

Emerging Risks Survey

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Fourth Risk Manager Survey of Emerging Risks

Some risks generate a large volume of historical data that remains stable over time. Other risks are evolving in uncertain ways, have been forgotten in their dormancy, or are new. These latter risks are called emerging risks. While stable risks can usually be represented by a statistical distribution, emerging risks typically do not have a known distribution.

In a competitive market, business opportunities often go to those who mistakenly ignore significant risks. Risk managers who recognize a risk before others can encounter several downsides. Rather than enjoying the immediate benefits of a lucrative investment that may, however, be doomed in the long run, their organizations may, on the other hand, do poorly in the short-term and not survive long enough for a hedge to pay off. An example occurred during the recent financial crisis in the pricing of credit default swaps for collateralized debt obligations. Some investors recognized the risk but their options were too short-lived. Others avoided this asset class and lost sales to others. This is a challenge for those who are first to recognize a problem through their environmental scanning for emerging risks.

When working with contingent events where cash flows occur many years out, clearly there will be risks that were not considered when the decision was made to accept the initial risk. For example, consider a product manager in 1990 looking at risks internationally. Should earthquake risk be considered? Yes, it generally is known if earthquakes have previously occurred in a particular location. How about fresh water shortages? Climate change? Pandemics? Asbestos? The answers to these questions are tougher. The risk manager must also consider these risks across an uncertain political environment. To do this a risk manager must be creative and able to communicate to a skeptical audience. While feature films and documentaries can invoke ancient Mayan calendars and the quatrains of Nostradamus, seeking to convince senior management with such prediction tools is unlikely to enhance a risk manager's credibility. Some companies seem to avoid the pitfalls of emerging risks better than others. Survivor bias makes it hard to know with certainty whether this is due to luck or skill.

This survey attempts to track the thoughts of risk managers about emerging risks across time. This is the fourth survey conducted by the Casualty Actuarial Society, Canadian Institute of Actuaries, and Society of Actuaries' Joint Risk Management Section on this topic. It demonstrates that trends are as important as absolute responses. The trends described herein can aid risk managers as they contemplate individual risks, combinations of risks, and unintended consequences of actions. The survey responses and summarized results also provide a tool for risk managers to network with peers and identify new ways to think about risk. To further clarify the responses, numerous opportunities were provided within the survey to comment beyond the specific questions posed.

Risk managers have recently encountered many risks that the markets did not anticipate. Many were financial risks, but others include hurricanes, data security and pandemics. There is currently an upsurge in management's willingness to listen to risk managers.

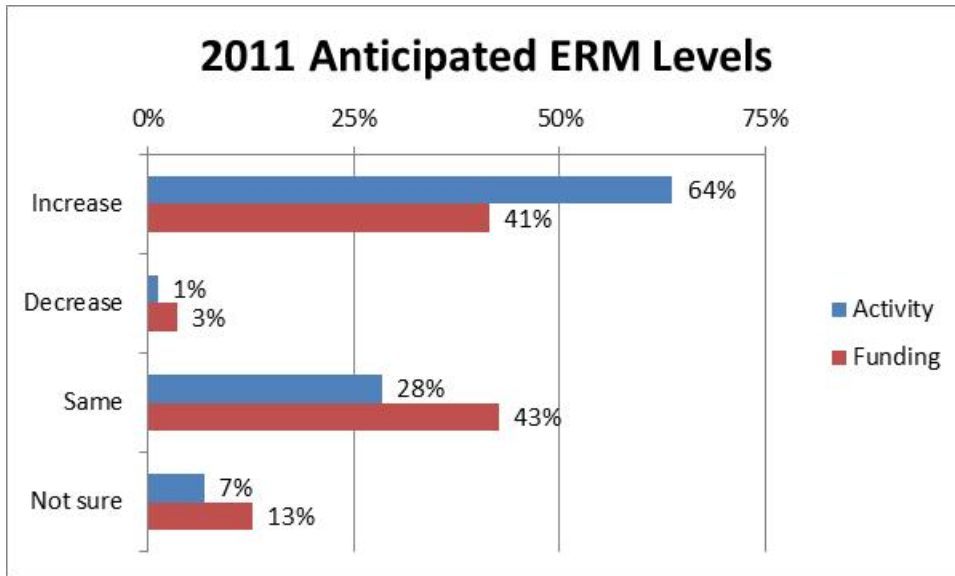
Long-term it is unclear if enterprise risk management (ERM) will consistently become part of the strategic decision making process. Many firms (and individuals) had no game plan in place to address the recent financial crisis. As Nassim Taleb has stated, a Black Swan is something no one predicted in advance but everyone predicted and understands after the fact. A goal of risk management is to evolve toward actionable leading indicators and improve decision making. In reality, very few were prepared for the extent of the impact on a wide range of financial instruments, but those with minimal leverage and long-term asset allocation strategies have had relatively better results. Some even profited by identifying emerging risks early, creating a competitive advantage for themselves. Good risk management practices help prepare a firm to succeed across a variety of potential scenarios with focus on both mitigation and optimization.

Executive Summary

The recent financial crisis highlighted the risks of a herd mentality. When everyone has similar training, uses the same models, and deals with risk in the same way this exposes groups, industries, or even the world economy to unintended consequences. Contrarian thinkers are not always right, but adding their thoughts into a conversation encourages better decisions to be made.

The field of behavioral finance describes as anchoring the tendency to let recent events dominate our thinking about potential events. Previous survey reports discussed the impact on results when the Mumbai terrorist attacks occurred while the survey instrument was open (Fall 2008). Prior to that event few had chosen *International terrorism* as one of the top 5 emerging risks, but post event each of the remaining surveys listed it and several noted it as the top overall emerging risk. We continue to be anchored by recent events, but awareness of this tendency can hopefully help us to understand it better. In this year's survey an initial question asked respondents to choose the top current risk and be aware that this response might act as an anchor for their responses later in the survey.

2010 proved to be a pivotal year for risk managers. Most organizations increased both their risk management activities and staff. Several white papers have been written on the topic. Donald Rumsfeld, he of Unknown Unknowns fame described in an earlier research report, released his memoirs. Are these activities and resources now the norm, or leading indicators that portray risk management as a fad, doomed to fade away as the economy improves? Survey results show continued higher ERM activity expected in 2011 but fewer resource increases than in 2010.



Stable environments can lead to excessive risk taking, while volatility leads to fear and paralysis. Better decision making comes from recognizing that many risks cycle over time. A strong risk culture empowers flexibility, and companies that embrace it will succeed over long time horizons. Along these lines, 77% of risk managers surveyed stated that predicting the future was part of their job in terms of potential events and building out the flexibility to address those events if they occur.

Anchoring

Since the previous iteration of this survey in 2009, a number of risks have been realized or highlighted. Severe earthquakes were felt in Haiti, Chile and New Zealand. In Iceland a volcano erupted, impacting air travel and transport for weeks. The oil spill in the Gulf of Mexico was the top news story for months, overshadowing floods in Central Europe, wildfires in Russia and flooding in Pakistan. Mother Nature was not the only one capable of generating risk events in 2010, as the European debt crisis widened and tensions erupted on the Korean peninsula.

With these events as a backdrop to anchor results, there were definite shifts in the 2010 results. The Economic category of risks is still a clear top choice ahead of the Environmental, Geopolitical, Societal and Technological categories. Yet it also shows that as time passes from the financial crisis, its dominance decreases. Finishing a strong number two, Geopolitical risks increased due to rising political tensions around the world.

As in past reports, the survey results show that current values of the S&P 500, a barrel of oil, and the U.S. dollar relative to the Euro seem to anchor perceptions of risk. The survey results have evolved over time, generally following the current environment. Only economic factors are shown here in Table 1, and the researcher would be interested in suggestions about how to track current exposures of other risks.

	S&P 500	Oil (per barrel)	USD/Euro
Spring 2008	1,385.59	\$ 113.70	\$ 1.56
Fall 2008	968.75	68.10	1.27
Fall 2009	1,106.41	77.04	1.48
Fall 2010	1,176.19	84.49	1.40

Table 1

The initial survey was released to the INARM group (International Network of Actuarial Risk Managers) in April 2008. When this survey was completed, the S&P 500 stood at 1,385.59 (according to Yahoo Finance), the price of a barrel of oil was \$113.70 (Energy Information Administration at <http://tonto.eia.doe.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=WEPCBRENT&f=W>) and one Euro cost \$1.56 (http://www.federalreserve.gov/releases/h10/Hist/dat00_eu.htm). Oil was priced relatively high, the stock markets were at record levels, and the dollar had trended down. At that time the top four emerging risks chosen were

1. *Oil shock* (57% of respondents)
- 2T. *Climate change* (40%)
- 2T. *Blow up in asset prices* (40%)
4. *Fall in value of US \$* (38%)

With oil at historic highs it was the predominant emerging risk chosen. The second survey was issued in early November 2008, so rates are compared at the end of October. At that time, using the same sources, the S&P 500 had dropped 30%, the price of a barrel of oil had decreased 40%, and the U.S. dollar had strengthened 23%. The top four emerging risks from this second iteration of the survey were

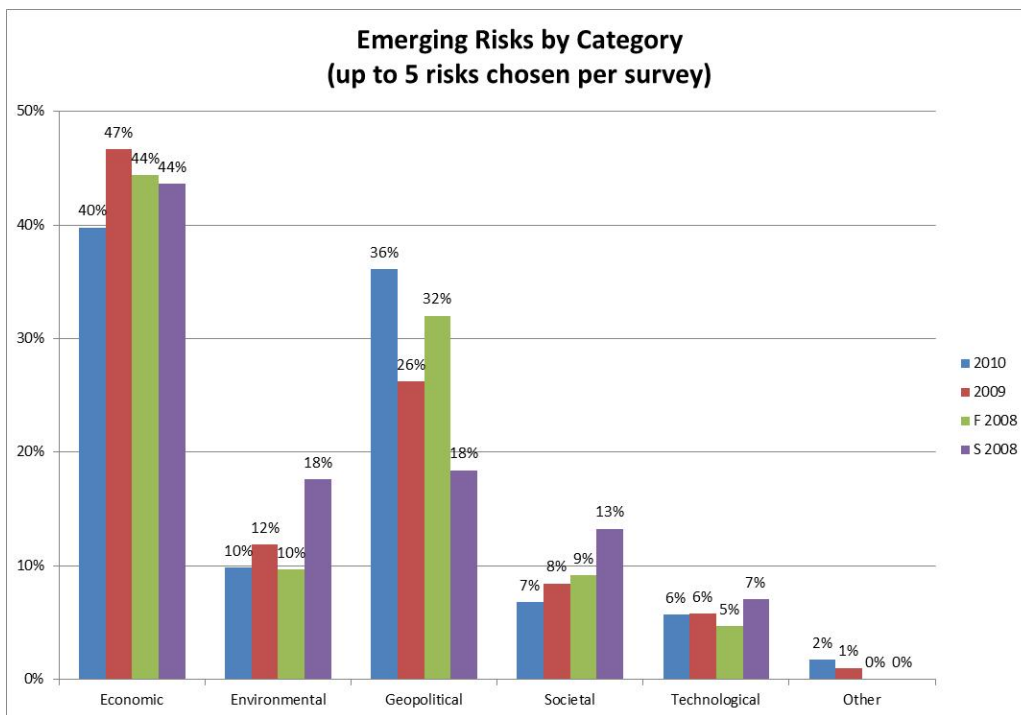
1. *Blow up in asset prices* (64%)
2. *Fall in value of US \$* (48%)
3. *Oil price shock* (39%)
4. *Regional instability* (34%)

Systemic risk was perceived to be very high at this time with stock values in free fall. Oil prices had fallen quite a bit, U.S. currency was considered a safe harbor and the U.S. election cycle had just ended with Barack Obama voted in as the new President. The previous survey to this one was issued in early December 2009, so rates are compared with those at November month end. At that time, using the same sources and comparing against the previous survey date, the S&P 500 had increased 14%, the price of a barrel of oil had increased 13%, and the U.S. dollar had weakened 17%. The top four emerging risks from this third iteration of the survey are

1. *Fall in value of US \$* (66%)
2. *Blow up in asset prices* (49%)
3. *Oil price shock* (45%)
4. *Chinese economic hard landing* (33%)

