Short-Tail P / C Personal Lines	Long-Tail P / C Personal Lines	Short-Tail P / C Commercial Lines	Long-Tail P / C Commercial Lines
Stochastic Scenario Testing	0	N/A	N/A	N/A	N/A	N/A
Deterministic Scenario Testing	1	100%	0%	0%	0%	0%
Mismatch Risk	3	67%	33%	33%	0%	33%
Transfer Pricing	0	N/A	N/A	N/A	N/A	N/A

* Companies may not write an indicated line of business, hence would not do a report for this line of business

TABLE 17b: ANALYSIS OF ASSET-LIABILITY RISK REPORTING BY LINE OF BUSINESS – LIFE ONLY*

	Life Only Companies						
	No. of Life Only Companies Doing this Report	All liabilities in aggregate	General Account Life and Accumulation Annuity	Equity Indexed	Variable	Payout Annuity	Short-Tail Health	Long-Tail Health
Stochastic Scenario Testing	8	75%	88%	13%	25%	63%	0%	13%
Deterministic Scenario Testing	9	67%	78%	11%	33%	67%	0%	11%
Mismatch Risk	8	75%	75%	13%	0%	50%	13%	25%
Transfer Pricing	2	100%	100%	0%	0%	50%	50%	50%

* Companies may not write an indicated line of business, hence would not do a report for this line of business

TABLE 17c: ANALYSIS OF ASSET-LIABILITY RISK REPORTING BY LINE OF BUSINESS – MULTI-LINE*

	No. of Multi-Line Companies Doing this Report	All liabilities in aggregate	Life and Health Lines						P / C Lines			
			General Account Life and Accumulation Annuity	Equity Indexed	Variable	Payout Annuity	Short-Tail Health	Long-Tail Health	Short-Tail P / C Personal Lines	Long-Tail P / C Personal Lines	Short-Tail P / C Commercial Lines	Long-Tail P / C Commercia Lines
Stochastic Scenario Testing	18	61%	78%	17%	22%	56%	0%	11%	6%	0%	6%	6%
Deterministic Scenario Testing	17	77%	65%	6%	29%	41%	18%	24%	6%	0%	6%	6%
Mismatch Risk	21	57%	71%	10%	19%	43%	5%	19%	5%	5%	5%	5%
Transfer Pricing	1	100%	100%	0%	100%	0%	0%	100%	0%	0%	0%	100%

* Companies may not write an indicated line of business, hence would not do a report for this line of business

In addition to the asset-liability risk reports specified in the questionnaire, four participants indicate that there is another report that is important to them. These reports include:

- Asset-liability or "integrated" Value at Risk across the balance sheet (2 companies)
- Equity risk and credit risk analysis
- Asset class distribution projection

A number of questions specific to each type of report were asked in order to get further insights. Each type of report is now discussed in detail (Section 4.3.2.1 covers Stochastic Scenario Testing; 4.3.2.2 covers Deterministic Scenario Testing; 4.3.2.3 covers Mismatch Risk; 4.3.2.4 covers Transfer Pricing; and 4.3.2.5 covers Other Important Asset-Liability Risk Reports).

4.3.2.1.   Stochastic Scenario Testing

Participants were posed a series of "closed ended" questions on stochastic scenario testing, including turnaround time, frequency, who receives the reports, and the level of influence of these reports. The following tables (Tables 18a, 18b, 18c and 18d) present the feedback from these questions, split by line of business.

TABLE 18a TURNAROUND TIME OF STOCHASTIC SCENARIO TESTING REPORTS

	All liabilities in aggregate	Life and Health Lines						P / C Lines			
		General Account Life and Accumulation Annuity	Equity Indexed	Variable	Payout Annuity	Short-tail Health	Long-tail Health	Short-tail P/C Personal Lines	Long-tail P/C Personal Lines	Short-tail P/C Commercial Lines	Long-tail P/C Commercial Lines
Of those companies doing this report, percentage turning around the report in…											
No. of companies doing this report	17	21	4	6	15	0	3	1	0	1	1
Overnight	0%	0%	0%	0%	7%	N/A	0%	0%	N/A	0%	0%
About 2 days	0%	5%	0%	17%	7%	N/A	33%	0%	N/A	0%	0%
3 days to 1 week	6%	0%	0%	0%	0%	N/A	0%	0%	N/A	100%	100%
Between 1 week and 1 month	53%	62%	75%	33%	40%	N/A	67%	0%	N/A	0%	0%
More than 1 month	41%	33%	25%	50%	47%	N/A	0%	100%	N/A	0%	0%
Don't Know	0%	0%	0%	0%	0%	N/A	0%	0%	N/A	0%	0%

TABLE 18b FREQUENCY OF STOCHASTIC SCENARIO TESTING REPORTS

	All liabilities in aggregate	Life and Health Lines						P / C Lines			
		General Account Life and Accumulation Annuity	Equity Indexed	Variable	Payout Annuity	Short-tail Health	Long-tail Health	Short-tail P/C Personal Lines	Long-tail P/C Personal Lines	Short-tail P/C Commercial Lines	Long-tail P/C Commercial Lines
Of those companies doing this report, percentage producing the report at a frequency of…											
No. of companies doing this report	17	21	4	6	15	0	3	1	0	1	1
Monthly or more often	12%	10%	25%	33%	20%	N/A	33%	0%	N/A	0%	0%
Quarterly	53%	38%	25%	50%	20%	N/A	67%	100%	N/A	100%	100%
Annually	29%	38%	50%	17%	53%	N/A	0%	0%	N/A	0%	0%
Once every 5 years	0%	0%	0%	0%	0%	N/A	0%	0%	N/A	0%	0%
Ad Hoc	6%	14%	0%	0%	7%	N/A	0%	0%	N/A	0%	0%
Don't Know	0%	0%	0%	0%	0%	N/A	0%	0%	N/A	0%	0%

TABLE 18c WHO RECEIVES STOCHASTIC SCENARIO TESTING REPORTS

| | All liabilities in aggregate | Life and Health Lines | | | | | | P / C Lines | | | |
		General Account Life and Accumulation Annuity	Equity Indexed	Variable	Payout Annuity	Short-tail Health	Long-tail Health	Short-tail P/C Personal Lines	Long-tail P/C Personal Lines	Short-tail P/C Commercial Lines	Long-tail P/C Commercial Lines
Of those companies doing this report, percentage where the report is received by…											
No. of companies doing this report	17	21	4	6	15	0	3	1	0	1	1
Line managers	65%	81%	75%	100%	80%	N/A	67%	100%	N/A	100%	100%
Senior management	82%	81%	100%	100%	67%	N/A	67%	100%	N/A	100%	100%
Board members	41%	29%	75%	17%	27%	N/A	33%	0%	N/A	0%	0%
Regulators	12%	19%	25%	17%	13%	N/A	0%	0%	N/A	100%	100%
Rating agencies	35%	24%	25%	17%	27%	N/A	0%	0%	N/A	0%	0%
External auditors	12%	0%	0%	0%	0%	N/A	0%	0%	N/A	0%	0%
Risk (or ALM) committee	77%	71%	100%	100%	67%	N/A	67%	100%	N/A	0%	0%
None of the above	0%	0%	0%	0%	7%	N/A	0%	0%	N/A	0%	0%
Don't know	0%	5%	0%	0%	0%	N/A	0%	0%	N/A	0%	0%

TABLE 18d LEVEL OF INFLUENCE OF STOCHASTIC SCENARIO TESTING REPORTS

	All liabilities in aggregate	Life and Health Lines						P / C Lines			
		General Account Life and Accumulation Annuity	Equity Indexed	Variable	Payout Annuity	Short-tail Health	Long-tail Health	Short-tail P/C Personal Lines	Long-tail P/C Personal Lines	Short-tail P/C Commercial Lines	Long-tail P/C Commercial Lines
Of those companies doing this report, percentage indicating this level of influence…											
No. of companies doing this report	17	21	4	6	15	0	3	1	0	1	1
High	35%	43%	25%	33%	7%	N/A	0%	0%	N/A	100%	100%
Medium	59%	43%	75%	67%	67%	N/A	67%	100%	N/A	0%	0%
Low	6%	14%	0%	0%	27%	N/A	33%	0%	N/A	0%	0%
Don't know	0%	0%	0%	0%	0%	N/A	0%	0%	N/A	0%	0%

Participants were asked to provide a brief description of the stochastic scenario testing reports that they think are most effective. For life business, stochastic scenario testing is obviously closely linked with duration and convexity computation and a number of participants mention that their models are effectively used for portfolio duration and convexity. In addition, some scenarios also mention using stochastic scenario testing to develop an efficient frontier. Other notable feedback includes:

- For "life only":

  — Usage of the stochastic model to identify risk drivers – comparison of results versus average interest rate, equity returns, etc.
  — Present value of future ROE averaged across many scenarios (also variances)
  — Tail analysis of all lines combined

- For "all others":

  — Asset and liability cash flows and earnings by duration and percentile
  — Ranking of results by scenario, grouping results by average Treasury rate
  — Standard rate-making types of analyses, emphasizing class of business, state and line of business
  — Volatility of surplus analysis
  — Projected earnings and economic value of surplus

Participants were asked to provide some indication as to what they may want out of stochastic scenario testing reports in the future and how they expect their stochastic scenario testing reports to look in the future. A number of companies are looking forward to quicker turnaround times, robust models and hence a more timely and more accurate assessment of risk and profit emergence. A few "life only" participants indicate that they are currently focused on C-3 risk, and will be looking more carefully at other risks in the future.

