

The State of the Art—and Science— of Risk Position Reporting

IN LATE 1999, THE SOCIETY OF ACTUARIES' FINANCE PRACTICE AREA set up a group to investigate the state of risk position reporting in the North American insurance industry. The investigation was to focus on the measurement and monitoring stages of the risk management process. Central to the investigation was an extensive survey of life and property/casualty insurers in North America, a major undertaking that took well over a year from start to finish.

The survey consisted of a detailed electronic questionnaire (accompanied by various hard-copy documents as a guide) that was mailed to 164 insurance companies in the United States, Canada, and Bermuda. The survey response rate was high given the large size of the questionnaire. Of the 164 companies solicited, 44 responded, with a good spread of responses by life versus property/casualty companies. The results of the survey essentially describe industry practice in risk position reporting. But the survey also indicates areas for potential improvements in reporting and hints at how such improvements could be made.

What Are Risk Position Reports?

Risk position reporting is effectively a way to quantify the risk inherent in an insurance operation at any point in time, and make it known to various parties interested in the financial operations of the firm.

The interested parties are numerous, including company management, shareholders, policyholders, regulators, rating agencies, auditors, and stock analysts. Clearly, any one report is unlikely to fit the requirements of all, and for this reason insurance companies tend to produce a very wide variety of reports.

Risk position reports can be categorized into four areas of risk:

- **ASSET RISK**—includes market risk (i.e., exposure to market value movements), credit risk, and concentration risk;

- **LIABILITY RISK**—includes claims cost risk (e.g., mortality, morbidity, persistency), expense overrun risk, and failure of reinsurance risk;

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- **ASSET-LIABILITY RISK**—includes cash flow mismatch risk, duration/convexity mismatch risk, liquidity mismatch risk, and currency mismatch risk; and

- **OPERATIONAL RISK**—includes event risk, people risk, technology risk, distribution risk, and catastrophe risk.

What type of reporting do North American insurers perform under each risk category? How effective are these reports in identifying the risks in the business? Who uses these reports? How much do the reports really influence business decisions? These are the types of questions posed in this survey.

Asset Risk Position Reports

Most companies prepare at least a few asset risk reports, because both market risks and credit risks represent significant exposure for most insurers. Life companies in particular consider these asset risks to be very material, as a result of holding high proportions of mortgage-backed securities, and the need to sometimes go into relatively lower grade bonds in order to pick up yield and be competitive in asset-sensitive product areas.

Reports assessing duration/convexity and liquidity are commonplace. Duration/convexity reports are considered particularly effective for the fixed interest securities portfolio, and are often better understood than newer concepts such as Value at Risk. Moreover, the most effective duration/convexity reports are those that consider both the assets and liabilities together (see below under asset-liability risk position reports). Along similar lines, the most effective asset liquidity



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reports are those that link the assets and liabilities, e.g., liquidity provided by assets less the liquidity required by liabilities under various scenarios.

Also important for assessing the asset risk/reward position are performance measurement and attribution analysis reports—again, commonplace among the companies surveyed. These are generally split between those that use “total return” and those that use “yield” as the basic performance metric, and typically involve comparison with a liability-driven benchmark. Performance is often measured at a very detailed level—by individual traders, for example. Some sophisticated analyses (e.g., tests on the effect of adverse scenarios on the return on equity) are also performed by some companies.

Value at Risk (VAR) reports aren’t as widely used as other asset risk position reports, partly because the concept is still new and not widely understood, and partly because it ignores the liabilities. However, VAR has become of increasing interest of late (particularly for property and casualty companies).

Reports on “The Greeks” (i.e., the option pricing indicators *theta*, *delta*, *rho*, *gamma*, *vega*), assessing the risk exposure of a derivatives portfolio, are surprisingly not mentioned by many companies. This may reflect a relatively low usage of derivatives in the insurance industry, or may simply be a failing in the survey process. The individuals participating may not have been aware of the full extent of reporting performed by the investment department. For those companies indicating that they do report on the Greeks, generally these reports are not very detailed, and are of low to medium influence in the decision-making process.