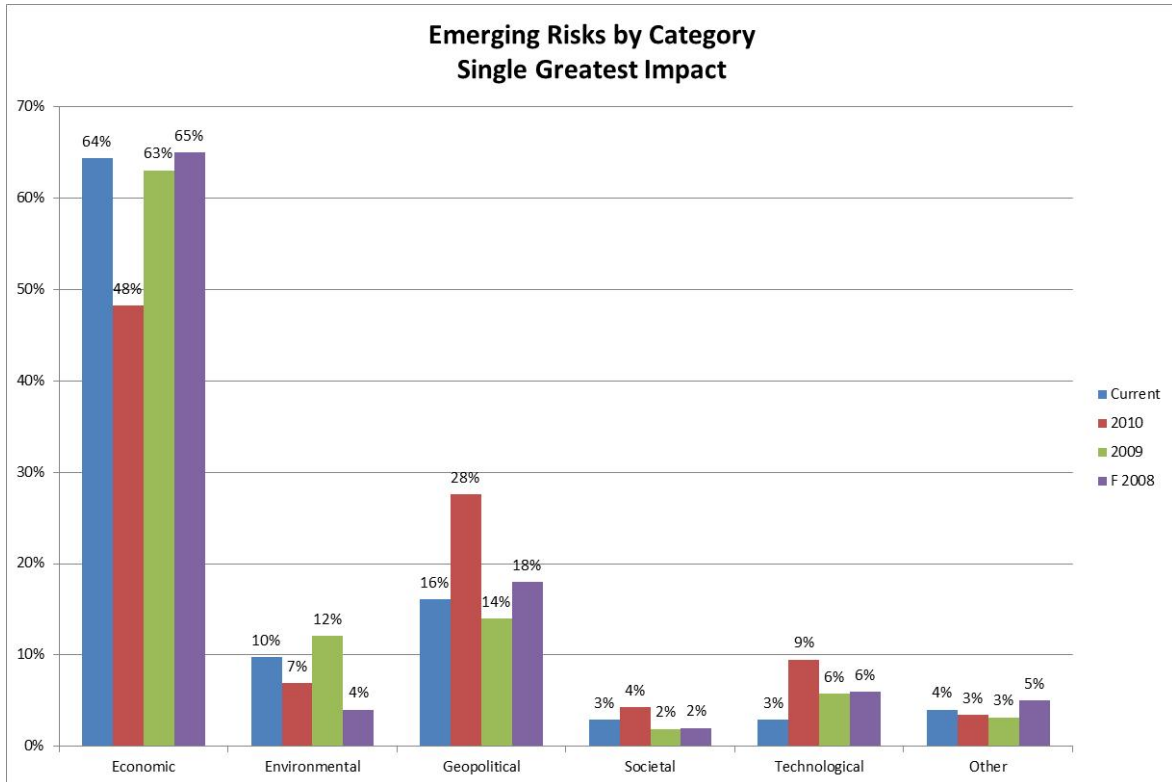
In the current survey, opened in mid-October 2010 (data compiled as of October 15), the indicators had not changed materially from the previous survey. The stock market was up 6%, oil was up 10% and the dollar had further strengthened by 6%. Most of the top 5 results continue to come from the Economic category. Over this short period of time *Climate change* has dropped from 40% to 25% of the responses. This could be due to risk managers no longer feeling it is an emerging risk, or it could be due to reduced media coverage.

1. *Fall in value of US \$ (49%)*
2. *International terrorism (43%)*
3. *Chinese economic hard landing (41%)*
4. *Oil price shock (40%)*
5. *Failed and failing states (38%)*



Concerns about China continue to increase, and the Geopolitical categories are moving up into the risk managers' collective consciousness with two risks in the top 5. Even more strongly, when asked for their overall top emerging risk, *Chinese economic hard landing* completed its ascension to the top ranking, increasing from 4% in the prior survey to 14% this year.

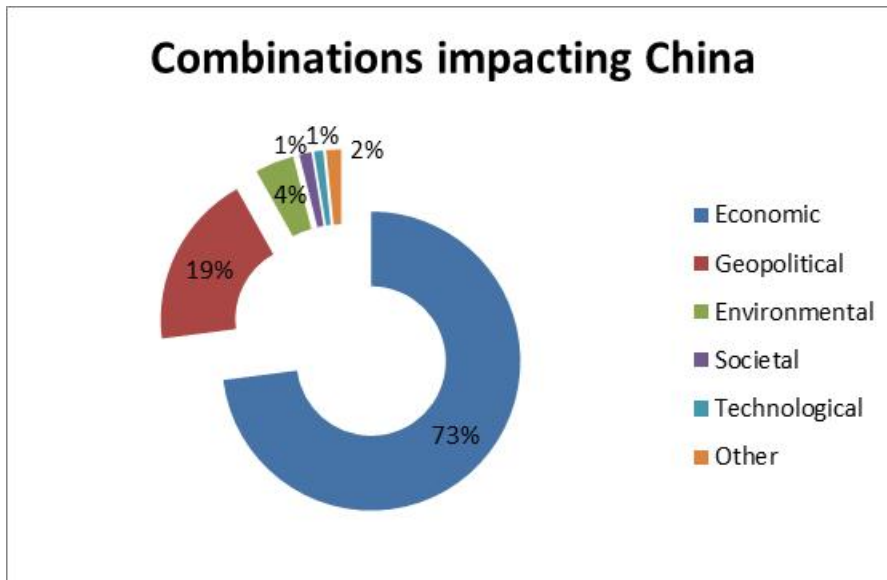
1. *Chinese economic hard landing (14%)*
2. *Fall in value of US \$ (11%)*
3. *Blow up in asset prices (10%)*
- 4T. *Breakdown of critical information infrastructure (CII) (9%)*
- 4T. *Oil price shock (9%)*



The four surveys were conducted in periods that have each had unique characteristics that drove results. The perceived financial systemic risk continues to recede, replaced by risks of geopolitical instability.

One question each year deals with a combination of risks surrounding a topical issue. Previous questions have addressed regional food shortages and political instability, and each has since proven to be timely topics. In this survey China's financial relationship with the world was explored. Respondents were asked to consider primarily changes in currency, commercial and investment relationships. Respondents were asked to include up to three risks. Results focused on Economic risks, with almost three-quarters of the risks chosen from that category.

1. 73% Economic
2. 19% Geopolitical
3. 4% Environmental
4. 1% Societal
5. 1% Technological



The top 2 specific risks chosen were almost a dead heat, with *Fall in value of US \$* (24%) and *Chinese economic hard landing* (23%). Rounding out the top 5 were *Oil price shock*, *Retrenchment from globalization*, and *Blow up in asset prices*.

Leading Indicators

Enterprise risk management (ERM) views risks holistically as they are managed across an entity. Emerging risks are a subset of ERM, dealing with new as well as evolving risks where historical data is incomplete. An approach used to manage risks and make better (and earlier) decisions factors in leading indicators. As companies implement an ERM process, many are creating metrics around key performance indicators. These are designed to help make better decisions. A lagging indicator uses information collected after a decision is made, such as the number of auto policies in force or widgets sold. A leading indicator provides information earlier in the process. Examples would include insurance applications being much higher/lower than expected or a spike in the credit default spread for a supplier. Over half the respondents reported having at least some leading indicators around emerging risks. These efforts continue to improve. While one risk manager said that their efforts were still “seat of the pants”, leading indicators will continue to be an important part of emerging risks research.

Enterprise risk management means different things to different people. For some the focus is on compliance related issues and downside risk. For others ERM incorporates opportunities and strategic planning along with constraints. An open ended question focusing on how risk managers were using ERM to find opportunities generated comments about finding mispriced assets, searching for hedging opportunities, and tracking events that would stress competitor results and provide relative advantages for their organization.

ERM consists of a balance of qualitative and quantitative analysis. Risk managers in this survey reported that their models continue to get more sophisticated, with specific

improvements to better measure extreme results and provide more detail, as well as incorporate more common sense and imagination into their analysis. Qualitative analysis seeking to improve decision making included scenario planning and building strategic objectives. Some risk managers stressed the importance of avoiding certain risks being just as important as the accepted risks.

Conclusions

As this report is being written some countries in North Africa and the Middle East have erupted in a people's revolt against the current regimes, Australia has experienced severe flooding, and New Zealand suffered another earthquake. As the report was being finalized Japan suffered one of the most devastating earthquakes on record, generating large losses of life and property and reminding the world of its fragility. Risk managers are human and may suffer from the flaws of anchoring. The world Geopolitical risk is rising, and that impacted the current survey. At some point disease or global warming may become more prevalent and dominate a list of emerging risks. By being vigilant and using leading indicators, organizations can better deal with these challenges.

Risk management is a process. While standardized measurement tools are developed for specific risks, allowing a range of viewpoints to participate in the risk discussion, constantly questioning methods and scanning for emerging risks will create an environment where an organization maintains a competitive advantage. As this survey adds data points, it will be interesting to see what new information can be obtained from trending the rich viewpoints of risk managers.

Background

This research project was funded by the Joint Risk Management Section of the Society of Actuaries, Canadian Institute of Actuaries, and Casualty Actuarial Society. A survey was developed and made available through an email link to members of the Joint Risk Management Section. Others were invited to participate utilizing the INARM list serve and Linked-in groups related to risk management. A total of 141 responses were received. This represents greater than 5% of completed surveys relative to the number distributed (over 2,500 to JRMS) and is comparable to previous research. This is the fourth survey completed. Many questions have been consistent and are generating lengthening trends. The previous surveys were distributed in April 2008, November 2008 and December 2009. For background, articles and the research itself can be found at

April 2008

- Article: pages 18-21 of the International News August 2008 issue <http://soa.org/library/newsletters/international-section-news/2008/august/isn-2008-iss45.pdf>
- Article (reprint): pages 17-20 of the Joint Risk Management Section March 2009 newsletter <http://soa.org/library/newsletters/risk-management-newsletter/2009/march/jrm-2009-iss15.pdf>

November 2008

- research report <http://www.soa.org/files/pdf/research-2009-emerging-risks-survey.pdf>

December 2009

- Research <http://www.soa.org/research/research-projects/risk-management/research-2009-emerg-risks-survey.aspx>
- Article pages 12-14 Aug/Sep 2010 The Actuary
<http://www.soa.org/library/newsletters/the-actuary-magazine/2010/august/act-2010-vol7-iss4.pdf>

Rather than developing a unique set of emerging risks to consider, one originally developed by the World Economic Forum (WEF) was chosen as reasonable. The World Economic Forum reports, starting in 2007, can be found at www.weforum.org. The 23 risks developed by the World Economic Forum are described in detail in Appendix I. Each risk has been categorized as Economic (5 risks), Environmental (5), Geopolitical (7), Societal (4) or Technological (2). The WEF has updated these risks recently and made some of the risks very specific. For this survey the original risks have continued, but several descriptions have been shortened. The changes were not felt to be material and so trends across surveys will continue. The current survey continues its evolution, adding questions about leading indicators and the ability to predict bubbles while leaving the core of the survey intact.

Research reports do not create themselves in isolation, and the researcher thanks Beverly Barney, Dave Ingram, Barbara Scott and Steve Siegel for their help designing and implementing the questionnaire, along with gleaning information from the results. Of course all errors and omissions remain the responsibility of the researcher.

Researcher

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Results

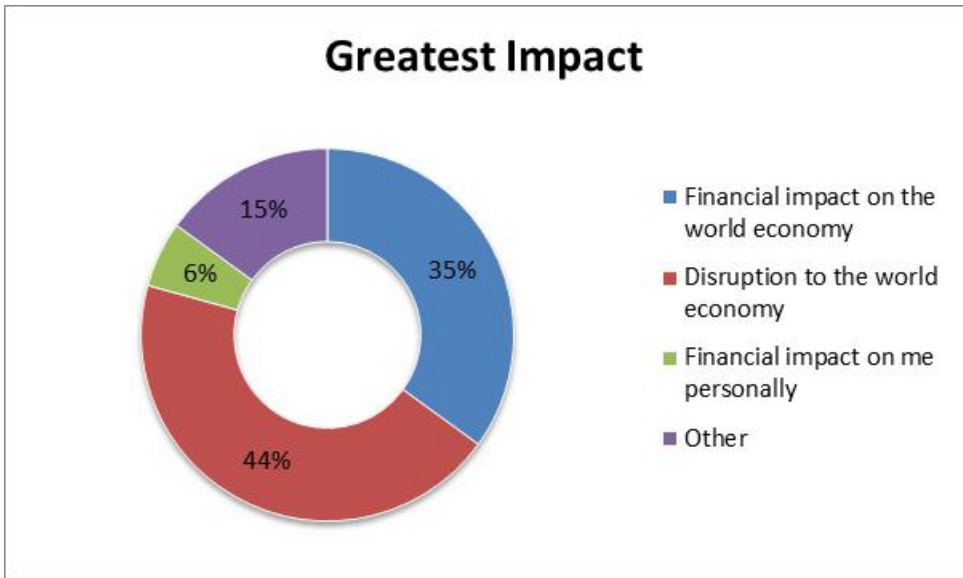
The survey contained sections covering Current Risks, Emerging Risks, Leading Indicators, Methodology, Predictions, Current Topics, and Demographics. Highlights of each section are presented here. A total of 141 surveys were completed (electronically). Some respondents did not answer all the questions. Partially completed surveys are included and percentages adjusted for the number completing each question. In addition, many questions allowed or sought out comments and examples that proved enlightening.