Specifically, with regard to what companies would like to get out of asset-liability duration reports in the future, other interesting feedback includes:

- Illustrative distribution showing risk/return profile for product line and rolled up to enterprise level
- Analysis of duration, convexity, etc. in terms of interest rate swings over a fixed time period
- Would like to be able to better identify key drivers
- Ability to gain a more comprehensive understanding of the company's risk profile
- Better understanding of the interaction of risks and implementable strategies
- Greater consistency of application across product lines

Specifically, with regard to how companies expect stochastic scenario testing reports to look in five years' time, other interesting feedback includes:

- Adding mortality, morbidity and equity factors to the interest rate modeling we do today; UVS driven
- More lines of business modeled
- Much more extensive in reports as we move into new product lines and invest in new assets
- Other assumptions besides interest rates will be modeled stochastically
- More automated, less time consuming and more coordinated with a corporate-wide and business segmentation
- Will incorporate stochastic equity market scenarios and test varying levels of new business
- More frequent to reflect dynamic nature of product issuance

Participants were asked as to how robust is the data collected for stochastic scenario analyses. In general, participants hover between "average" and "good" so far as how robust is the data for stochastic scenario projections is concerned. A few companies see their data as reasonably robust, but certainly with room for improvement. Specific comments worthy of mention are as follows:

- Generally high, except for dynamic lapse and transfer assumptions, which lack experience data
- Number of cells is limited by need to keep run-time to a minimum
- Asset projections are accurate; liability projections becoming increasingly sophisticated

4.3.2.2.   Deterministic Scenario Testing

Participants were posed a series of "closed ended" questions on deterministic scenario testing, including turnaround time, frequency, who receives the reports, and the level of influence of these reports. The following tables (Tables 19a, 19b, 19c, and 19d) present the feedback from these questions, split by line of business.

TABLE 19a TURNAROUND TIME OF DETERMINISTIC SCENARIO TESTING REPORTS

| | | Life and Health Lines | | | | | | P / C Lines | | | |
	All liabilities in aggregate	General Account Life and Accumulation Annuity	Equity Indexed	Variable	Payout Annuity	Short-tail Health	Long-tail Health	Short-tail P/C Personal Lines	Long-tail P/C Personal Lines	Short-tail P/C Commercial Lines	Long-tail P/C Commercial Lines
Of those companies doing this report, percentage turning around the report in…											
No. of companies doing this report	20	18	2	8	13	3	5	1	0	1	1
Overnight	0%	0%	0%	0%	8%	0%	20%	0%	N/A	0%	0%
About 2 days	0%	0%	0%	0%	0%	0%	0%	100%	N/A	0%	0%
3 days to 1 week	10%	0%	0%	0%	8%	33%	0%	0%	N/A	0%	0%
Between 1 week and 1 month	40%	56%	100%	50%	31%	67%	40%	0%	N/A	100%	100%
More than 1 month	50%	44%	0%	50%	54%	0%	40%	0%	N/A	0%	0%
Don't Know	0%	0%	0%	0%	0%	0%	0%	0%	N/A	0%	0%

TABLE 19b FREQUENCY TIME OF DETERMINISTIC SCENARIO TESTING REPORTS

	All liabilities in aggregate	Life and Health Lines						P / C Lines			
		General Account Life and Accumulation Annuity	Equity Indexed	Variable	Payout Annuity	Short-tail Health	Long-tail Health	Short-tail P/C Personal Lines	Long-tail P/C Personal Lines	Short-tail P/C Commercial Lines	Long-tail P/C Commercial Lines
Of those companies doing this report, percentage producing the report at a frequency of…											
No. of companies doing this report	20	18	2	8	13	3	5	1	0	1	1
Monthly or more often	0%	0%	0%	0%	0%	0%	0%	100%	N/A	0%	0%
Quarterly	40%	33%	50%	38%	31%	0%	20%	0%	N/A	100%	100%
Annually	60%	67%	50%	63%	69%	100%	80%	0%	N/A	0%	0%
Once every 5 years	0%	0%	0%	0%	0%	0%	0%	0%	N/A	0%	0%
Ad Hoc	0%	0%	0%	0%	0%	0%	0%	0%	N/A	0%	0%

TABLE 19c WHO RECEIVES DETERMINISTIC SCENARIO TESTING REPORTS

| | All liabilities in aggregate | Life and Health Lines | | | | | | P / C Lines | | | |
		General Account Life and Accumulation Annuity	Equity Indexed	Variable	Payout Annuity	Short-tail Health	Long-tail Health	Short-tail P/C Personal Lines	Long-tail P/C Personal Lines	Short-tail P/C Commercial Lines	Long-tail P/C Commercial Lines
Of those companies doing this report, percentage where the report is received by…											
No. of companies doing this report	20	18	2	8	13	3	5	1	0	1	1
Line managers	70%	78%	50%	100%	54%	67%	40%	100%	N/A	100%	100%
Senior management	80%	78%	100%	75%	77%	33%	80%	100%	N/A	100%	100%
Board members	45%	39%	100%	38%	39%	0%	40%	0%	N/A	0%	0%
Regulators	45%	61%	50%	50%	69%	67%	60%	100%	N/A	0%	0%
Rating agencies	25%	22%	50%	0%	31%	0%	0%	0%	N/A	0%	0%
External auditors	10%	22%	0%	13%	8%	33%	20%	0%	N/A	0%	0%
Risk (or ALM) committee	55%	50%	100%	63%	39%	0%	40%	0%	N/A	0%	0%
None of the above	5%	6%	0%	0%	0%	0%	0%	0%	N/A	0%	0%
Don't know	0%	0%	0%	0%	0%	0%	0%	0%	N/A	0%	0%

TABLE 19d LEVEL OF INFLUENCE OF DETERMINISTIC SCENARIO TESTING REPORTS

	All liabilities in aggregate	Life and Health Lines						P / C Lines			
		General Account Life and Accumulation	Equity Indexed	Variable	Payout Annuity	Short-tail Health	Long-tail Health	Short-tail P/C Personal	Long-tail P/C Personal	Short-tail P/C Commercial	Long-tail P/C Commercial Lines
Of those companies doing this report, percentage indicating this level of influence…											
No. of companies doing this report	20	18	2	8	13	3	5	1	0	1	1
High	25%	28%	50%	38%	0%	33%	20%	0%	N/A	100%	100%
Medium	50%	56%	50%	63%	54%	33%	40%	0%	N/A	0%	0%
Low	25%	17%	0%	0%	46%	33%	40%	100%	N/A	0%	0%
Don't know	0%	0%	0%	0%	0%	0%	0%	0%	N/A	0%	0%

Participants were asked to provide a brief description of the deterministic scenario testing reports that they think are most effective. As might be expected, for many companies, deterministic scenario testing is primarily performed for purposes of meeting prescribed regulatory requirements, e.g., U.S. statutory cash flow testing, and for Canadian companies, Dynamic Capital Adequacy Testing ("DCAT"). However, a number of companies use deterministic scenario testing for purposes beyond merely meeting a regulatory requirement and much interesting feedback was received on deterministic reports that are effective:

■ Calculate the impact of a 200 basis point change on the value of the fixed-income portfolio
■ Analysis of historical interest rate patterns
■ Stress test increased lapse, mortality, morbidity, expense and prepayment assumptions
■ Earnings and embedded value impacts of high severity/low probability events, say 95 and 99 percentiles
■ Report that displays results consistent with financial statement presentation
■ These are traditional ratemaking type reports by major type of business groups, state and line of business
■ Cash flow graphs with deterministic scenario of asset and liability cash flows
■ Measures shock to current interest rates

Participants were asked to provide some indication as to what they may want out of deterministic scenario testing reports in the future and how they expect their deterministic scenario testing reports to look in the future. In general, participants are not looking to get anything different in the future out of their deterministic scenario testing reports, nor do they expect to see much change, with the focus continuing to be on satisfying the regulatory requirements. As per stochastic scenario testing, some companies are looking forward to quicker turnaround time, which in the case of deterministic scenario testing means additional scenarios and more detailed analysis.

Specifically, with regard to what companies want out of deterministic scenario testing reports in the future, other interesting feedback includes:

■ Set capital commensurate with risk instead of being factor driven; better pricing
■ We want our reports to coordinate and support an overall corporate financial plan, including investments' taxes

Specifically, with regard to how companies expect deterministic scenario testing reports to look in five years, other interesting feedback includes:

■ Move toward stochastic scenario testing; more internally developed stress tests
■ More combinations of stress tests
■ We expect to incorporate our traditional blocks of business, as well as our interest sensitive
■ More sophisticated techniques for selecting tail risk scenarios
■ More closely tied in with business initiatives and plans

■ More efficient process of assembling data and running reports

Participants were asked as to how robust is the data collected for deterministic scenario analyses. Responses to this question are very similar to those responses for stochastic scenario testing, reflective of the fact that both are likely to originate from the same underlying projection model. Again, participants hover between "average" and "good" so far as data is concerned.