Liability Risk Position Reports

Unexpected claim costs and reserve/pricing inadequacies can quickly destroy the profitability of a line of business, or even an entire company. These 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. Of course, this means that failure of reinsurance is also a potential risk. The reader should bear in mind that the survey was completed in fall 2000 and therefore doesn’t reflect recent changes to risk exposures due to terrorist activity in North America.

The materiality of liability risks has brought about the development of tools to analyze these risks, and most companies prepare a variety of liability risk position reports.

Not surprisingly, experience studies are commonly used to track mortality, morbidity, expenses, and termination rates (e.g., lapse, surrender, and not-taken rates) by almost all the respondents to the survey. The most effective experience studies relate to mortality, lapses, and expenses for life insurers, and loss ratios for property and casualty companies.

In recent years, insurance companies have also begun to use *embedded value added* as a tool for measuring the growth in a company’s value. Although these reports are being added at many North American insurers and are a very useful addition to a company’s management reports, embedded value added reports are created by only around 30 percent of the survey’s respondents.

Embedded value added itself doesn’t serve as a tool for monitoring changes in individual liability risks. However, an extension of the embedded value added process is to perform variance analysis on the individual risk elements by product. This additional step allows the company to understand how each risk element has contributed to the overall change in value, and can be a very useful risk analysis tool.

Asset-Liability Risk Position Reports

Mismatch risk can represent a significant exposure for certain product lines, espe-

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cially those with inherent optionality. Despite this, most participants in the survey consider mismatch risk to be of only low to medium materiality. By the nature of their business, life insurers attach higher importance to mismatch risk than do property and casualty companies.

Surprisingly, around 20 percent of respondents indicate that they don't perform any asset-liability risk position reports. Of those that do report on asset-liability risk positions, most perform mismatch risk reports. Most life insurers do some form of deterministic or stochastic scenario testing, and a few prepare transfer pricing reports.

For many companies, the most effective asset-liability risk reports are those that assess the level of duration and convexity mismatch. Cash-flow mismatch risk reports are also important, especially when split by product line, operating division, or asset portfolio.

As might be expected, for many companies, deterministic scenario testing is primarily performed for purposes of meeting the prescribed regulatory requirements, i.e., U.S. statutory asset adequacy testing, and for Canadian companies, Dynamic Capital Adequacy Testing ("DCAT"). A number of companies use deterministic scenario testing for purposes beyond regulatory requirements, primarily stress-testing increased lapse, mortality, morbidity, expense, and prepayment assumptions.

Stochastic scenario tests are used primarily to compute portfolio duration and convexity or to develop an efficient frontier. Other uses mentioned include the averaging of future return on equity across many scenarios, the identification of risk drivers, and a focus on result distributions rather than best estimates.

Operational Risk Position Reports

Respondents to the survey rate the materiality of operational risks as highly as financial risks. Of the many types of operational risk, the most material are those relating to adverse events (such as political developments, tax changes, changes in regulation), the loss of key personnel,

technology risk, and risks relating to insufficient volumes of business.

It's surprising, then, that despite the materiality of these risks, only around 40 percent of respondents do any operational risk reporting, even at an overall corporate level. Only 10 percent of the life companies surveyed prepare any operational risk reports, compared to around 60 percent of property and casualty companies and around 40 percent of composites. This

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indicates that the insurance industry as a whole—particularly life insurers—has much room for improvement in the field of operational risk reporting. The events of Sept. 11, 2001, will likely have a strong impact on developments in this area.

Most of the companies that do operational risk reporting base their reports on an empirical evaluation of past data. Some use a probability function with an analysis to derive the parameters, and a few perform regression analysis. Even these reports are rarely performed more than once a year.

As expected, the most effective reports are those that assess the vulnerability to, and likely changes in, customer choice of distribution channel, and catastrophic risk. Hurricane studies and other catastrophic risk reports are usually performed using stochastic modeling techniques.

The Way Forward

Clearly, there are many areas of risks where the insurance industry is producing effective reports that are actively used to manage risk. Both asset risk reports and liability risk reports are generally quite well developed. On the other hand, there are clearly other areas of risk where reporting could be substantially improved, especially operational risk.