Default Question

In previous surveys, it was observed that responses were anchored in recent events. For example, when the Mumbai terrorist attack occurred in November 2008 while the survey instrument was open, respondents were much more likely to choose *International terrorism* as a leading emerging risk after that time. When oil prices spiked, *Oil price shock* was more often selected as a top emerging risk. As time passes from the financial crisis, the Economic category is receding from high levels. The reality was that these risks were not “more” emerging after they happened; however, it confirmed expectations from the field of behavioral finance about how perceptions change. It might be that this survey should be considered contrarian in nature, or more valuable when looking at averages over several years. The survey continues to be analyzed using open ended questions and data mining techniques to learn about emerging risks and how they relate to risk management practices.

In past surveys, respondents seemed to have varying definitions when asked to list the emerging risks they felt would have the greatest impact over the next few years. In this survey respondents were provided several alternatives and asked to choose one. While disruption to the world economy and financial impact on the world economy were the leading responses, others viewed the question personally or as it related to their organization. In the future the survey will make it clearer that respondents should take a broad perspective while completing the survey.

- Disruption to the world economy 62 responses 44%
- Financial impact on the world economy 49 responses 35%
- Financial impact on me personally 8 responses 6%
- Other (mostly impact on industry) 21 responses 15%

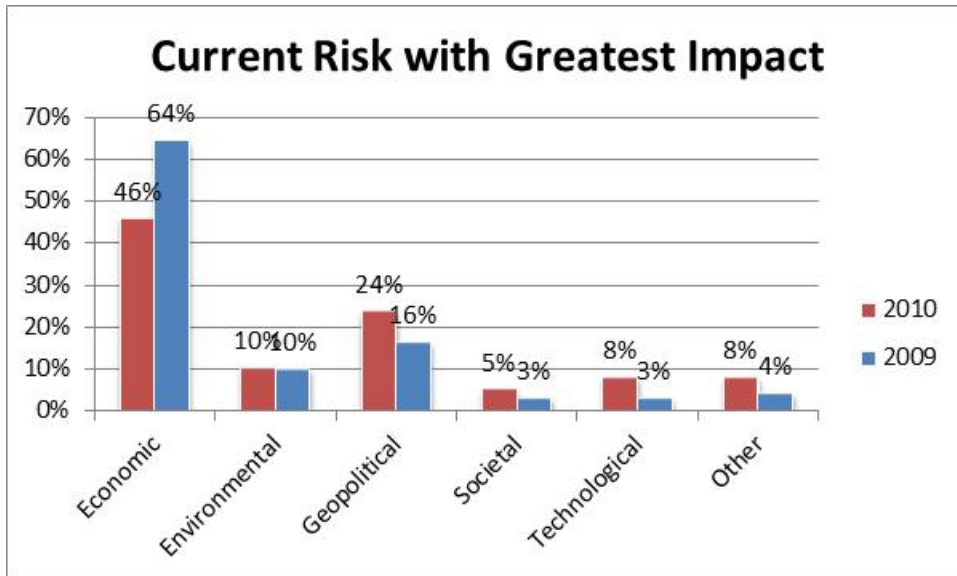


In the survey a benchmarking question was asked about the top current risk. It was thought that a respondent would answer the current risk question, and then when answering the rest of the survey would recognize the conceptual difference between current and emerging risks. In the field of behavioral finance it is thought that recognizing our shortcomings will help us to overcome them. Anchoring continues to be seen in this iteration of the survey. One could argue that this method might increase the anchoring effect, and future survey iterations will seek out alternative methods to approach this topic in the survey.

For the five broad categories, responses were impacted by several events occurring in 2010. Tensions were high on the Korean peninsula and the European debt crisis ensnared Greece, Ireland and Portugal. Earlier in the year major earthquakes hit in Haiti, Chile, and New Zealand, volcanic eruptions occurred in Iceland and Indonesia, and of course the oil spill in the Gulf of Mexico dominated the news.

- Economic 64 responses (46% in 2010/64% in 2009)
- Environmental 14 responses (10%/10%)
- Geopolitical 33 responses (24%/16%)
- Societal 7 responses (5%/3%)
- Technological 11 responses (8%/3%)
- Other 11 responses (8%/4%)

The Economic category retreated as the financial crisis faded a bit, with Geopolitical, Technological and Societal categories picking up the slack.



More than half of the “other” responses were also tied to economic risks, with several concerned about a low interest rate scenario. The leading individual risks displayed more breadth in 2010. The top choices were

- 14% *Blow up in asset prices*
- 11% *Fall in value of US \$*
- 8% *Chinese economic hard landing*
- 8% *Breakdown of critical information infrastructure (CII)*
- 7% *Fiscal crises caused by demographic shift*

Of the economic risks, the only one outside the top five responses was *Oil price shock*. This was considered by many to be the top risk early in 2008 when the first emerging risks survey was completed. Two years later it is not even in the top five of current risks (6th overall) as oil prices have fallen back.

Respondents were clearly less worried about financial risks, and there was a shift from the previous year’s question. Categories that increased materially (over 5% or doubled) included

- *Retrenchment from globalization*
- *Breakdown in critical information infrastructure (CII)* – tied for 3rd overall

The categories that decreased materially (over 5% or reduced by half)

- *Fall in value of US \$* - still 2nd overall
- *Blow up in asset prices* - still 1st overall
- *Regional instability*

Section 1: Emerging Risks

Top 5: Geopolitical increases but Economic Category leads

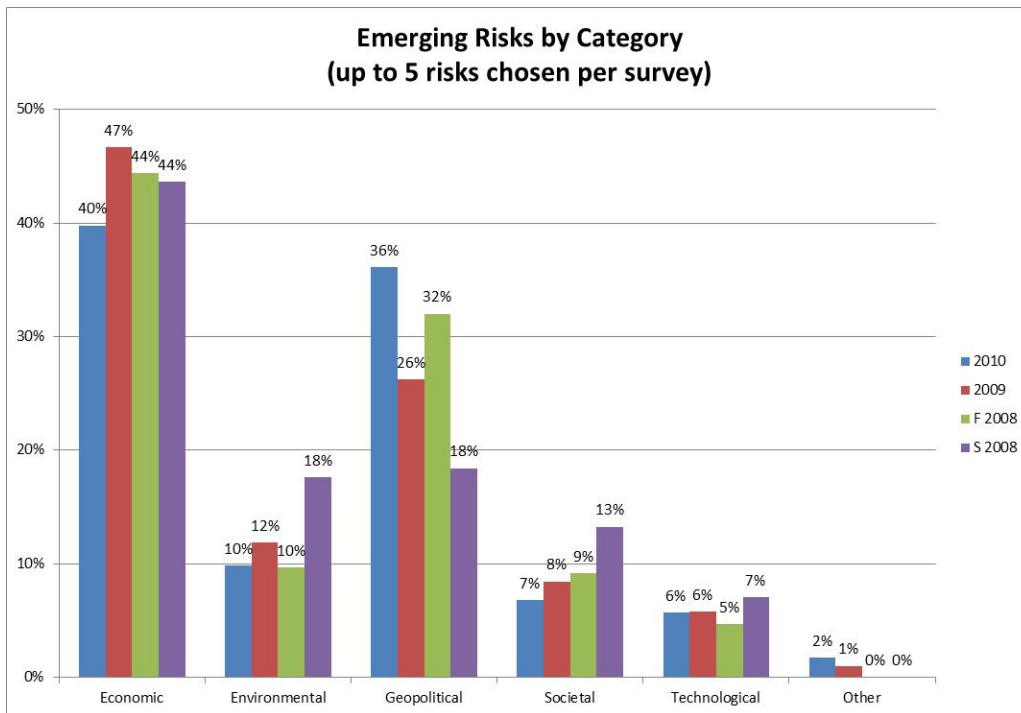
After the attempt to help respondents understand the tendency to anchor and to define greatest impact, 134 survey respondents chose up to five emerging risks that “you feel will have the greatest impact over the next few years.” The World Economic Forum had a time horizon of 10 years in mind when it developed these 23 risks, but that is not required here. Trend data is considered when questions are similar between surveys. In May 2008 the market was a bit rocky, but the real concern was the price of oil. In late 2008 the stock markets had fallen precipitously but the price of oil had dropped from record highs. This was the height of the global financial crisis and marked the end of the U.S. Presidential cycle with the election of Barack Obama. In December 2009 the global financial crisis and systemic risk were beyond the worst point and unemployment was high. A large climate conference had just been held in Copenhagen and the H1N1 pandemic had spread in the spring and receded. The large deficits incurred by fiscal stimulus packages were front and center in risk manager’s minds. In late 2010 political tensions on the Korean peninsula and the European debt crisis were hot topics.

Not all respondents chose to list five risks. While 81% of those who filled out at least one risk did list the maximum allowed, the average was 4.71. Percentages in this survey are based on the number of respondents who answered the specific survey question. This allows consistent comparison with previous and subsequent survey iterations. For example, 134 respondents answered Question 1 and 41 included *Blow up in asset prices* as one of their (up to 5) responses. Thus 31% ($41/134 = 0.31$) chose this emerging risk. These percentages will be higher than those that are based on all of the responses rather than the number of respondents.

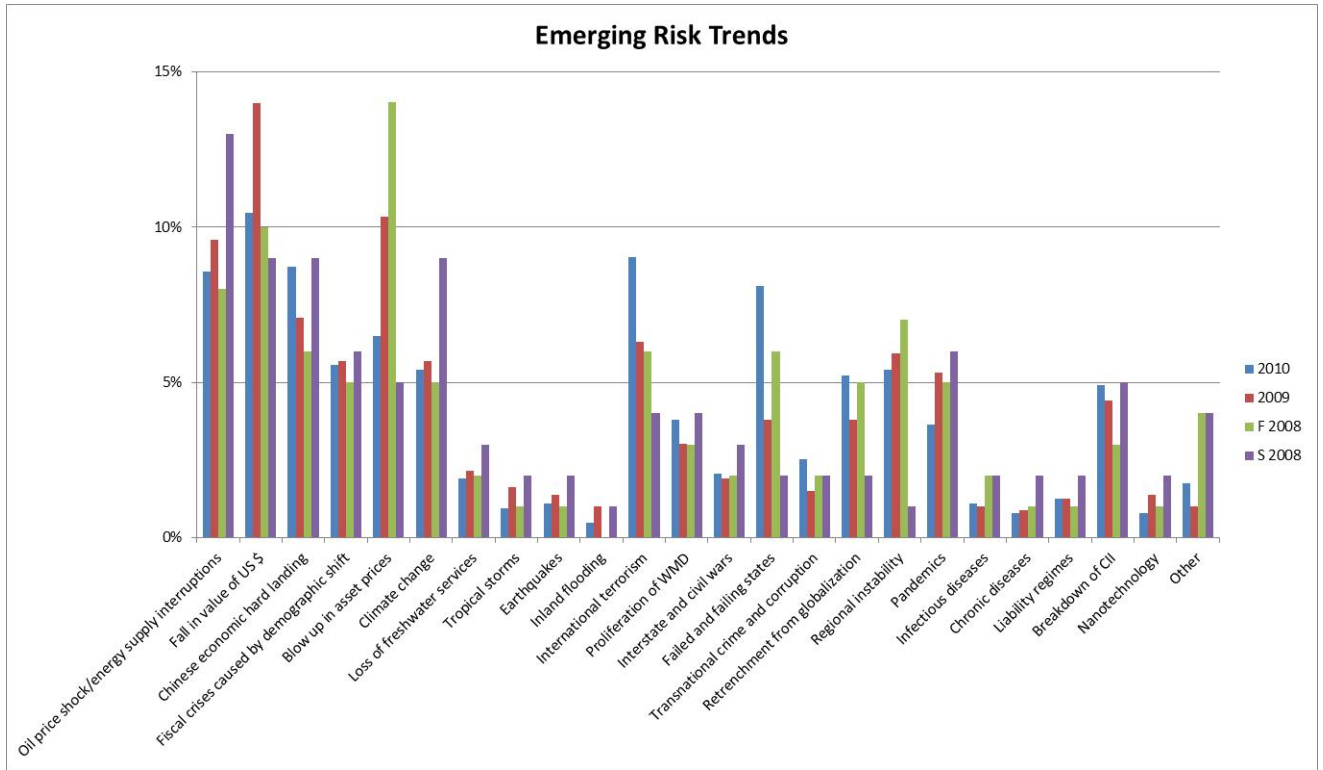
Given the current economic stresses worldwide and the group being surveyed (risk managers), it is not surprising that the Economic category again received the most responses, followed closely this year by Geopolitical. Other major categories trailed far behind. Some signs are pointing to the possibility that this question provides a contrarian indicator. Can risk professionals step outside their current surroundings to predict emerging risks, or do they get locked into today’s major issues and ignore risks about to explode into consciousness after years of calm? Some would argue this is what happened with the recent financial problems, where it became too easy to take risk. Managers were lulled into a false sense of security by increasingly complex models supposedly reducing volatility risk and government interventions intended to smooth the bumps in the financial road. Credit spreads are quite low at this time and may reflect an assumption that bailouts will protect lenders from credit risk.