4.3.2.3. Mismatch Risk

Participants were posed a series of "closed ended" questions on mismatch risk, including turnaround time, frequency, who receives the reports, and the level of influence of these reports. The following tables (Tables 20a, 20b, 20c and 20d) present the feedback from these questions, split by line of business.

TABLE 20a TURNAROUND TIME OF MISMATCH RISK REPORTS

	All liabilities in aggregate	Life and Health Lines						P / C Lines			
		General Account Life and Accumulation Annuity	Equity Indexed	Variable	Payout Annuity	Short-tail Health	Long-tail Health	Short-tail P/C Personal Lines	Long-tail P/C Personal Lines	Short-tail P/C Commercial Lines	Long-tail P/C Commercial Lines
Of those companies doing this report, percentage turning around the report in…											
No. of companies doing this report	20	21	3	4	13	2	6	2	2	1	2
Overnight	0%	0%	0%	0%	8%	0%	0%	0%	0%	0%	0%
About 2 days	0%	5%	33%	0%	0%	0%	17%	0%	0%	0%	0%
3 days to 1 week	15%	14%	0%	0%	15%	50%	17%	0%	0%	0%	0%
Between 1 week and 1 month	50%	38%	67%	50%	31%	0%	17%	100%	100%	100%	100%
More than 1 month	30%	38%	0%	50%	46%	50%	50%	0%	0%	0%	0%
Don't Know	5%	5%	0%	0%	0%	0%	0%	0%	0%	0%	0%

TABLE 20b FREQUENCY OF MISMATCH RISK REPORTS

	All liabilities in aggregate	Life and Health Lines						P / C Lines			
		Gen'l Account Life & Accumulation Annuity	Equity Indexed	Variable	Payout Annuity	Short-tail Health	Long-tail Health	Short-tail P/C Personal Lines	Long-tail P/C Personal Lines	Short-tail P/C Commercial Lines	Long-tail P/C Commercial Lines
Of those companies doing this report, percentage producing the report at a frequency of…											
No. of companies doing this report	20	21	3	4	13	2	6	2	2	1	2
Monthly or more often	15%	24%	67%	0%	23%	0%	17%	0%	0%	0%	0%
Quarterly	45%	38%	33%	75%	39%	0%	33%	50%	50%	100%	50%
Annually	35%	29%	0%	25%	31%	50%	33%	50%	0%	0%	0%
Once every 5 years	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Ad Hoc	0%	5%	0%	0%	8%	50%	17%	0%	50%	0%	50%
Don't Know	5%	5%	0%	0%	0%	0%	0%	0%	0%	0%	0%

TABLE 20c WHO RECEIVES MISMATCH RISK REPORTS

		Life and Health Lines						P / C Lines			
Of those companies doing this report, percentage where the report is received by…	All liabilities in aggregate	General Account Life and Accumulation Annuity	Equity Indexed	Variable	Payout Annuity	Short-tail Health	Long-tail Health	Short-tail P/C Personal Lines	Long-tail P/C Personal Lines	Short-tail P/C Commercial Lines	Long-tail P/C Commercial Lines
No. of companies doing this report	20	21	3	4	13	2	6	2	2	1	2
Line managers	50%	76%	67%	100%	77%	100%	67%	0%	0%	0%	0%
Senior management	90%	81%	100%	100%	77%	50%	67%	100%	50%	100%	50%
Board members	40%	29%	67%	25%	39%	0%	33%	0%	50%	0%	50%
Regulators	0%	10%	0%	0%	8%	0%	17%	0%	0%	0%	0%
Rating agencies	20%	19%	33%	0%	39%	0%	0%	0%	0%	0%	0%
External auditors	15%	10%	0%	0%	8%	0%	17%	0%	0%	0%	0%
Risk (or ALM) committee	60%	71%	100%	100%	54%	50%	50%	0%	0%	0%	0%
None of the above	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Don't know	5%	5%	0%	0%	0%	0%	0%	0%	0%	0%	0%

TABLE 20d LEVEL OF INFLUENCE OF MISMATCH RISK REPORTS

		Life and Health Lines						P / C Lines			
Of those companies doing this report, percentage indicating this level of influence…	All liabilities in aggregate	General Account Life and Accumulation Annuity	Equity Indexed	Variable	Payout Annuity	Short-tail Health	Long-tail Health	Short-tail P/C Personal Lines	Long-tail P/C Personal Lines	Short-tail P/C Commercial Lines	Long-tail P/C Commercial Lines
No. of companies doing this report	20	21	3	4	13	2	6	2	2	1	2
High	40%	19%	67%	25%	8%	0%	0%	0%	0%	0%	0%
Medium	40%	67%	33%	75%	46%	50%	50%	0%	50%	0%	50%
Low	15%	10%	0%	0%	46%	50%	50%	100%	50%	100%	50%
Don't know	5%	5%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Feedback from participants on effective mismatch reports is wide and varied. As expected, a number of companies specifically mention that duration and convexity mismatch reports are their most effective mismatch reports. Some other interesting comments are as follows:

- Cash flow projections of the insurance operation versus investments; variability of each
- Review asset and liability cash flows at company level
- Asset-liability duration management reports, as well as asset-liability cash flow reports
- Premiums should be included with asset cash flows; look at enterprise level and drill down
- Crediting spread, duration mismatch, cash flow mismatch
- Asset and liability cash flows and earnings by duration and percentile reports showing duration, convexity for assets and liabilities, including dollar duration and dollar convexity
- Report demonstrating impact of change of yield curve
- Key rate duration analysis and aggregate duration reports
- No specific reports; analytic information provided by ALM staff when appropriate or requested
- Mismatch reports by line of business/operating division/asset portfolio
- Cash flow mismatch by year (quarter) and duration mismatch, each by investment segment
- Asset/liability duration and cash flow mismatch for selected product lines
- Quarterly liquidity mismatch reports

Participants were asked to provide some indication as to what they may want out of mismatch risk reports in the future and how they expect their mismatch risk reports to look in the future. In similar fashion to the feedback for scenario testing, a number of companies are looking forward to quicker turnaround time, enabling more timely and relevant mismatch risk reports to be produced. Otherwise, many companies are currently satisfied with their mismatch reports and do not expect to see much change in their reports in the future.

Specifically, with regard to what companies would like to get out of mismatch reports in the future, other interesting feedback includes:

- More scenario analysis
- Attach a dollar value to the risk (UVS – similar thought to VaR)
- Better use as feedback tool in management decisions
- Want to be able to use these for investment purchases so that assets will match up with liabilities
- Earnings at Risk, Value at Risk

Specifically, with regard to how companies expect mismatch reports to look in five years time, other interesting feedback includes:

- Improved stochastic drivers; go beyond interest rate risk

- More robust – better models
- Need to move into a more sophisticated mode – look at all the risks (cash flow, duration, etc.)
- Better graphics
- Extend to more product lines

Participants were asked as to how robust is the data collected for mismatch risk analyses. Again, responses to this question are very similar to those responses for scenario testing, reflective of the fact that all asset-liability analysis is probably off the same underlying projection model. Again, participants are between "average" and "good" so far as data is concerned.

4.3.2.4. Transfer Pricing

Participants were posed a series of "closed ended" questions on transfer pricing, including turnaround time, frequency, who receives the reports, and the level of influence of these reports. The following tables (Tables 21a, 21b, 21c and 21d) present the feedback from these questions, split by line of business.

TABLE 21a TURNAROUND TIME OF TRANSFER PRICING REPORTS

| | All liabilities in aggregate | Life and Health Lines | | | | | | P / C Lines | | | |
		General Account Life and Accumulation Annuity	Equity Indexed	Variable	Payout Annuity	Short-tail Health	Long-tail Health	Short-tail P/C Personal Lines	Long-tail P/C Personal Lines	Short-tail P/C Commercial Lines	Long-tail P/C Commercial Lines
Of those companies doing this report, percentage turning around the report in…											
No. of companies doing this report	3	3	0	1	1	1	2	0	0	0	1
Overnight	0%	0%	N/A	0%	0%	0%	0%	N/A	N/A	N/A	0%
About 2 days	0%	0%	N/A	0%	0%	0%	0%	N/A	N/A	N/A	0%
3 days to 1 week	33%	33%	N/A	0%	0%	0%	0%	N/A	N/A	N/A	0%
Between 1 week and 1 month	67%	67%	N/A	100%	100%	100%	100%	N/A	N/A	N/A	100%
More than 1 month	0%	0%	N/A	0%	0%	0%	0%	N/A	N/A	N/A	0%
Don't Know	0%	0%	N/A	0%	0%	0%	0%	N/A	N/A	N/A	0%