In addition to improving operational

risk reporting, the industry should look forward to seeing future improvements in the preparation of reports that bring together all the various risk exposures with a holistic view. Only 25 percent of the 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.

■ **ASSET RISK POSITION REPORTS.** In general, reports on asset duration/convexity, liquidity, and performance measurement are seen as mature technologies, with no real need for improvement. Perhaps in future they may show greater frequency, shorter turnaround time, longer time horizons, and more detail. But in general, most respondents are neither hoping for nor anticipating any changes.

It appears that the emerging techniques in asset risk position reporting are VAR and the Greeks. The most important change expected in these reports is that they will become more comparable with liabilities, so that mismatches can be assessed. Most of the respondents to the survey also indicate a desire for greater understanding of potential outcomes from their VAR reports, leading to strategies that are easier to implement. These reports are expected to become more robust, more sophisticated, more rigorous, and less costly as they're more widely used and accepted in the industry.

■ **LIABILITY RISK POSITION REPORTS.** Respondents appear to be generally happy with their experience study reports, with some indicating that they might want them to be a little more timely and granular. In the future, respondents expect less focus

on data collection and more on analysis, leading to more detailed, quicker, and more frequent reports. Some suggestions on how this might be achieved are the use of on-line reports with industrywide access, or data warehouses for the sharing of experience studies.

A liability risk assessment technique with more room for improvement is embedded value added. Embedded value added reports are expected to be more widely used in future to indicate profit drivers, and gain better understanding of risk/reward trade-offs. Companies indicate that in the future they would like to use their embedded value-added reports to monitor and explain changes in embedded value, as well as aid in making strategic decisions.

■ **ASSET-LIABILITY RISK POSITION REPORTS.** From their stochastic scenario tests, many companies indicate that they would like to see quicker turnaround times, more robust models and a more timely assessment of risk and profit emergence in future. These reports should help management to better identify key drivers and gain a better understanding of the interactions between risks. Expectations are that more lines of business will be modeled, and mortality, morbidity, default and equity factors will be added to models. It's also expected that future models will allow for varying levels of new business and be more automated.

Some companies indicate that in the future they would like their deterministic scenario test reports to coordinate and support their overall corporate financial plan. They expect a move toward the more sophisticated stochastic scenario methods. Where deterministic methods are expected to be used in future, they'll most likely be more efficient and more closely tied to business initiatives and plans. They're expected to incorporate more stress testing and more sophisticated techniques for selecting tail risk scenarios.

Respondents indicate that they'd like more scenario analysis from their mismatch risk reports in the future, as well as the ability to attach a dollar value to the risk. In the future, companies expect mismatch risk reports to include im-

proved stochastic drivers and be more robust and sophisticated. As companies become more comfortable with them, mismatch risks are expected to be extended to more product lines.

■ **OPERATIONAL RISK REPORTS.** As indicated earlier, the insurance industry seems to be lacking effective tools for the assessment of operational risks. A recent Tillinghast-Towers Perrin survey ("Enterprise Risk Management in the Insurance Industry: 2000 Benchmarking Survey Report") indicates that two of the biggest areas of dissatisfaction for insurers on the risk and capital management side are the inability to include operational risk in the determination of economic capital and the limited capability to stochastically model important operational risks. In the future, it's hoped that existing techniques will be improved and new reports developed that accurately measure operational risk.

In general, empirical evaluation reports appear to have gone as far as they can,

and companies don't expect much improvement in future.

From their evaluation using probability function reports, companies would like to see more relevant information and greater accuracy. These reports are expected to improve significantly and become more sophisticated in the future as they gain more knowledge of operational risks and the technique of evaluation using a probability function.

Useful management tools used in other industries to measure operational risks are influence diagrams and management surveys, including the Delphi method. Despite the value these reports can add in terms of assessing business risk, they don't seem to be common in the insurance industry. Perhaps an area of improvement for insurers might be to investigate these and other methods, or even develop some of their own techniques to gain better insight into the level of operational risk in the company.

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