A total of 631 responses were received, including 11 (2%) in the Other category. The results distributed by category (using percentages of total responses) are:

1. 251 responses 40% (47% in 2009) Economic
2. 228 responses 36% (26%) Geopolitical
3. 62 responses 10% (12%) Environmental
4. 43 responses 7% (8%) Societal
5. 36 responses 6% (6%) Technological



The Geopolitical category was the largest increase, mainly due to surges in *International Terrorism* and *Failed and failing states*. This category is starting to show signs of volatility from year-to-year, although there may be an increasing trend. China's increasing importance to the world economy makes it not surprising that the trend for *Chinese economic hard landing* is higher. What is surprising is that *Regional instability* is lower. In past surveys this question was limited to *Middle East instability*, so researcher expectations were that with an expanded question there would be additional responses. Economic categories with material decreases are described below. Increasing trends (at least 2 consecutive years) include *Chinese economic hard landing*, *International terrorism*, and *Breakdown of critical information infrastructure (CII)*. Decreasing trends included *Blow up in asset prices*, *Regional instability* and *Chronic diseases*. Some categories rebounded after falling in the previous survey. These included *Failed and failing states* and *Retrenchment from globalization*. Dropping after an increase in the last survey were *Oil price shock*, *Fall in value of US \$*, *Climate change*, *Tropical storms* and *Inland flooding*.



The top five specific responses to Question 1, *What are the emerging risks that you feel will have the greatest impact over the next few years?*, were spread across the Economic and Geopolitical categories.

1. 49% (66%/48% in previous surveys) *Fall in value of US \$*
2. 43% (30%/29%) *International terrorism*
3. 41% (33%/27%) *Chinese economic hard landing*
4. 40% (45%/39%) *Oil price shock*
5. 38% (18%/26%) *Failed and failing states*

In earlier surveys, the top responses to this question were dominated by Economic responses. Notice that there is not really a drop-off in categories like *Climate change* that saw their ranking fall but that other categories increased rapidly while the top choices had fewer votes. The top responses from non-Economic categories were

1. 43% (30%/29%) *International terrorism* (2nd overall)
2. 38% (18%/26%) *Failed and failing states* (5th overall)
3. 25% (27%/25%) *Climate change*
4. 25% (28%/34%) *Regional instability*
5. 25% (18%/25%) *Retrenchment from globalization*
6. 23% (21%/16%) *Breakdown of critical information infrastructure*
(CII)

Some risks reversed their trend in this survey. For example, Environmental risks related to natural catastrophes increased materially last year but decreased back to their 2008 levels in this survey. Last year's results appear to have been a statistical anomaly but this will be monitored.

The Geopolitical group had large increases in *International terrorism* (30% to 43%), *Failed and failing states* (18% to 38%), *Transnational crime and corruption* (7% to 12%) and *Retrenchment from globalization* (18% to 25%). These seem to reflect the increasing tension associated with the Korean peninsula. Surprisingly, *Regional instability* decreased by a small amount (28% to 25%) from the last survey. As this report is being written, several countries in northern Africa are poised for regime change, and the world economy shows mixed signs. Japan has experienced a large earthquake that will have major repercussions to their economic and energy future.

The only other response that increased from the prior survey was *Chinese economic hard landing* (33% to 41%). Responses that decreased included *Oil price shock* (45% to 40%), *Fall in value of US \$* (66% to 49%), *Blow up in asset prices* (49% to 31%), and *Pandemics* (25% to 17%). Although these risks decreased, they all remain significant responses in the survey.

Other responses to question 1, in addition to the 23 choices provided, included solar storms, pollution, failure of the European Union, decline in interest rates, off balance sheet liabilities of governments in developed markets, fiat currencies, indebtedness, cyber-crime, uncertainty (political, policy, fiscal, regulatory) and peak oil. It is interesting that someone would consider regulatory uncertainty as an emerging risk since regulation seems to constantly change in a cycle pattern with a short setback to the economy. When the economy is in a down cycle it is not long thereafter that regulations tighten up. They also seem to loosen following calm economic periods.

Complete results for all survey questions can be found in Appendix II. Appendix III details the survey results from Fall 2009 and are provided for comparison.

Another interesting result continues to be the trend of Societal risks. The number of responses in this category has decreased in each survey to date, from 13% to 9% to 8% to 7%. One hypothesis is that these risks are increasingly being classified as current risks by more risk managers. They might feel able to manage these risks in the normal course of their risk management process. Specifically, the influenza pandemic of 2009 might have initially been considered an emerging risk, but risk managers may feel that tactical plans are now in place.

One method to analyze this data over time is to highlight those risks reported in the current survey above their long-term averages. For this purpose the data was analyzed with responses as a percentage of all responses, rather than as a percentage of surveys collected. Six of the 23 risks meet these criteria. The greatest differential was 3% for both *International terrorism* and *Failed and failing states*. Eight are trending below the average, led by a 3% below average result for *Blow up in asset prices*. Three in five risks

are below their long term average for both the Economic and Environmental categories, while the Geopolitical category has 4 out of 7 above their longer term average. These results seem consistent with the anchoring effect discussed in previous surveys.

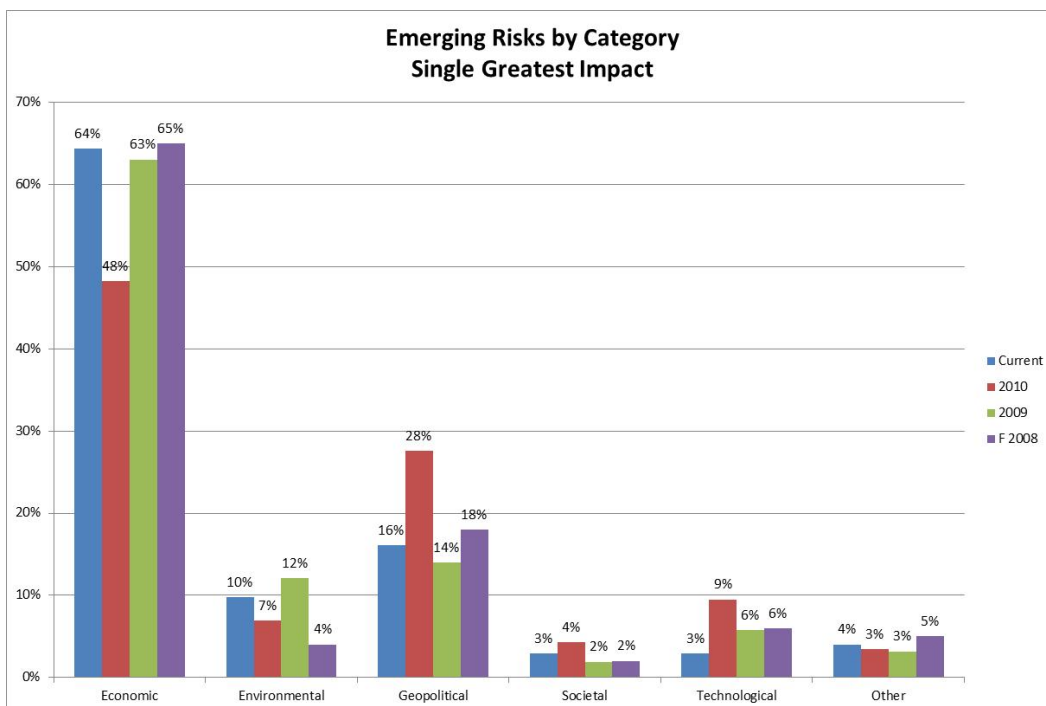
Top Emerging Risk: Chinese Economic Hard Landing

In Question 2, respondents were asked to state which single emerging risk they expected to have the greatest impact. Not surprisingly, the Economic category continues to dominate this question, with Geopolitical risks again ranked second (but much higher than in previous surveys) and Technological moved up to third, passing the Environmental category for the first time.

1. 48% (63%/65%) Economic
2. 28% (14%/18%) Geopolitical
3. 9% (6%/6%) Technological
4. 7% (12%/4%) Environmental
5. 4% (2%/2%) Societal

In the accompanying chart the current risk with greatest impact has been included with the emerging risk choices for greatest impact. It will be interesting to see if, in future surveys, the results for current risk pull up the emerging risk results as might be expected by the anchoring theory of behavioral finance.

Five of the seven categories within the Geopolitical category increased relative to prior surveys. Environmental category risks decreased across the board as memories of the Copenhagen conference on climate change fade.



Even with the overall drop for the Economic category, four of the top five specific responses came from the Economic category, with *Breakdown in critical information infrastructure (CII)* (Technological) tied for fourth. Results were more spread out in this survey, with 25% explained by the top two responses and 53% in the top 5 (down from nearly half of the results explained by only two risks in 2009). These results are telling as the recent crisis is receding in risk managers' collective memory. One of the major findings of this survey is the increased awareness of China in the minds of the risk managers.

- | | | |
|-----|---------------|---|
| 1. | 14% (4%/3%) | <i>Chinese economic hard landing</i> |
| 2. | 11% (26%/18%) | <i>Fall in value of US \$</i> |
| 3. | 10% (22%/25%) | <i>Blow up in asset prices</i> |
| 4T. | 9% (4%/6%) | <i>Breakdown of critical information infrastructure (CII)</i> |
| 4T. | 9% (6%/12%) | <i>Oil price shock</i> |

Survey responses continue to show the effects of anchoring in the results, even for the top emerging risks. Respondents show more concern for Geopolitical categories and less for Economic categories. *Breakdown of critical information infrastructure (CII)* returned to the top 5 after a one year absence.

Risk Combinations

The world exists in a dynamic environment. Whether it is the interaction between countries competing for resources and the *Loss of freshwater services* or *International terrorism* and *Proliferation of weapons of mass destruction (WMD)*, it is clear that no one can fully understand all of the interactions between risks and how it will all play out. An example of such interaction might be instability on the Korean peninsula. If bloodshed breaks out there, will the conflict escalate into a major war or fizzle quickly? How would this influence economic growth, availability of freshwater, currency imbalances and spreads on U.S. Treasuries? The expert risk manager won't have the absolute "right" answer to this, but will oversee a process that considers flexibility in responding to new issues rather than inflexibly following a set of rules to measure and manage risk.

Combinations of emerging risks interact in ways that are often not fully understood. Potential unintended consequences need to be considered as scenarios are developed. Risk combinations can happen simultaneously or sequentially. For example, the Geopolitical risk *Loss of freshwater services* could lead to *Interstate and civil wars*. Concurrent emerging risks could exacerbate a scenario. In 2010 Haiti experienced an earthquake early in the year, and months later a cholera epidemic broke out due to conditions created by the earthquake.