TABLE 21b FREQUENCY OF TRANSFER PRICING REPORTS

| | All liabilities in aggregate | Life and Health Lines | | | | | | P / C Lines | | | |
		General Account Life and Accumulation Annuity	Equity Indexed	Variable	Payout Annuity	Short-tail Health	Long-tail Health	Short-tail P/C Personal Lines	Long-tail P/C Personal Lines	Short-tail P/C Commercial Lines	Long-tail P/C Commercial Lines
Of those companies doing this report, percentage producing the report at a frequency of…											
No. of companies doing this report	3	3	0	1	1	1	2	0	0	0	1
Monthly or more often	33%	33%	N/A	100%	0%	0%	50%	N/A	N/A	N/A	100%
Quarterly	67%	67%	N/A	0%	100%	100%	50%	N/A	N/A	N/A	0%
Annually	0%	0%	N/A	0%	0%	0%	0%	N/A	N/A	N/A	0%
Once every 5 years	0%	0%	N/A	0%	0%	0%	0%	N/A	N/A	N/A	0%
Ad Hoc	0%	0%	N/A	0%	0%	0%	0%	N/A	N/A	N/A	0%
Don't Know	0%	0%	N/A	0%	0%	0%	0%	N/A	N/A	N/A	0%

TABLE 21c   WHO RECEIVES TRANSFER PRICING REPORTS

		Life and Health Lines						P / C Lines			
	All liabilities in aggregate	General Account Life and Accumulation Annuity	Equity Indexed	Variable	Payout Annuity	Short-tail Health	Long-tail Health	Short-tail P/C Personal Lines	Long-tail P/C Personal Lines	Short-tail P/C Commercial Lines	Long-tail P/C Commercial Lines
Of those companies doing this report, percentage where the report is received by…											
No. of companies doing this report	3	3	0	1	1	1	2	0	0	0	1
Line managers	100%	100%	N/A	100%	100%	100%	100%	N/A	N/A	N/A	100%
Senior management	67%	33%	N/A	100%	0%	0%	50%	N/A	N/A	N/A	100%
Board members	0%	0%	N/A	0%	0%	0%	0%	N/A	N/A	N/A	0%
Regulators	0%	0%	N/A	0%	0%	0%	0%	N/A	N/A	N/A	0%
Rating agencies	0%	0%	N/A	0%	0%	0%	0%	N/A	N/A	N/A	0%
External auditors	0%	0%	N/A	0%	0%	0%	0%	N/A	N/A	N/A	0%
Risk (or ALM) committee	67%	67%	N/A	0%	100%	100%	50%	N/A	N/A	N/A	0%
None of the above	0%	0%	N/A	0%	0%	0%	0%	N/A	N/A	N/A	0%
Don't know	0%	0%	N/A	0%	0%	0%	0%	N/A	N/A	N/A	0%

TABLE 21d   LEVEL OF INFLUENCE OF TRANSFER PRICING REPORTS

		Life and Health Lines						P / C Lines			
	All liabilities in aggregate	General Account Life and Accumulation Annuity	Equity Indexed	Variable	Payout Annuity	Short-tail Health	Long-tail Health	Short-tail P/C Personal Lines	Long-tail P/C Personal Lines	Short-tail P/C Commercial Lines	Long-tail P/C Commercial Lines
Of those companies doing this report, percentage indicating this level of influence…											
No. of companies doing this report	3	3	0	1	1	1	2	0	0	0	1
High	33%	33%	N/A	100%	0%	0%	50%	N/A	N/A	N/A	100%
Medium	67%	67%	N/A	0%	100%	0%	50%	N/A	N/A	N/A	0%
Low	0%	0%	N/A	0%	0%	100%	0%	N/A	N/A	N/A	0%
Don't know	0%	0%	N/A	0%	0%	0%	0%	N/A	N/A	N/A	0%

With only three participants indicating the usage of transfer pricing, feedback on the "open ended" question around which reports are most effective, what companies are looking for in the future, and how robust is the data, is very sparse. Indeed, only one of the companies performing transfer pricing has provided any feedback on these questions and in the interest of confidentiality, this feedback is not being presented as part of this paper.

4.3.2.5.   Other Important Asset-Liability Risk Position Reports

Participants were posed a series of "closed ended" questions on "Other Important Asset-Liability Risk Position Reports". As already discussed in the introduction to Section 4.3.2, there are only four companies indicating an "Other" report, with a few mentioning Value at Risk across the whole balance sheet.

Participants were asked to provide some indication as to what they may want out of these reports in the future and how they expect their reports to look in the future. With only four participants indicating the usage of an "other" report, feedback on the "open ended" questions around which reports are most effective, what companies are looking for in the future, and how robust is the data, is very sparse. One piece of feedback of note is that, similar to responses elsewhere throughout the survey, companies are looking forward to quicker turnaround time enabling more timely and relevant reports to be produced.

4.4   Operational Risk Position Reports

Operational risks relate to any non-financial risk and arise from many sources, including (but not limited to) the following:

- Event Risk – This risk category includes risk exposures arising from:

  — Taxation
  — Political souces
  — Regulation
  — Capital Markets

- People Risk – This risk category includes risk exposures arising from:

  — Integrity
  — Health and safety
  — Key Personnel

- Technology Risk – This risk category includes risk exposures arising from:

  — Inappropriate transactions
  — Lost data
  — Availability and infrastructure

- Distribution Risk

  — Business volumes
  — Market conduct
  — Sales compliance

- Catastrophic Risk

  — Property Damage
  — Flood, hurricane, tornado
  — Business interruption

4.4.1 Risk Materiality

Respondents rate the materiality of operational risks as highly as financial risks. Unlike financial risks, there is typically a lot of uniformity of operational risks across life and P/C companies, and between "North America only" and "Multi-National" companies.

The survey posed questions on operational risk materially, using a rating scale of 1 to 5, where 5 is high. Table 22 presents the results of this by category of company.

TABLE 22:   OPERATIONAL RISK MATERIALITY (BY CATEGORY OF COMPANY)

	Event Risk							
	Taxation				Political Sources			
	All Participants	P/C Only	Life Only	All Others	All Participants	P/C Only	Life Only	All Others
No. of Survey Participant Companies	44	10	10	24	44	10	10	24
No. of Companies responding to the Operational Risk Reports part of the survey	43	10	10	23	43	10	10	23
Materiality Level								
1-Low	26%	30%	20%	26%	33%	20%	30%	39%
2	26%	20%	20%	30%	16%	10%	20%	17%
3	26%	20%	50%	17%	33%	40%	30%	30%
4	12%	10%	0%	17%	16%	30%	10%	13%
5-High	9%	20%	0%	9%	2%	0%	10%	0%
N/A	2%	0%	10%	0%	0%	0%	0%	0%
	100%	100%	100%	100%	100%	100%	100%	100%
Average Materiality Rating	2.52	2.70	2.33	2.52	2.40	2.80	2.50	2.17

	Event Risk							
	Regulation				Capital Markets			
	All Participants	P/C Only	Life Only	All Others	All Participants	P/C Only	Life Only	All Others
No. of Survey Participant Companies	44	10	10	24	44	10	10	24
No. of Companies responding to the Operational Risk Report part of the Survey	43	10	10	23	43	10	10	23
Materiality Level								
1-Low	9%	10%	0%	13%	16%	20%	20%	13%
2	33%	30%	50%	26%	28%	40%	20%	26%
3	23%	30%	20%	22%	23%	20%	40%	17%
4	26%	10%	20%	35%	26%	10%	20%	35%
5-High	9%	20%	10%	4%	2%	0%	0%	4%
N/A	0%	0%	0%	0%	5%	10%	0%	4%
	100%	100%	100%	100%	100%	100%	100%	100%
Average Materiality Rating	2.93	3.00	2.90	2.91	2.68	2.22	2.60	2.91

TABLE 22: OPERATIONAL RISK MATERIALITY (BY CATEGORY OF COMPANY) (CONT.)

| | People Risk | | | | | | | |
| | Integrity | | | | Health & Safety | | | |
	All Participants	P/C Only	Life Only	All Others	All Participants	P/C Only	Life Only	All Others
No. of Survey Participant Companies	44	10	10	24	44	10	10	24
No. of Companies responding to the Operational Risk Reports part of the survey	43	10	10	23	43	10	10	23
Materiality Level								
1-Low	40%	40%	20%	48%	56%	60%	40%	61%
2	35%	20%	60%	30%	30%	30%	40%	26%
3	19%	30%	10%	17%	12%	10%	10%	13%
4	5%	0%	10%	4%	0%	0%	0%	0%
5-High	2%	10%	0%	0%	0%	0%	0%	0%
N/A	0%	0%	0%	0%	2%	0%	10%	0%
	100%	100%	100%	100%	100%	100%	100%	100%
Average Materiality Rating	1.95	2.20	2.10	1.78	1.55	1.50	1.67	1.52

| | People Risk (Continued) | | | | Technology Risk | | | |
| | Key Personnel | | | | Inappropriate Transactions | | | |
	All Participants	P/C Only	Life Only	All Others	All Participants	P/C Only	Life Only	All Others
No. of Survey Participant Companies	44	10	10	24	44	10	10	24
No. of Companies responding to the Operational Risk Report part of the Survey	43	10	10	23	43	10	10	23
Materiality Level								
1-Low	14%	0%	30%	13%	30%	10%	40%	35%
2	30%	50%	30%	22%	37%	20%	60%	35%
3	42%	30%	40%	48%	28%	60%	0%	26%
4	12%	10%	0%	17%	2%	0%	0%	4%
5-High	2%	10%	0%	0%	2%	10%	0%	0%
N/A	0%	0%	0%	0%	0%	0%	0%	0%
	100%	100%	100%	100%	100%	100%	100%	100%
Average Materiality Rating	2.58	2.80	2.10	2.70	2.09	2.80	1.60	2.00

TABLE 22: OPERATIONAL RISK MATERIALITY (BY CATEGORY OF COMPANY) (CONT.)