In Question 3, risk combinations are considered. These results can be looked at from several perspectives. Each respondent could choose up to three combinations of two risks. In total 315 combinations were suggested. Respondents were asked to list their top combination first. Appendix II includes a grid showing all combinations. Even though the question is about combinations of risks, it is helpful to look first at the risks in isolation.

As was seen in earlier questions, Economic (45%) and Geopolitical (35%) are the most frequent responses when identified in isolation. There was movement toward Geopolitical, and the Technological category continued its slow rise. The Economic and Environmental categories reduced from the prior survey.

- | | | |
|----|---------------|---------------|
| 1. | 45% (53%/49%) | Economic |
| 2. | 35% (25%/32%) | Geopolitical |
| 3. | 11% (13%/9%) | Environmental |
| 4. | 5% (5%/8%) | Societal |
| 5. | 4% (3%/2%) | Technological |

Individual risks were led by the same major categories. *Chinese economic hard landing* continued its rise as it moved into the top 5 last year and now sits in 2nd place, behind only *Fall in value of US \$*.

- | | | |
|-----|---------------|--------------------------------------|
| 1. | 13% (18%/12%) | <i>Fall in value of US \$</i> |
| 2. | 10% (8%/6%) | <i>Chinese economic hard landing</i> |
| T3. | 9% (13%/12%) | <i>Oil price shock</i> |
| T3. | 9% (6%/8%) | <i>International terrorism</i> |
| 5. | 8% (3%/5%) | <i>Failed and failing states</i> |
| 6. | 7% (11%/14%) | <i>Blow up in asset prices</i> |

While most of the top three were various combinations of the most frequently listed individual risks, the third leading response included *International terrorism* teamed with *Proliferation of weapons of mass destruction (WMD)*. Responses were more broadly distributed than in the previous survey, with more risk combinations chosen (104 versus 101/75 in previous surveys, out of a set of 253 possible combinations). The major category combinations were

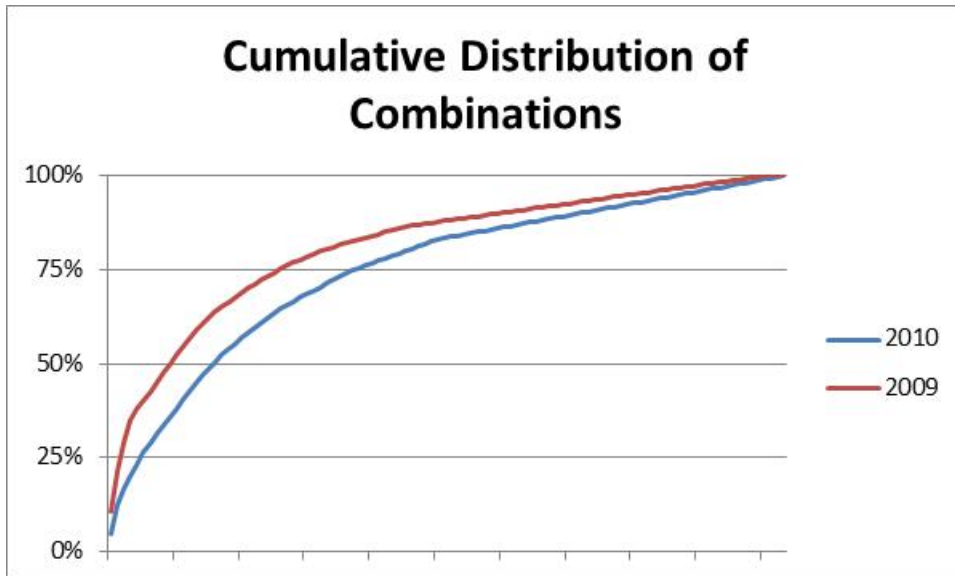
- 29% (42%/34%) Economic – Economic
- 21% (16%/22%) Economic – Geopolitical
- 20% (14%/16%) Geopolitical – Geopolitical
- 7% (9%/7%) Environmental – Environmental
- 5% (3%/2%) Economic – Environmental
- 3% (2%/1%) Geopolitical – Technological
- 3% (2%/2%) Environmental – Geopolitical
- 3% (1%/1%) Economic – Technological
- 2% (3%/2%) Economic – Societal
- 2% (3%/5%) Environmental – Societal
- 2% (2%/4%) Geopolitical – Societal
- 2% (1%/2%) Societal – Societal
- 1% (<1%/1%) Societal – Technological
- <1% (1%/<1%) Technological – Technological
- 0% (<1%/0%) Environmental – Technological

While Economic/Economic combinations were down substantially, combinations of two Geopolitical categories rose from 14% of the total to 20%. This is consistent with other results in the survey, but risks such as *International terrorism*, *Interstate and civil wars*, and *Failed and failing states* seem to be on risk managers' minds in late 2010. In surprising contrast, *Regional instability* fell in relative rankings despite tension on the Korean peninsula and other regions. The 2011 Mideast demonstrations, starting in Tunisia, occurred after the close of the survey.

Leading combinations were

1. 24 responses
 - *Fall in value of US \$*
 - *Chinese economic hard landing*
2. 15 responses
 - *Oil price shock*
 - *Fall in value of US \$*
3. 13 responses (not in top 5 in 2009)
 - *International terrorism*
 - *Proliferation of weapons of mass destruction (WMD)*
4. 10 responses (leading response in 2009)
 - *Fall in value of US \$*
 - *Blow up in asset prices*
5. 10 responses (not in top 5 in 2009)
 - *Chinese economic hard landing*
 - *Blow up in asset prices*
6. 8 responses
 - *Oil price shock*
 - *International terrorism*
7. 8 responses
 - *International terrorism*
 - *Failed and failing states*

Many of these combinations are likely to have unintended consequences, and these responses provide useful input to specific combination questions for future surveys. For example, this survey includes a question specific to a *Chinese hard economic landing*. As a result, it could lead to future questions focusing on geopolitical topics.



There are 253 possible risk combinations. The distribution was much more dispersed in 2010 relative to 2009, as can be seen in the accompanying chart. This could be a result of being further removed from the recent financial crisis and risk managers having more time to think about other emerging risks that might occur. Last year it could be that risk managers were completely focused on surviving the then-current environment, and the risks they worried about tended to be more financial in nature. By quartile, with data listed cumulatively, results were

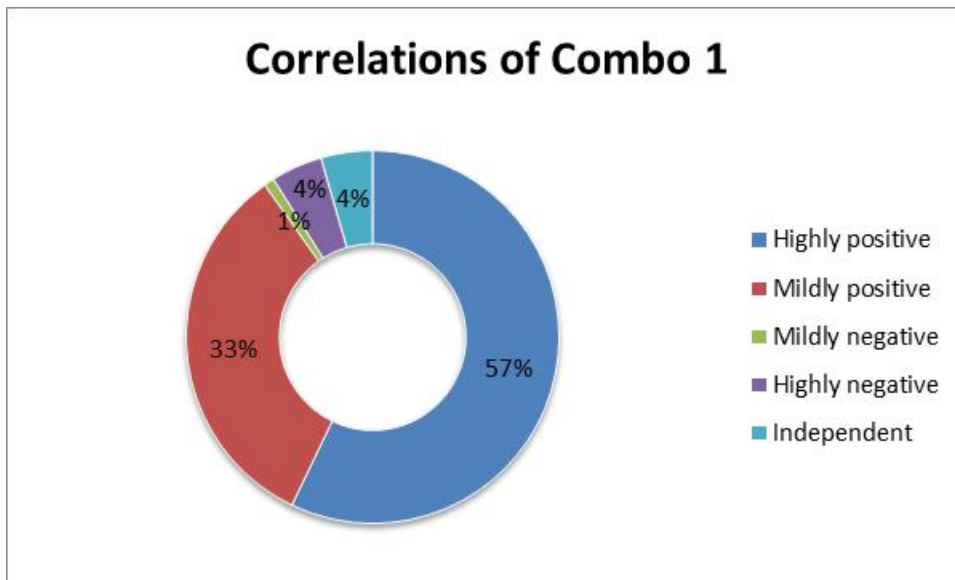
- First quartile (most frequent) 6 (3 in 2009) combinations
- Second quartile (median) 17 (10) combinations
- Third quartile 38 (27) combinations
- Fourth quartile 104 (101) combinations
- Remaining 149 (152) risk combinations were not selected

The next chart shows the responses in the order they were chosen. A follow up question referred to combination 1 so it would be reasonable to assume that Combo 1 is the risk manager's first choice. Risks such as *Fall in value of US \$* (#2) fall off quickly after the first choices, while *Transnational crime and corruption*, *Natural catastrophe: Tropical storms*, *Regional instability*, and *Infectious diseases* are chosen more often after the first round. It may be that a risk manager is anchored in current events for the first choice and that Combo 2 and 3 provide more forecasting credibility.

	1	2	3	4	5	6	7	8	9	10	11	12
Combo 1	26	44	30	8	17	13	7	1	1	4	14	10
Combo 2	22	19	18	16	14	13	3	4	2	2	23	9
Combo 3	12	18	12	8	15	7	8	5	3	1	17	7
Total	60	81	60	32	46	33	18	10	6	7	54	26

	13	14	15	16	17	18	19	20	21	22	23	
Combo 1	8	20	1	6	4	3	2	1	-	6	-	226
Combo 2	8	15	5	9	16	3	4	1	2	8	2	218
Combo 3	8	13	8	10	9	8	7	1	1	7	1	186
Total	24	48	14	25	29	14	13	3	3	21	3	630

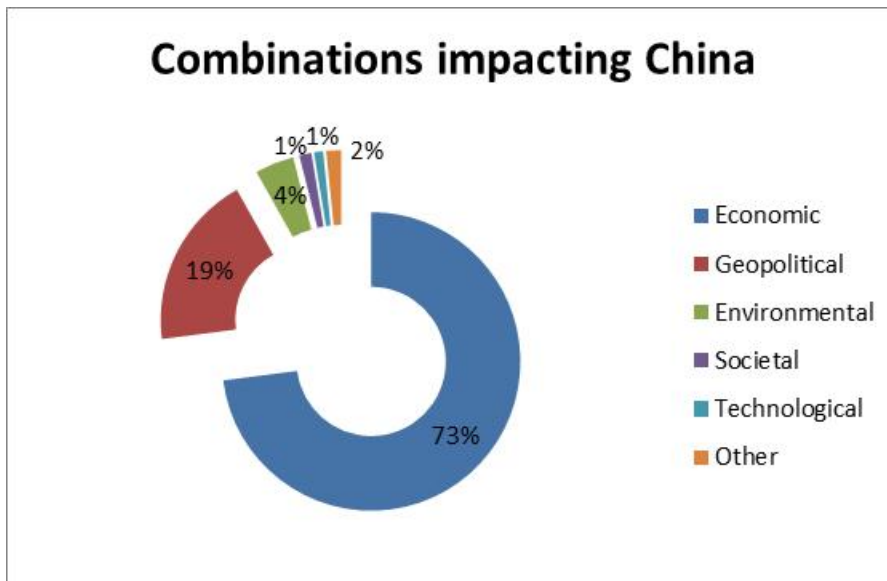
A new question was inserted into the survey for 2010 asking the level of correlation for the risks from Combo 1. 90% of responses felt they were either highly or mildly positively correlated. Only 4% thought they were independent. An interesting result is the 4% of responses that felt the risks were highly negatively correlated.



Question 5 changes with each survey, looking at risk combinations surrounding a topical issue. Previous questions have addressed regional food shortages and political instability. In this survey China's financial relationship with the world was explored. Respondents were asked to consider primarily changes in currency, commercial and investment relationships. Respondents were allowed to include up to three risks, and 113 respondents chose 308 responses (2.8 per). Results focused on Economic risks, with almost three-quarters of the risk chosen from that category.

1. 73% Economic
2. 19% Geopolitical
3. 4% Environmental
4. 1% Societal
5. 1% Technological

The top 2 specific risks chosen were almost a dead heat, with *Fall in value of US \$* (24%) and *Chinese economic hard landing* (23%). Rounding out the top 5 were *Oil price shock*, *Retrenchment from globalization*, and *Blow up in asset prices*.



Some of the results were surprising for their lack of consideration. Various Geopolitical concerns seem to be a possibility for disruption, as do *Climate change* and *Loss of freshwater services*. From the write-in vote some interesting comments referred to a Eurozone break-up, population versus food pressures, and pollution.

Risk as Opportunity

Many risk managers view risk as two sided, with opportunities drawn out of the same tools and datasets used for risk mitigation. The survey asked which emerging “opportunities” are being monitored. Some of the responses included

- Climate change
- Demographic shift
- Currency/Exchange rates
- Precious metals
- Hedging opportunities
- Mispriced assets
- Regulatory changes
- Correlation
- Prices to insure against terrorism, natural catastrophes and pandemics
- Commodities
- Which countries are opening up their markets to trade
- Market opportunities based on stresses on competitors

This is a developing area in risk management. If the risk manager is to aid the strategic planning process, it seems to be a place where competitive advantage can be added. Looking objectively at competitors, finding under/overvalued assets, and seeking out opportunities for diversification could be early indicators of success that risk managers are especially qualified to complete.

Section 2: Leading Indicators

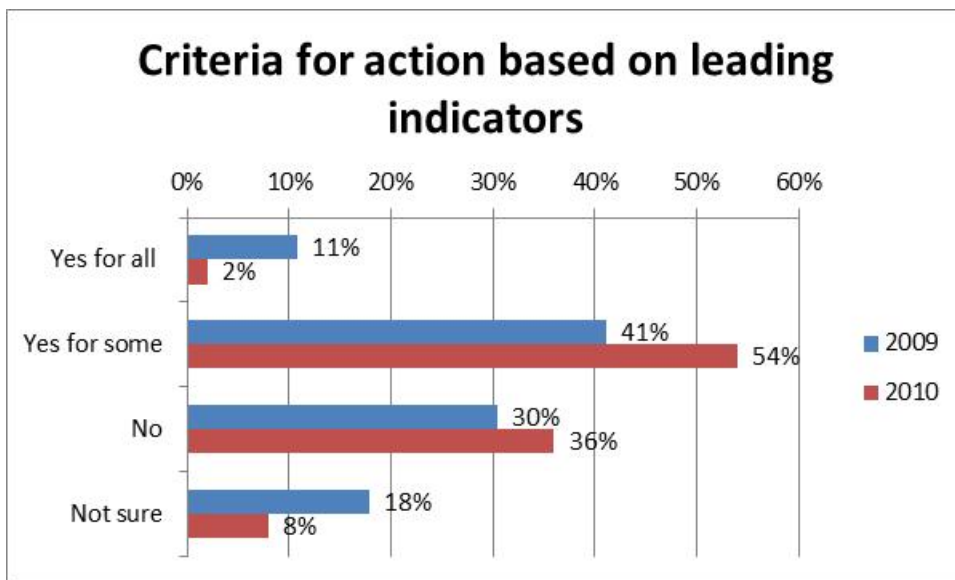
Leading indicators are metrics, or events, that drive decision making. Key risk indicators (KRIs) provide information about a specific risk. Trending GDP or CPI can provide macroeconomic KRIs, as can revenue and liabilities for a firm. These are examples of lagging indicators that measure historic results. Leading indicators, in contrast, provide information where plans can still be adjusted. For example, a leading indicator such as a lower unemployment rate would drive expectations of higher collected taxes. A leading indicator could also be an event, and when it occurs that becomes the indicator. An example might be the signing of a star athlete that would drive higher attendance at games. The survey asked about the use of leading indicators that would provide a firm with actionable information about a risk.

The first question stated: “Once an emerging risk is identified, do you select leading indicators to measure changing likelihoods?” 3% of the respondents noted that they had leading indicators for all identified emerging risks, down from 5% in the previous survey. Having anyone choose “Yes for all” is astounding based on the difficulties encountered in quantifying many emerging risks. 20% did not formally identify emerging risks and 14% were not sure. The trend from the prior survey is very positive, with over 50% now saying they identify at least some leading indicators.



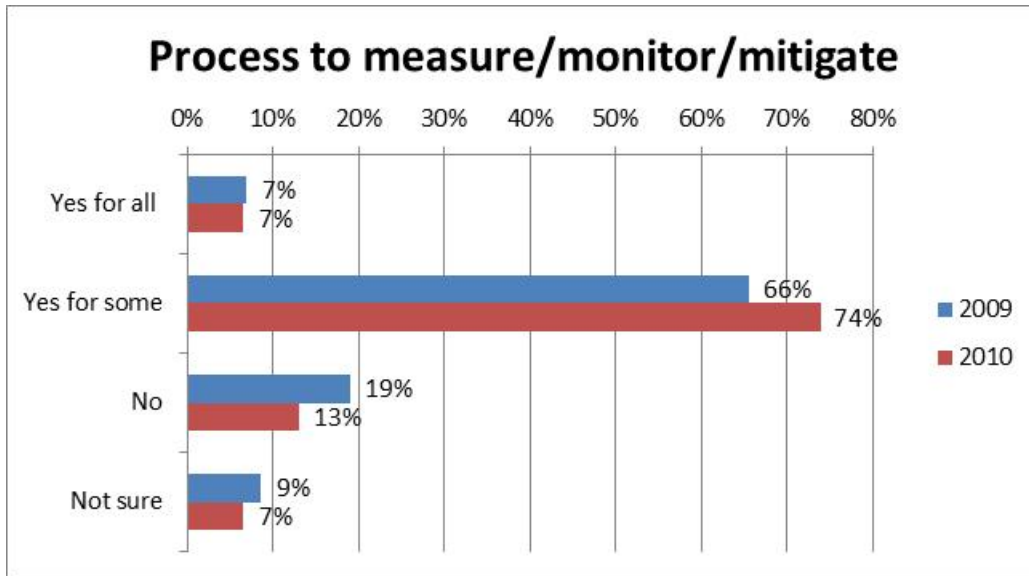
Risk managers continue to advance beyond exclusively using lagging indicators that are byproducts of the financial reporting process. Respondents provided many excellent examples (found in their entirety in Appendix II). Many of the leading indicators used are well known: sea surface temperatures to project hurricane activity, the WHO pandemic alert level for infectious diseases, CO₂ to measure climate change, and economic metrics like CPI, GDP, value of the dollar, gold price, oil price, US deficit, US debt, CDS rates, unemployment and interest rates. Several surveys stated that they are monitoring solar activity due to its cyclical nature and impact on electronics. Another has been measuring water supplies as that resource becomes scarcer. One risk manager tracks a news service for specific words and trends them over time.

The survey asked whether these leading indicators included criteria that would lead to an action to mitigate or accept the risk. There were 50 responses of the 52 who stated that they use leading indicators for emerging risks. Of those, over half (56%, up from 49% in 2009) stated that criteria exist for at least some of their emerging risks. The trends for this question seem to reflect an evolving practice where more risk managers are considering leading indicator criteria and more realizing this is a process that continues to evolve (the Yes for all response is down from 11% to 2%).



When asked for examples, several respondents provided general statements about following risk appetite statements. Specific examples included hedging equity positions, stopping new sales, adjusting fees, and selling US dollar investments. These criteria continue to become more specific. Interestingly, one respondent said that currently their criteria are “mostly by the seat of our pants.” This is likely how others feel as well.

46 surveys answered a question about measuring, monitoring, and mitigating an emerging risk once it has been identified, with 80% responding that they did for some or all of their identified emerging risks (up from 74% in 2009). The trend continues its upward swing.

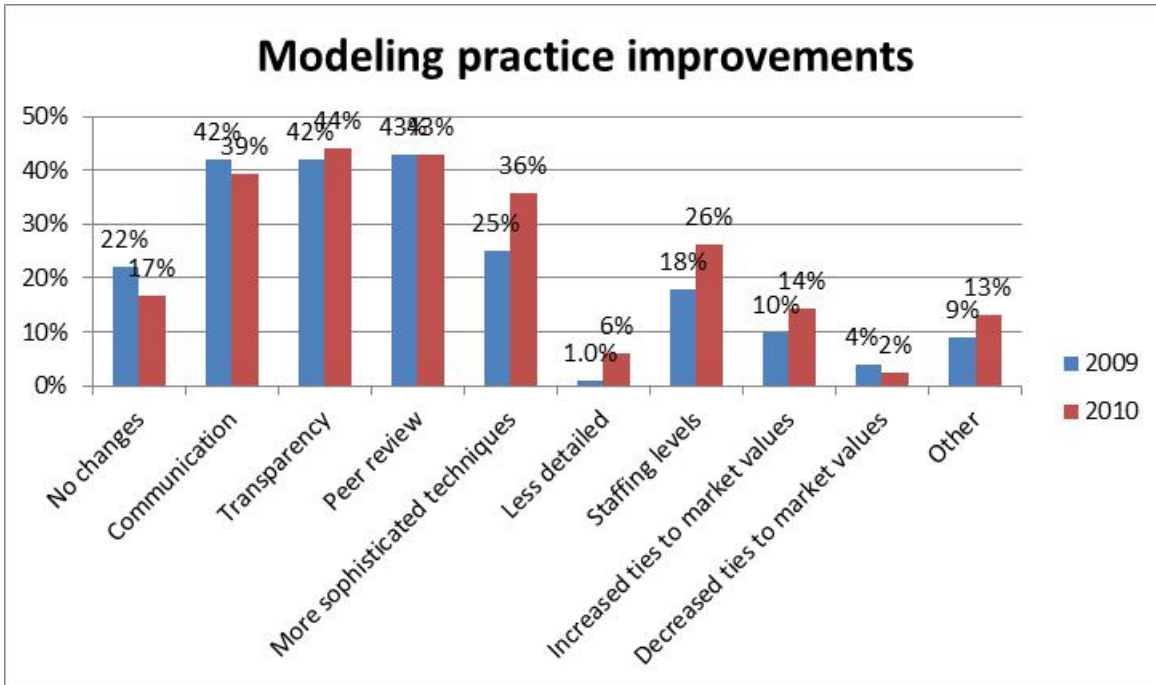


Examples provided continue to be non-specific, talking in generalities rather than the resulting action. Topics included purchases of low risk investments like land, along with stopping purchases of securitizations based on collateral issued in specific years. Others talked of hedging equity positions when exposure becomes large, but no mention was made of actions taken when equity values drop, although it might be a reflection that firms recognize that often a strong positive run in the markets precedes a crash. Some respondents stated the need to prioritize these action steps, and others reported that this is an ad hoc process for them. This reflects the dynamic nature of leading indicators as they impact emerging risks. Much information is new and timeframes are often short.

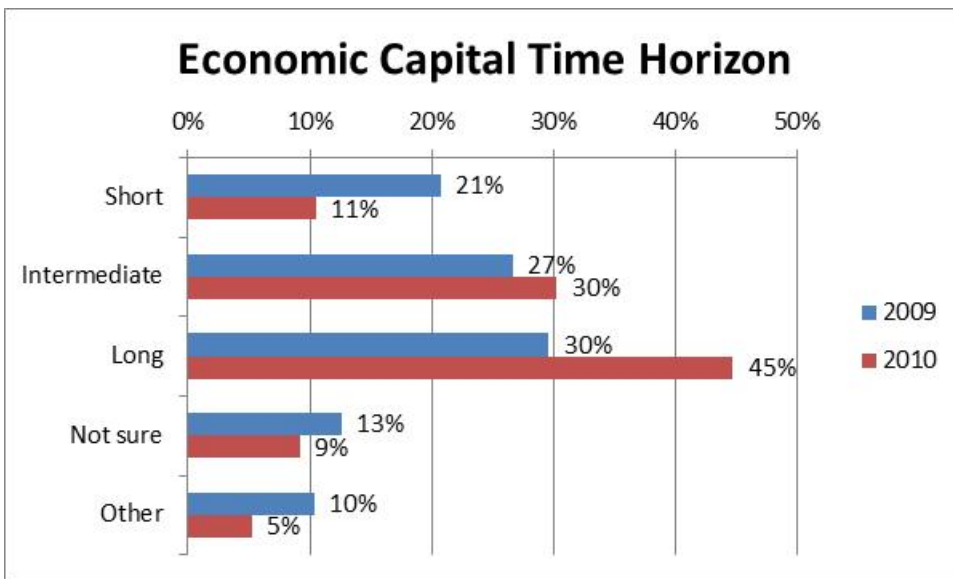
Section 3: Methodology

As the world tries to bounce back from the recent financial crisis, models have taken a beating. Regulators are doing their best to update regulations so such an event does not recur. More likely to improve a firm’s risk/return profile are risk managers’ efforts to improve their methodology to measure risk. It is now almost universally accepted that “all models are wrong but some are useful”, and that models and assumptions should be challenged through a transparent peer review process.