	Technology Risk (Continued)							
	Lost Data				Availability and Infrastructure			
	All Participants	P/C Only	Life Only	All Others	All Participants	P/C Only	Life Only	All Others
No. of Survey Participant Companies	44	10	10	24	44	10	10	24
No. of Companies responding to the Operational Risk Reports part of the survey	43	10	10	23	43	10	10	23
Materiality Level								
1-Low	19%	20%	10%	22%	19%	30%	20%	13%
2	37%	10%	50%	44%	33%	0%	40%	44%
3	37%	50%	30%	35%	44%	70%	40%	35%
4	5%	10%	10%	0%	5%	0%	0%	9%
5-High	2%	10%	0%	0%	0%	0%	0%	0%
N/A	0%	0%	0%	0%	0%	0%	0%	0%
	100%	100%	100%	100%	100%	100%	100%	100%
Average Materiality Rating	2.35	2.80	2.40	2.13	2.35	2.40	2.20	2.39

	Distribution Risk							
	Business Volumes				Market Conduct			
	All Participants	P/C Only	Life Only	All Others	All Participants	P/C Only	Life Only	All Others
No. of Survey Participant Companies	44	10	10	24	44	10	10	24
No. of Companies responding to the Operational Risk Report part of the Survey	43	10	10	23	43	10	10	23
Materiality Level								
1-Low	16%	30%	30%	4%	26%	30%	10%	30%
2	30%	30%	30%	30%	35%	30%	50%	30%
3	28%	30%	20%	30%	21%	20%	30%	17%
4	23%	10%	20%	30%	16%	20%	10%	17%
5-High	2%	0%	0%	4%	2%	0%	0%	4%
N/A	0%	0%	0%	0%	0%	0%	0%	0%
	100%	100%	100%	100%	100%	100%	100%	100%
Average Materiality Rating	2.65	2.20	2.30	3.00	2.35	2.30	2.40	2.35

TABLE 22: OPERATIONAL RISK MATERIALITY (BY CATEGORY OF COMPANY) (CONT.)

| | Distribution Risk (Continued) | | | | Catastrophic Risk | | | |
| | Sales Compliance | | | | Property Damage | | | |
	All Participants	P/C Only	Life Only	All Others	All Participants	P/C Only	Life Only	All Others
No. of Survey Participant Companies	44	10	10	24	44	10	10	24
No. of Companies responding to the Operational Risk Reports part of the survey	43	10	10	23	43	10	10	23
Materiality Level								
1-Low	23%	30%	20%	22%	28%	30%	20%	30%
2	28%	20%	30%	30%	21%	10%	0%	35%
3	30%	30%	40%	26%	16%	30%	10%	13%
4	12%	10%	10%	13%	5%	0%	0%	9%
5-High	2%	0%	0%	4%	5%	20%	0%	0%
N/A	5%	10%	0%	4%	26%	10%	70%	13%
	100%	100%	100%	100%	100%	100%	100%	100%
Average Materiality Rating	2.39	2.22	2.40	2.45	2.16	2.67	1.67	2.00

| | Catastrophic Risk (Continued) | | | | | | | |
| | Flood, Hurricane, Tornado | | | | Business Interruption | | | |
	All Participants	P/C Only	Life Only	All Others	All Participants	P/C Only	Life Only	All Others
No. of Survey Participant Companies	44	10	10	24	44	10	10	24
No. of Companies responding to the Operational Risk Report part of the Survey	43	10	10	23	43	10	10	23
Materiality Level								
1-Low	26%	10%	20%	35%	30%	40%	30%	26%
2	26%	30%	0%	35%	40%	20%	40%	48%
3	12%	20%	10%	9%	16%	20%	10%	17%
4	9%	20%	0%	9%	7%	20%	0%	4%
5-High	2%	10%	0%	0%	0%	0%	0%	0%
N/A	26%	10%	70%	13%	7%	0%	20%	4%
	100%	100%	100%	100%	100%	100%	100%	100%
Average Materiality Rating	2.16	2.89	1.67	1.90	2.00	2.20	1.75	2.00

Classifying "capital markets" and "catastrophic risk" as operational risks may have caused some confusion among respondents, with some companies interpreting capital markets in the context of "market risk" and catastrophic risk in the context of P/C product line risk (both already covered earlier). In providing feedback on operational risks, we have attempted to strip out responses that appear to refer to these other, non-operational, risks. However, these effects may have influenced the materiality results in Table 22.

4.4.2   Analysis and Reporting Methodology

A large proportion of participants indicate that they do not compile any operational risk reports – only 17 of the 43 companies responding to the operational risk reports

part of the survey do any reporting at all (40%). Given this low response rate, then, the reader should be cautious in interpreting the results presented here for the operational risks part of the survey. Of the 17 respondents doing some type of operational risk reporting, most perform analyses around empirical evaluation based on historical data, with some doing evaluation using a probability function with analysis used to derive parameters. No company reports using either Influence Diagrams or the Delphi Method. An overview of the types of analysis performed by respondents is shown in Table 23. Note that "life only" companies are largely absent from this section of the report: one "life only" company indicates doing at least one of the operational risk position reports specified in the survey but then provides no further information.

Table 23: For these companies producing at least one of the operational risk position reports specified in the questionnaire, what type of analysis we performed (Percentages are % of these companies producing at least one of the operational risk reports specified in the questionnaire).

	All Participants	P/C Only	Life Only	All Others
No. of Participating Companies	44	10	10	24
No. of Companies responding to the operational risk reports part of the survey	43	10	10	23
Companies doing at least one of the operational risk position reports specified in the survey	17	6	1	10
Empirical evaluation based on historical data	88%	100%	0%	90%
Evaluation using a probability function with analysis used to derive parameters	35%	50%	0%	30%
Regression analysis on the risk variable	6%	17%	0%	0%
Influence diagrams	0%	0%	0%	0%

Operational risks tend to affect the corporation overall rather than a line of business or a particular asset category. Having said this, from time-to-time companies may wish to investigate the operational risks inherent in a specific area, for example, the operational risks inherent in switching from one distribution channel to another. In any case, because operational risks tend to be a company-wide phenomenon, and because any further carving of analysis tends to be very company-specific, the survey concentrated on looking at what industry practice is from an overall corporate level rather than by attempting to go any finer than this. Indeed, it is clear from one of the questions that the corporate level analysis on operational risks is the norm, with 88% of companies who do some form of operational risk reporting indicating that their operational risk analysis is at a "fleet or corporate level" (See Table 24 below).

Table 24: For those companies producing at least one of the operational risk position reports specified in the questionnaire, is operational risk management performed at the fleet/"corporate" level, or is a finer level of analysis preferred?

	All Participants	P/C Only	Life Only	All Others
No. of Participating Companies	44	10	10	24
No. of Companies responding to the operational risk reports part of the survey	43	10	10	23
Companies doing at least one of the operational risk position reports specified in the survey	17	6	1	10
Fleet or Corporate level	88%	83%	0%	100%
Finer level of analysis than at the corporate level	12%	17%	100%	0%
Don't know	0%	0%	0%	0%

In addition to the operational risk reports specified in the questionnaire, two companies indicate that there is another report that is important to them, although very little description is provided on what these other reports are.

A number of questions specific to each type of report were asked in order to get further insights. Each type of report is now discussed in detail (Section 4.4.2.1 covers empirical evaluation; 4.4.2.2 covers evaluation using a probability function; 4.4.2.3 covers regression analysis; and 4.4.2.4 covers other important operational risk reports).

4.4.2.1 Empirical Evaluation

Participants were posed a series of "closed ended" questions on empirical evaluation, including turnaround time, frequency, who receives reports, and the level of influence of these reports. The following tables (Tables 25a, 25b, 25c and 25d) present the feedback from these questions. The time frames here are materially longer than for other (non-operational) risk categories, which is natural given the fundamentally different nature of these risks.

Table 25a: Turnaround Time of Empirical Evaluation Reports

Of those companies doing this report,
percentage turning around the report in ……

No. of companies doing this report	15
Overnight	0%
About 2 days	0%
3 days to 1 week	0%
Between 1 week and 1 month	47%
More than 1 month	40%
Don't know	13%

Table 25b: Frequency of Empirical Evaluation Reports

Of those companies doing this report,
percentage producing the report at a
frequency of ……

No. of companies doing this report	15
Monthly or more often	0%
Quarterly	20%
Annually	53%
Once every 5 years	0%
Ad Hoc	13%
Don't know	13%

Table 25c: Who Receives Empirical Evaluation Reports

Of those companies
doing this report, percentage where the
report is received by ……

No. of companies doing this report	15
Line Managers	40%
Senior Management	80%
Board Members	33%
Regulators	13%
Rating Agencies	20%
External Auditors	13%
Risk (or ALM) Committee	13%
None of the above	0%
Don't know	13%

Table 25d: Level of Influence of Empirical Evaluation Reports

Of those companies doing this report,
percentage indicating this level of influence ……

No. of companies doing this report	15
High	13%
Medium	67%
Low	7%
Don't know	13%

Participants were asked to provide a brief description of the empirical evaluation reports that they think are most effective. The following is some of the feedback with respect to this question.