In previous years survey questions focused on the metrics used to measure risk, but that produced answers pertaining to the metric used by respondents’ domestic regulators. Risk modeling continues to receive resources, and regulatory initiatives such as Basel III, Solvency II, PBR and others are helping publicize the need for improvement.

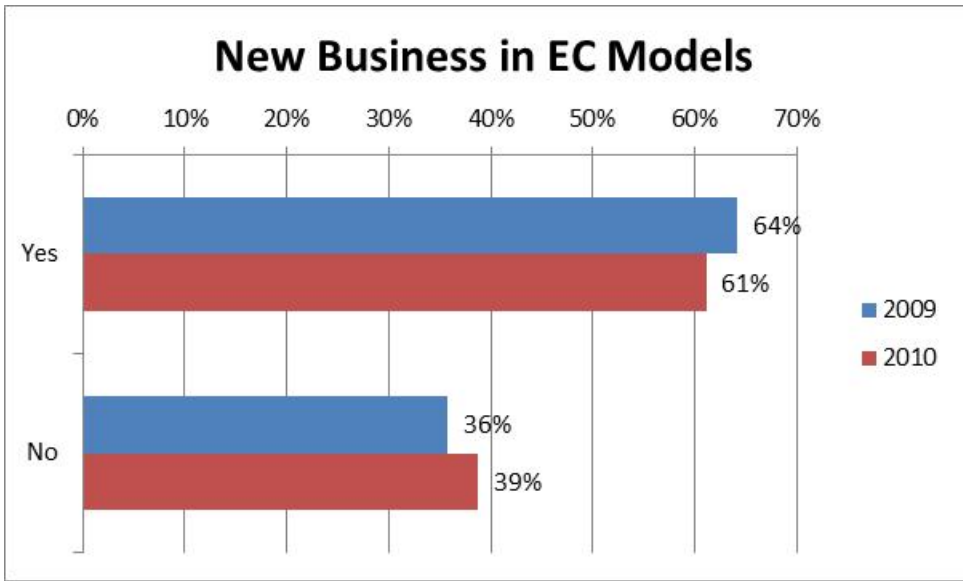


The survey asked how modeling practices had improved. While most results were consistent with the prior survey, more sophisticated techniques are being employed and staffing has increased. Some of the additional comments were enlightening, including analysis of extreme risks in the tail and faster processing speed. Interestingly, and showing how opposite ideas can interact, several responses focused on a move toward common sense and imagination. These comments show that risk managers continue to improve their models, but are taking time to validate them qualitatively as well.

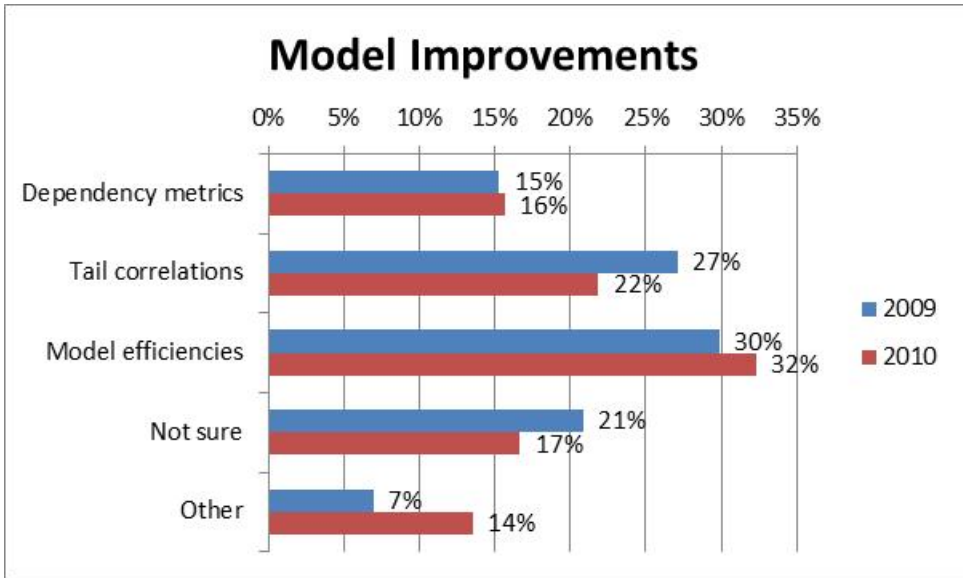


Economic capital models operate under a variety of time horizon requirements, but there is a definite trend away from short (1 year) models toward longer (e.g., 30 years) duration

analysis. Others stated that they model for the entire lifetime of risks or a combination of time horizons. Almost two-thirds included new business in their analysis, with a slight movement away from including new business.



Modeling improvements are important to any evolutionary process. Financial modeling is no exception. Model efficiencies (32%) and tail correlations (22%) were again the leading responses. Interestingly, the “Not sure” response remained high at 17%.



The 13 additional comments included using increased computing power to complete additional scenarios, but also discussed extreme value theory, incorporating stress scenarios, and managing model risk.

In possibly the most interesting part of the survey to analyze, respondents were asked first to share instances where quantification efforts have enabled better decision making and then where qualitative efforts did the same.

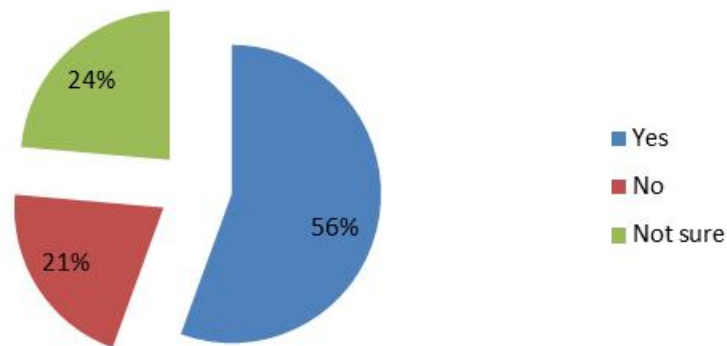
The 24 quantitative responses included discussions about ALM, hedge rebalancing, extreme value theory, changes to product design, assumption sensitivities, asset class correlations and catastrophe reinsurance. One response stated that quantification is used to “confirm some management decisions” and that this might cause them to “question if the model is working properly”. It is unclear what they do if the decisions are not confirmed!

There were a number of qualitative examples where decision making was aided. Some described a technique such as heat maps and scenario planning, while others said they discussed their risk profile, built strategic objectives, and analyzed liquidity needs. Several used their qualitative analysis to avoid certain assets or evaluate assumptions to long-tailed liability models such as asbestos risk.

Section 4: Predictions

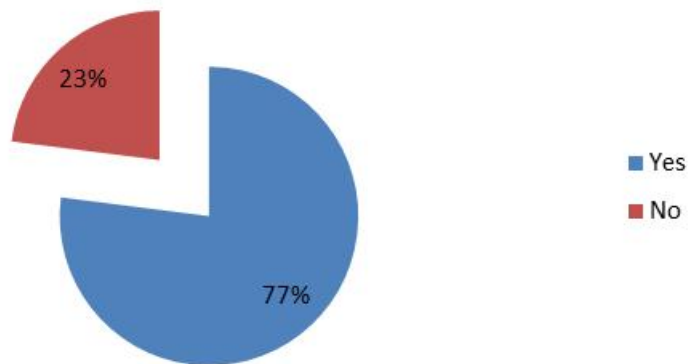
In some instances risk managers have been held accountable for their employer’s risk management lapses, appearing to be a “fall guy” for the senior managers who made the strategic decisions to be in a specific market. The Predictions Section was added to see if risk managers thought that was a reasonable perception. In the first question the survey asked if it is possible to anticipate/predict a crisis. Over half agreed that it was possible. Comments received were very revealing. Many thought that some crises could be predicted but that it was hard to predict them all. Others defined anticipate as preparing for, and stated that you should prepare for a crisis that had the potential to occur. Some went so far as to say it was possible to predict that the likelihood of a crisis had increased. Others commented that predicting the likelihood was easier than predicting the severity of a crisis, or “how it will play out”. One response hinted at an interesting question – what if you avoid two bubbles for each one that actually occurs – are you successful?

Ability to Anticipate/Predict Crisis



Over three-fourths of risk managers felt it was their job to predict the future. Based on the comments received, most seemed to define this as predicting potential outcomes rather than actual future events. One humorous response called that job an oracle or soothsayer. Others referred to leading indicators and how that would help one to anticipate specific events. Most seemed to agree with the response that, “to be prepared to react is the goal”.

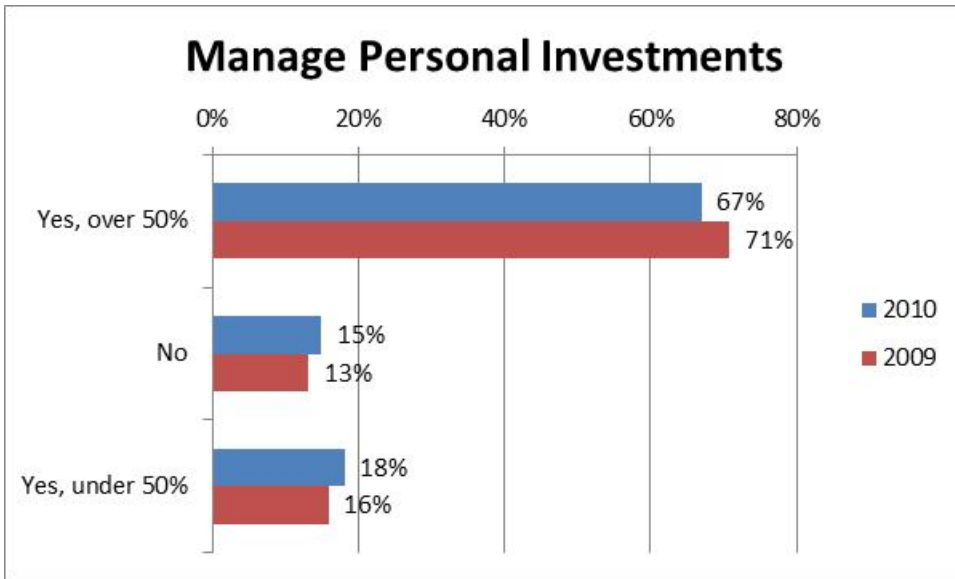
Risk Manager's Job to Predict Future



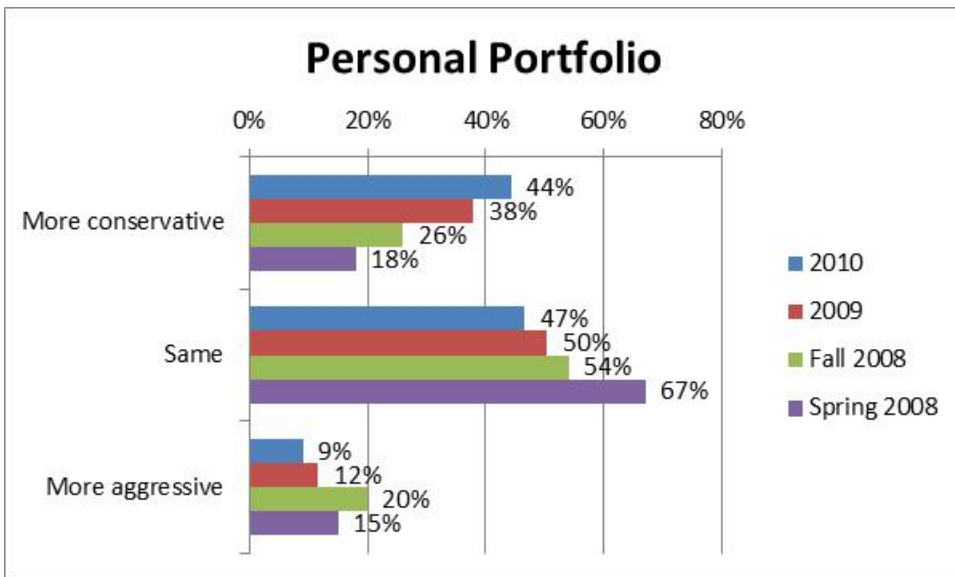
Section 5: Current topics

This is the fourth iteration of this survey, and much has happened since April 2008 when the initial survey was completed. With this in mind, some questions were posed for trending purposes and to determine if the responses can be used as leading indicators and thus predictive.