- Assessment of vulnerability to and likely changes in customer choice of distribution channel
- This report backs up the operational risk component of our required surplus formula
- Contract processing turnaround time; quality assurance reviews
- These are various depending on the issue and the management group responsible
- Assessment of catastrophic property risks, sales practices, and employee dishonesty

Participants were asked to provide some indication as to what they may want out of empirical evaluation reports in the future and how they expect these reports to look in the future. In general, those companies doing empirical evaluation reports appear to think they have gone as far as they can with these reports, and most anticipate reports will not look any different in five years' time to what they are today. Note that this does not imply that companies are satisfied generally with their operational risk reporting – merely that they have taken empirical evaluation as far as it will go. One company indicates that they expect future reports to better reflect concentrations of risk across the organizational aspects of management.

So far as data is concerned, the response is quite varied, with some companies stating their data is on the poor side (with comments such as "adequate," "weak," and/or "data is fairly simple for the most part"), but with other companies stating that data is actually "very robust" and "fairly complete and relevant."

4.4.2.2   Evaluation using a Probability Function

Participants were posed a series of "closed ended" questions on evaluation using a probability function, including turnaround time, frequency, who receives reports, and

the level of influence of these reports. The following tables (Tables 26a, 26b, 26c and 26d) present the feedback for these questions.

Table 26a: Turnaround Time of Evaluation Using a Probability Function Report

---

Of those companies
doing this report,
percentage turning around
the report in ……

No. of companies doing this report	6
Overnight	0%
About 2 days	0%
3 days to 1 week	33%
Between 1 week and 1 month	50%
More than 1 month	17%
Don't know	0%

Table 26b: Frequency of Evaluation Using a Probability Function Report

---

Of those companies doing this report,
percentage producing the report at a frequency
of ……

No. of companies doing this report	6
Monthly or more often	17%
Quarterly	33%
Annually	33%
Once every 5 years	0%
Ad Hoc	17%
Don't know	0%

Table 26c: Who Receives Evaluation Using a Probability Function Reports

---

Of those companies doing this report,
percentage where the is received by……

No. of companies doing this report	6
Line Managers	50%
Senior Management	83%
Board Members	17%
Regulators	17%
Rating Agencies	17%
External Auditors	33%
Risk (or ALM) Committee	17%
None of the above	0%
Don't know	0%

Table 26d: Level of Influence of Evaluation using a Probability Function Report

Of those companies doing this report,
percentage indicating this level of influence ……

No. of companies doing this report	6
High	17%
Medium	67%
Low	17%
Don't know	0%

Participants were asked to provide a brief description of the evaluation using probability function reports that they think are most effective. Only three companies have responded to this question, with hurricane modeling and probabilistic catastrophe studies specifically mentioned.

In similar fashion, there are very few responses regarding what companies may want out of their evaluation using probability function reports in the future and how they expect these reports to look in the future. The key to what companies would like in the future appears to be more relevant information and greater accuracy, with an expectation that reports will improve significantly and become more sophisticated as more knowledge is gained generally on the subject of operational risks and/or the technique of evaluation using a probability function in particular.

So far as data is concerned, only two responses were received, with both companies indicating that the data is generally "good."

4.4.2.3 Regression Analysis

As can be inferred from Table 23, only one participant company prepares a regression analysis on the risk variable report. In the interest of confidentiality, no further analysis is provided here on the report produced by that company.

4.4.2.4 Other Important Operational Risk Position Reports

As already discussed in the introduction to Section 4.3.2, only two participants indicate that an "other important operational risk position report" is produced, and very little description is provided on what these other reports are. One company mentions the use of stochastic economic projections, and that these projections are used for pricing and required capital decisions. Looking forward, both companies doing an "other" report expect turnaround time to shorten in the future, and expect modeling to change and improve as a better understanding is gained of the various types of operational risk. In general, data is on the poor side.

5. LOOKING FORWARD

This paper has investigated the state of risk position reporting in the insurance industry. It is clear that there are many areas of risks where the insurance industry is producing effective reports, which are actively used by risk management. On the other hand, there are clearly other areas of risk where reporting could be substantially improved. Although it was not apparent from this survey, a recent Tillinghast-Towers Perrin Survey on Enterprise Risk Management in the Insurance Industry[1], indicates that two of the biggest areas of dissatisfaction for insurers on the risk and capital management side is the inability to include operational risk in the determination of economic capital, and the limited capability to stochastically model important operational risks.

In addition to improving operational risk reporting, the industry should look forward to seeing future improvements in the preparation of reports which bring together all of the various risk exposures. Only 10 of the 44 survey participants indicate that they prepare a "Total Company Risk Exposure Report". Although relatively few appear to do this type of analysis, clearly this type of overall picture could be of much interest to top management, and this looks like an area where we would anticipate there being major developments in the years to come.

In conclusion, the authors would like to express thanks to the following who participated in the development of this research: the Project Oversight Group, chaired by Allan Brender, comprising Joe Buff, Tom Grondin, Max Rudolph, and Eric Thorlacius; Jim Merrill and Christine Coleman of Applied Market Research, Inc., who provided the electronic survey tool and helped compile results; John Foehl and Terry Freeman, who provided input to the authors on risk reporting in the banking sector; Herwig Kinzler, who provided input to the authors on risk reporting in Continental Europe; Andy Chua, Steve Hodges and Don Sanning who participated in the survey "beta test"; Jerry Miccolis who provided input on operational risks; Chandra Turk who assisted the research group; Tom Edwalds and Joanne Temperly at the Society of Actuaries; and Doug Doll and Dave Sandberg who provided valuable input to the process.

A list of all participant companies prepared to have their names disclosed as part of the survey is attached in Appendix 2.

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[1] Tillinghast-Towers Perrin, "Enterprise Risk Management in the Insurance Industry: 2000 Benchmarking Survey Report"

Appendix 1: Glossary of Analytical Terms

<u>ASSET RISK</u>

The questionnaire contains questions about the following analysis approaches with respect to asset risk.

<u>Duration</u>

The sensitivity of the price of an investment to shifts in the yield curve. For the purposes of this survey, duration analysis includes analysis of non-parallel shifts (e.g., key rate duration) and effective duration.

<u>Convexity</u>

The sensitivity of the duration of an investment to shifts in the yield curve.

<u>"The Greeks": Delta, Gamma, Rho, Theta, Vega</u>

In relation to derivative instruments, "the Greeks" refer to the theoretical sensitivity of the price of the derivative instrument to shifts in one of the following: change in the underlying security (delta), change in interest rate (rho), change in volatility (vega), change in time to expiration of contract (theta). "The Greeks" also include the sensitivity of delta to a change in the underlying security (gamma).

<u>Performance Measurement and Attribution</u>

Analysis of performance and of historical security behavior, to determine expected cash flow characteristics of the security type under different economic scenarios. An example of attribution analysis would be a study of the prepayment behavior of mortgage backed securities.

<u>Value at Risk</u>

The systematic measurement of the amount of money at risk over the portfolio, over a specific time period, with a specific probability.

<u>Liquidity</u>

The assessment of the ability to liquidate assets readily.

LIABILITY RISK

The questionnaire contains questions about the following analysis approaches with respect to liability risk.

Experience studies

Analysis of historical product experience, typically performed on the same basis that pricing assumptions are set, e.g., mortality, lapse, expenses, etc.

Embedded value added and variance analysis

Embedded value is a valuation of the liabilities computed as a present value of future distributable earnings. A change in embedded value represents the difference between two values at given points in time and variance analysis is the identification of what has contributed to this change (e.g., mortality, etc.).

ASSET-LIABILITY RISK

The questionnaire contains questions about the following analysis approaches with respect to asset-liability risk.

Analytical Model: (1) Stochastic scenario testing

Asset-liability analysis involving any process where projections are made on the basis of a stochastic process.

Analytical Model: (2) Deterministic scenario or stress testing

Asset-liability analysis involving any process where projections are made on the basis of specified scenarios defined by the user.

Mismatch Risk

This covers a number of important asset-liability mismatches:

- Cash flow mismatch (where the emerging cash flows on assets and liabilities are not entirely coincident)
- Duration mismatch
- Convexity mismatch
- Liquidity mismatch

Transfer Pricing

Intra-company reinsurance of risk from the product lines to a centralized risk function. For example, for interest rate risk, synthetic asset portfolios can be constructed with the same interest rate profile as the product liabilities. Actual

investment performance over and above that of the synthetic portfolio then gets allocated to the corporate function.

OPERATIONAL RISK

The questionnaire contains questions about the following analysis approaches with respect to operational risk.

Empirical evaluation based on historical data

Assessment using historical data only.

Evaluation using a probability function with analysis used to derive parameters

Assessment using a probability function.

Regression analysis on the risk variable

Assessment using regression analysis.

Influence diagrams

A form of structured decision making in which the structure of the problem is represented graphically as cause-effect relationships.

Delphi method

An approach to structuring group communication, ususally involving anonymity of responses, feedback to the group as collective views, and the opportunity for any respondent to modify and earlier judgement.

Appendix 2: Risk Position Reports Survey Participating Companies

P/C Insurance Only (10 Companies)
Arbella Insurance Group
Chubb Group of Insurance Companies
Co-Operators General Insurance Company
Insurance Corporation of British Columbia
MMIA
Selective Insurance Company

4 companies preferred their names not be disclosed

Life Insurance Only (10 Companies)
AmerUS Group
Knights of Columbus
Minnesota Mutual Companies
Mutual of Omaha Insurance Companies
Nationwide Financial Services
Royal and Sun Alliance Financial
Sentry Life Insurance Company
Southern Farm Bureau Life
UnumProvident

1 company preferred their name not be disclosed

All Others (24 Companies)
AEGON USA
Aid Association for Lutherans
Allmerica Financial
Allstate Financial
American Family Life Insurance Company
CENTRE
Clarica Life Insurance Company
Combined Insurance
Federated Mutual Group
Guardian Life Insurance Company of America
ING Investment Products Group
John Hancock Financial Services
MassMutual Financial Group
MetLife
New Jersey Manufacturers
New York Life
Protective Life Group
Security Benefit Group
Sun Life Assurance Company of Canada
Swiss Re Life & Health Canada

2 companies preferred their names not be disclosed

Appendix 3: Comparisons with banking industry

Although banks were not specifically covered by the survey, the Society of Actuaries working group believed it would be instructive to compare the results of the survey to risk position reporting practices in the banking industry. This section of the paper provides such a high level comparison, beginning with an overview of bank risks (Section 1) and then moving on to discussing specific bank risk position reports (Section 2). The appendix ends with some concluding thoughts (Section 3).

1. Overview of Bank Risks

The assets and liabilities of a banking institution have similarities to those of an insurer, but, from a risk reporting perspective, there are three notable differences in particular:

- the assets and liabilities of a bank are generally much shorter than those of an insurance company.

- the business of a bank is a much more transaction intensive environment (associated with cash lending and cash deposits) on a daily basis.

- a bank's assets and liabilities are financial assets (i.e., traded in financial markets), whereas an insurer's liabilities are, in the main, not traded at all. Therefore, it can be difficult to place a value on the liability profile of an insurance company.

These differences, in turn, means that the emphasis of risk measurement and monitoring, and hence reporting, is necessarily different.

In broad terms, the assets of a bank comprise loans and the liabilities comprise deposit accounts. On the assets side the single biggest risk is credit risk, akin to the "C-1 risk" faced by the insurers, while on the liabilities side the single biggest risk is that of liquidity in so much as the bank may not have the cash (or borrowing capacity) to meet large deposit withdrawals. Market risk also exists for banks with trading capabilities in the securities markets. Running across all of this, however, is operational risks which has manifested itself to a dramatic effect in the banking industry. For example, in the case of Barings Bank, a number of different operational risks (brought about by poor corporate and local office management, inappropriate trading activity, and a lack of differentiation between front and back offices) combined to bring about the downfall of one of the oldest and most respected financial institutions in the UK. Operational risks are becoming of increasing concern for the large multinational banks moving business away from traditional lending into broader capital markets.

Bank lending needs to be further sub-divided by commercial lending, either secured or unsecured, which is looked at on a transaction-by-transaction basis, and retail lending (or consumer credit), which is now underwritten largely on an automated basis (automation has recently begun to appear on the commercial lending side with small business owner loans). Loans with secure collateral, such as mortgage loans, have the least risk, with unsecured credit loans carrying the greatest risk. Clearly, the

critical consideration on the lending side, in order to mitigate credit risk, is the ability to underwrite a customer, on both a macro or micro basis, and this in turn is one of the most actively managed areas of a bank's activities.

Both the assets and liabilities are relatively short-term, notwithstanding those banks with large mortgage loans in their asset portfolios, certainly much shorter than the assets and liabilities of a typical insurance company. Moreover, it is the very essence of banking that these assets and liabilities be managed in tandem. The bank's treasury department is responsible for handling asset-liability management properly, often being called "the bank within the bank", reflective of its importance.

Under the Basel Accord, banks are required to hold capital of at least 8% of their risk-weighted assets, where risk-weighted assets include 100% of commercial loans, 50% of mortgages, 20% of interbank loans and 0% of government debt. However, within each category (e.g., commercial loans or mortgages) the regulatory capital requirement includes no allowance for differences in default risk. This means that loans to large corporations need the same level of capital as loans to individuals which, in turn, as Allan[1] et al note, may encourage high-risk lending. It is with this concern in mind, that a recent move away from "one size fits all" has been made in the banking industry to more of a true "economic capital" approach to setting capital. Under the Proposal for a New Basel Capital Accord[2], the Basel Committee on Banking Supervision places great emphasis on banks' own assessment of the risks to which they are exposed in the calculation of regulatory capital charges, including using an internal ratings-based approach to credit risk. An explicit capital charge for operational risk is also proposed.

2. Risk Position Reporting in the Banking Industry

It is clear that many of those risks to which an insurance operation is exposed are not applicable to a banking institution. Moreover, where there are similar risks, the emphasis for risk management is very different.

Looking at each of the areas of asset risk, liability risk, asset-liability risk and operational risk, the following presents some background on bank specific risk position reporting which in turn can be compared to practice in the insurance industry as determined from our survey.

- **Asset Risk Position Reporting**

  In general, the biggest risk faced by a bank on the assets side is credit risk. As a corollary to this, asset risk reporting in the banking industry in concentrated on credit risk reports, although it is important to note that within the industrial countries certain reporting is required by the regulatory bodies, specifically,

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[1] Allan, J.N., P.M. Booth, R.J. Verrall and D.E.P. Walsh, 1988. "The Management of Risks in Banking", British Actuarial Journal, Volume 4, Part IV.
[2] Bank for International Settlements, 2001. "The New Basel Capital Accord", Consultive Document, Issued for comment by 31 May 2001.

duration, liquidity and stress test reports. Looking specifically at each of the categories of asset risk analysis used in the survey:

− **Duration**

   While the duration of assets held by a bank are typically much shorter than those held by a typical insurer, the careful understanding and monitoring of asset and liability interest rate sensitivities are critical to the financial soundness of a bank. Thus, as would be expected, regular reporting and monitoring of asset duration (including key rate duration) is typical in the banking industry, and, as already indicated, duration reporting in the industrial countries is a requirement of the regulatory bodies.

− **Liquidity**

   The major issue for a bank on the liquidity side is the ability to have cash (or borrowing facilities) to meet large deposit withdrawals, similar to the concern for life insurers faced with a potential for high surrender or loan outgo. In this regard, banks will report and monitor on a daily basis its comparison of potential short-term cash needs on both the asset and liability sides of the balance sheet. Moreover, banks engage in the purchase and sale of excess liquidity through the Federal Funds market on a daily basis, which is monitored using credit risk metrics. Again, as already indicated, liquidity reporting in the industrial countries is a requirement of the regulatory bodies.

− **Convexity**

   The convexity of assets is also reported on and carefully monitored in the banking industry, reflective of the changing nature of the asset and liability sensitivities as interest rates go into an upward or downward spiral.

− **Performance measurement and attribution analysis**

   The "performance" of a particular asset, e.g., a particular loan, can be related to whether repayment instalments are paid in accordance with the loan conditions. For this reason the most relevant performance measurement and attribution reports are really more concerned with emerging credit experience, discussed below under Other Important Asset Risk Position Reports.

− **Value at Risk**

   While Value at Risk is a rather ill-defined term in the insurance industry, it has a very clear meaning in terms of "maximum loss" in a banking context, and has been important in the banking industry for a number of years. Under the Value at Risk approach for a bank, the aim is to determine the loss that

occurs at a particular extreme point probability level and this is then used as proxy for the maximum loss that could hit the bank over a short time frame. Value at Risk for a bank has more meaning than it does for an insurer because loss can be computed in terms of the cash that can be lost today: for an insurer, loss only has meaning in terms of a long-term projection.

Value at Risk reporting is commonplace in the banking industry, but tends to be supplemented or is tied in with asset-liability simulation (see below). In addition, it is tied in with the computation of Risk Adjusted Return on Capital ("RAROC"), a frequently used metric in the banking industry. RAROC creates a connection between risk and return figures and shows the relationship between return created and risk capital (e.g., expressed in Value at Risk terms).

– **Other Important Asset Risk Position Reports**

While credit risk reporting was mentioned occasionally by insurers in our survey, it is of utmost importance for any bank to be right on top of its credit experience.

As background to this, credit can be viewed as going through several stages of delinquency:

- "Past-due", with interest continuing to accrue
- "Non-accrual loans", where the loan has no interest accruing
- "Foreclosure," where the bank recognises the asset is non-performing and will attempt to call the collateral on the loan.

To help the bank's senior management get a handle on its credit experience, of critical importance is a "watch report" or some derivation thereof. This is a report which is monitored by either a credit committee and/or senior management and tracks changes in fundamentals of large loans and/or the concentration of loans. The report(s) look at deterioration in payment patterns, loans to collateral values, economic considerations, etc. The intent is to serve as early warning indicators for loans that might be going bad.

In addition to the watch report, another useful report is the charge-off report, which presents the sum of the estimated loan losses on non-accrual and foreclosed loans as a percentage of the total underlying portfolio. Such reports are a useful tool for appraising the emerging credit experience of the bank, and can enable the bank to take remedial action on the underwriting side where the experience looks to be deteriorating.

Specifically on the commercial side, there are a large number of "concentration reports" that are typically prepared. The most widely used of these is an analysis of lending concentrations by industry grouping (using the Standard Industrial Code, or SIC, classifications), recognising that

lending in some industries is riskier than others. Other type of concentration reports includes an analysis of loans by size and geography.

- **Liability Risk Position Reporting**

  On the liabilities side, the primary risk is that of withdrawals due to changing interest rates or the seasonality of demand deposits (primarily for commercial customers). The key analysis here is the gap between asset and liability cash flows. As a starting point, the bank will perform projections that look at the contractual cash flows on both the assets and liabilities under a variety of interest rate scenarios. This is covered in more detail under Asset-Liability Risk Position Reporting below. Again looking specifically at each of the categories of liability risk analysis used in the survey:

  - **Experience studies**

    All banks will report on and analyze the emerging withdrawal experience on a daily basis.

  - **Embedded Value Added and Variance Analysis**

    The concept of "embedded value" in a banking environment does not have the same meaning it does in the insurance industry. Indeed, to a bank embedded value added would typically mean the profits emerging each year. Thus, embedded value added and variance analysis is not believed to be used much, if at all, in the banking industry.

- **Asset-liability Risk Position Reporting**

  Asset-liability management and asset-liability risk reporting lies at the very heart of the operation of any banking organization. For some banks, asset-liability analysis and reporting may mean a full-blown stochastic interest rate scenario projection, while for others it may mean extensive stress-testing using a variety of deterministic scenarios. Either way, it is standard procedure, and as already indicated, required for regulatory reporting, for a bank to perform some projections under varying interest rate scenarios. The important difference here between an insurer and a bank is over the period of the projection - given the generally short-term nature of the bank's business, the projections will rarely extend beyond a few years. Again, looking specifically at each of the categories of asset-liability risk reporting used in the survey:

  - **Stochastic scenario testing**

    As indicated above, this is prevalent in the banking industry.

  - **Deterministic scenario or stress testing**

    As indicated above, this is prevalent in the banking industry.

– **Mismatch risk**

From previous sections in this appendix, it will be apparent that mismatch risk reporting as various levels is commonplace in the banking industry, particularly as far as duration and convexity are concerned, and also with regard to short-term cash needs. The most common and well-known report is a "gap analysis", showing the gap between asset and liability cash flows over a period (usually no more than 10 years).

- **Operational Risk Position Reporting**

The main form of operational risk for banks is the risk related to the cash transaction intensive environment in which the bank does business, primarily interparty risks arising from electronic cash transactions). The ability of the bank to clear cash transactions quickly is key. A delay of a day in clearing a major transaction can have a huge impact on a bank. Hence, the key operational risks are tied in with all the underlying technology that supports efficient clearing. Any down-time or failure in systems (e.g., mis-postings leading to a loss) can therefore pose a potential operational risk for the bank. On the other hand, more efficient systems, for example, in being able to better detect fraud and forgery, can represent an opportunity for the bank to minimise risk in this area. Operational risk is also embedded in many of the new fee-based services and products that banks are offering (e.g., credit cards where theft of customer information has become a major issue).

In the light of the above, so far as operational risk reporting is concerned, banks look at reports on how quickly they are turning cash around on a daily basis. However, the usage of methods such as the Delphi Method to get to some of the other operational risks is not commonplace.

3. Concluding thoughts

It should be apparent from the preceding discussions that the realities of banking compared to insurance is in much shorter durations on both sides of the balance sheet, plus, by necessity, more active asset-liability management. One other important difference relevant to risk management, hinted at in the opening to this appendix, should be mentioned at this stage: the banks enjoy the luxury of having an active secondary market for virtually everything they do. This means that a bank can sell a product and entirely take the risk off the balance sheet straight away in the secondary markets. As a corollary to this, this means asset-liability management for banks is easier because both sides of the balance sheet are financial assets and can be hedged and liquidated easily. While securitization in the insurance industry has been used more extensively in recent years, there is still some way to go to get to the sophisticated secondary markets of the banking industry. Clearly, developments in this area in the future could have a profound impact on insurance company risk management and risk reporting practices in years to come.

Appendix 4: Perspectives from Continental Europe

While the survey focused specifically on practices in North America, the Society of Actuaries working group believed it would be instructive to compare the results of the survey to risk position reporting practices of insurers elsewhere in the world. For this purpose, reference has been made to a recent survey of asset-liability management practices in Continental Europe performed by Tillinghast-Towers Perrin[1]. Life insurance products in North American and Continental Europe are broadly similar in structure, so it was felt that such a comparison of risk reporting practices would be useful. The Continental European survey targeted major life insurers in Belgium, France, Germany, Italy, the Netherlands, Spain and Switzerland. This section of the paper is structured in four parts: modeled risks (Section 1), analytical methods (Section 2), relevance of risk position analyses for senior management (Section 3), and trends after completion of the Tillinghast – Towers Perrin survey (Section 4).

1. Modeled Risks

Participants in the survey were asked which investment risks they consider in their asset-liability models and the ways in which modeled risks are treated. They had four categories to choose from: not modeled, deterministic, fixed function of a stochastic variable and true independent stochastic.
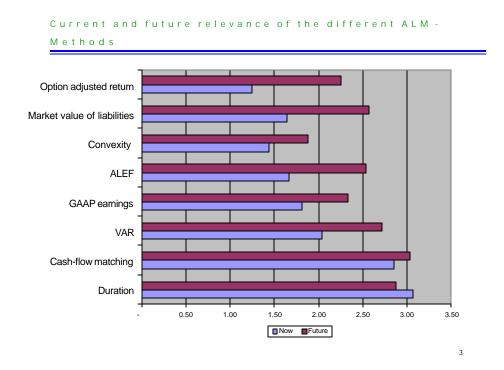
In Europe, deterministic modeling of interest rates and stock prices is being increasingly replaced by stochastic modeling. Companies rarely model foreign exchange rates and other asset classes stochastically. Surprisingly, in most cases, companies exclude defaults and prepayment rates, which in turn could lead to analyses where the dynamics of the asset-liability and risk-return relationships are not properly reflected.

Operational risks are generally not modeled, despite this being a serious area of risk facing life insurers in Continental Europe. In similar fashion to North America, this looks like an area where there is much scope for improvement in the years to come.

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[1] Kinzler, Herwig and Theo Berg, ALM Invades Continental Europe, Emphasis (a Tillinghast-Towers Perrin publication), Fourth Quarter 2000

2. Analytical Methods

The chart below shows the relative importance of various analytical methods in Continental Europe (the higher the value, the more relevant the analytical method). Two metrics stand out among the survey responses: cash flow matching (performed by 63% of respondents), and modified duration (54%). The chart shows not only the relative importance of current analytical methods and metrics but also the anticipated change in relative importance in the future.

Current and future relevance of the different ALM - Methods

3

3. Relevance of risk position analyses for senior management

Cash-flow and duration matching are the metrics of most interest to CEOs. They are also the most popular methods used. More complex metrics seem less relevant at this time. Convexity and option-adjusted analysis are less favorably regarded by CEOs compared to their expected relevance.

The dominance of bancassurance in some European countries helps to explain the relatively high ranking of Value at Risk analyses. While Value at Risk, as a methodology to measure short-term banking risk, may not be applicable in the risk management environment of insurers, insurers could benefit by adapting the concept to fit insurance needs. At this time it is not believed that Continental European insurers are specifically adapting Value at Risk measures to be relevant, and, being used more as a tool to measure short-term asset risk, is therefore not seen to be particularly helpful for enterprise risk management purposes for insurers.

4. Trends after completion of the study

The Tillinghast – Towers Perrin survey of Continental European practices was performed at the end of 1999. With European-wide low interest rates and risky (volatile) stock markets in year 2000, the environment increased dramatically the need for proper risk position analyses for senior management. The requirements for a more sophisticated risk position risk position analyses has required, amongst others:

- An integrated, consistent approach to asset-liability management for life and non-life business

- Development of insurance-relevant risk metrics, such as the Asset-Liability Efficient Frontier

- Separation of the asset management function, by way of insurers setting up insurance-owned fund management companies which manage the group's and third party assets. This requires professional benchmark setting.

- A trend from actuary-driven asset-liability management to strategic-orientated asset-liability management, with senior management and asset managers being increasingly involved.

- Asset-liability projects with consistent cross-European methodologies are becoming increasingly important.