Respondents were asked if they manage their personal investments. A large majority of the risk managers, 85%, manage some portion of their portfolio with over half managing the entire amount.

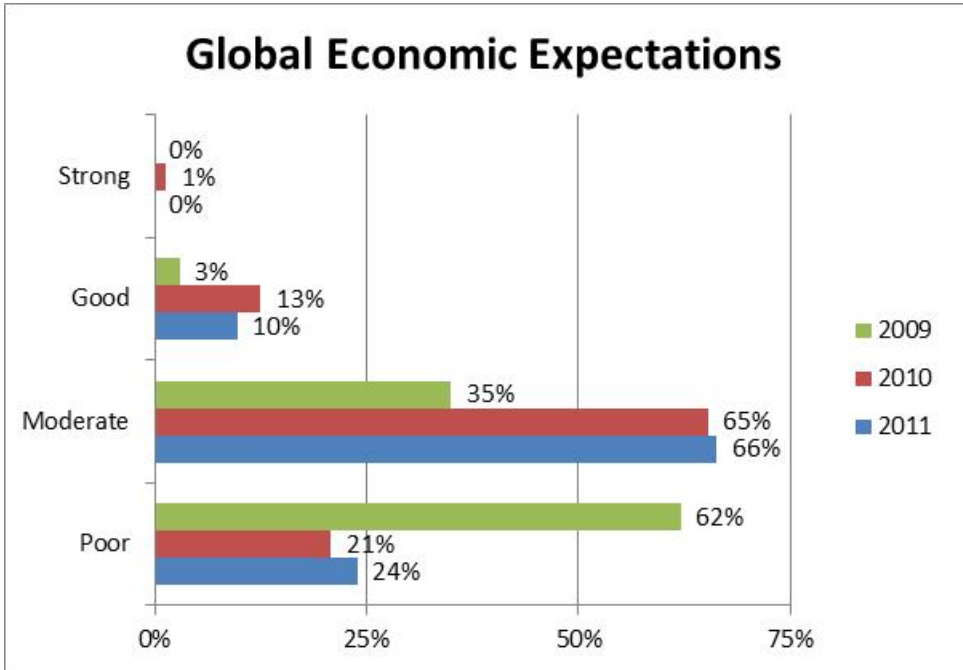


There is clearly a trend toward more conservatism in personal investment styles among the survey respondents over the past several years, as seen in the following chart. The stock market enjoyed a healthy rally between the survey completed in Fall 2008 and the current one. Only time will tell if this is good advice or a contrarian indicator.

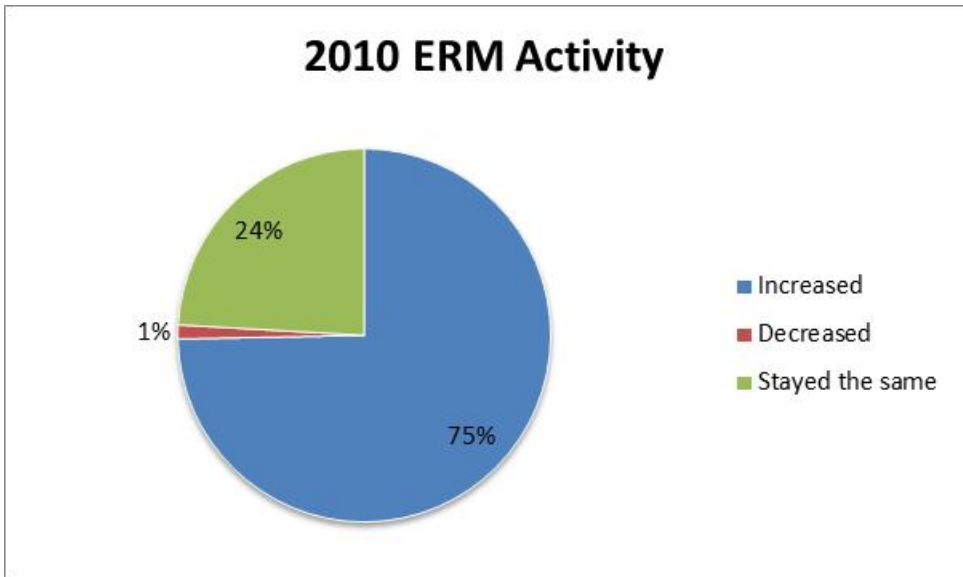


Starting with the second survey, in late 2008, Global Economic Expectations were asked about the following year. The responses for 2009 were, not surprisingly, very negative with 62% expecting a poor economy. Respondents were more optimistic for 2010 with 65% expecting a moderate economy. The current survey has similar results, with a small

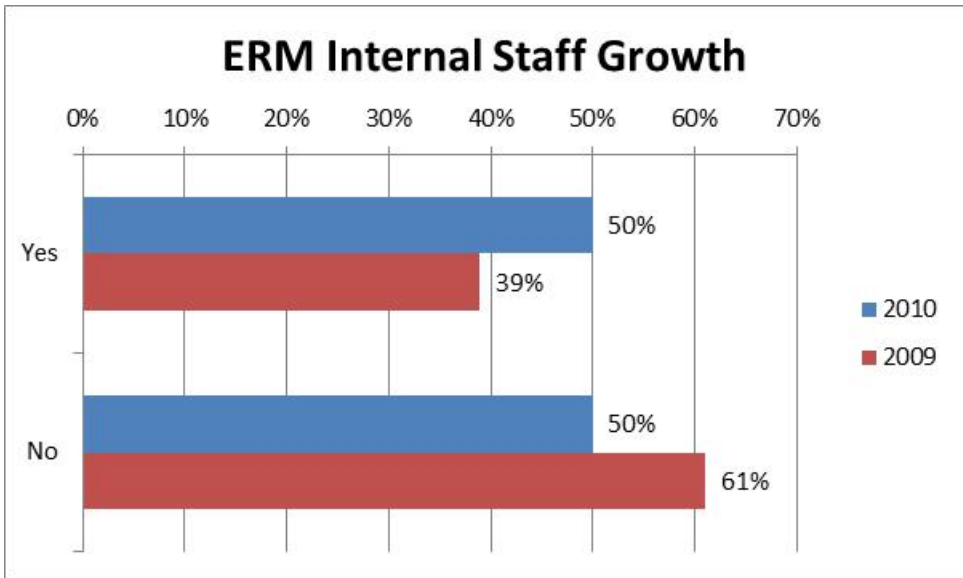
increase in those expecting a poor economy and a similar decrease in those expecting a good economy.



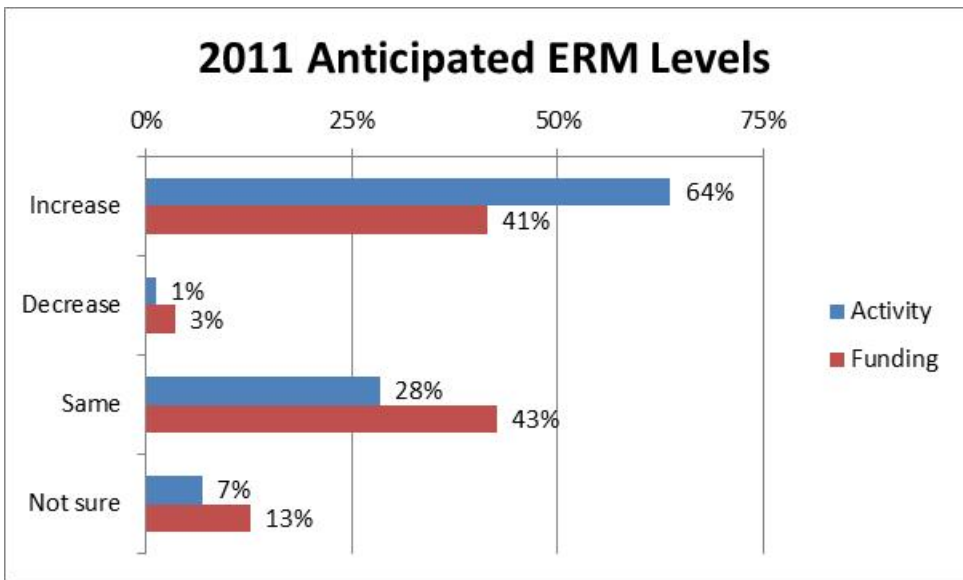
The recent crisis continues to lead to increased ERM activity, and 75% saw more in 2010. This continues to be a strong result for the risk management profession. It will be interesting to see how long the additional activity will last post crisis.



In addition to the higher ERM activity, for the first time half the respondent's internal staff grew in 2010.

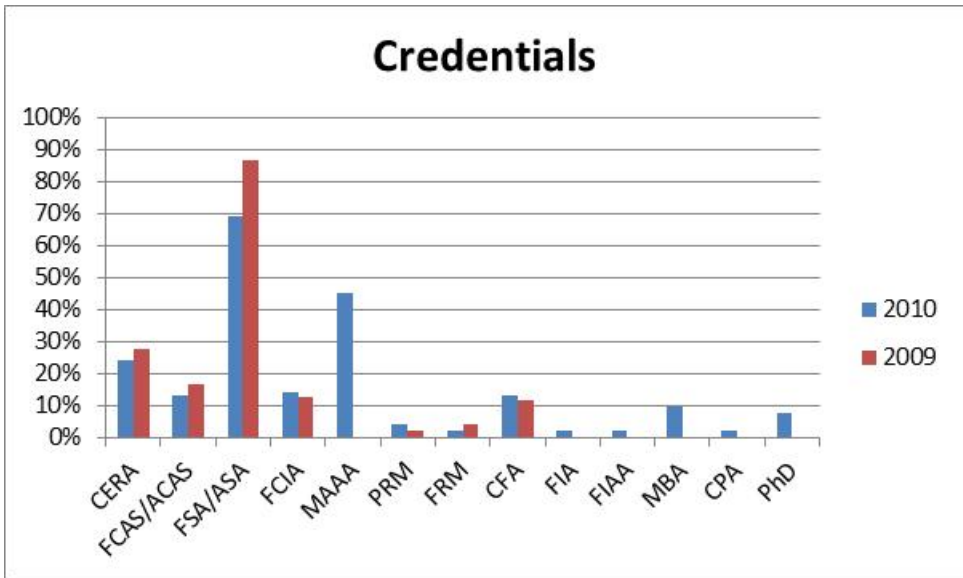


For 2011, survey respondents anticipate continued growth in their activities (64%), but less than half expect to see increased funding to accomplish this heightened expectation. This could signal the end of growing staffs following the financial crisis.



Section 6: Demographics

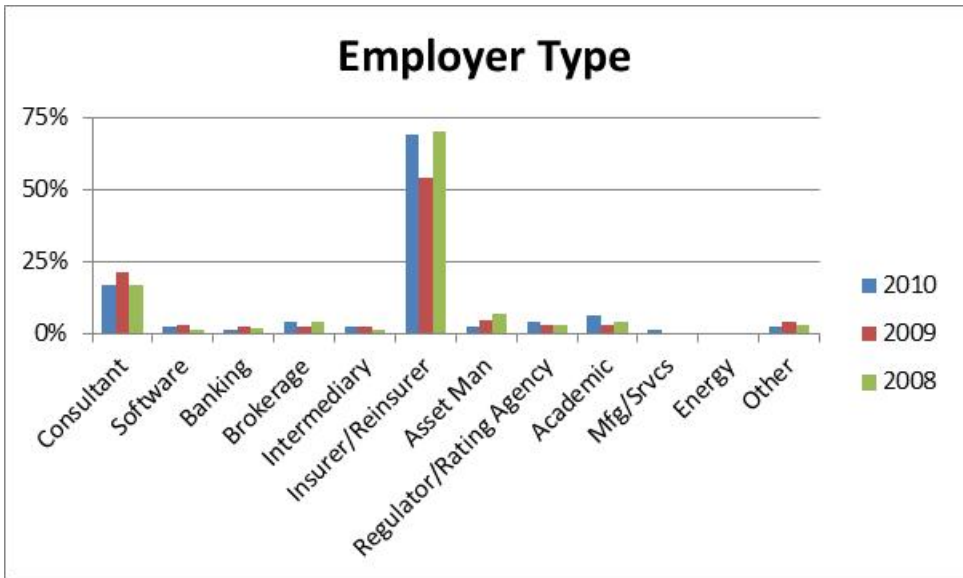
The range of credentials continues to grow among survey participants. This year several were added to the survey options, including MBA and PhD, based on prior year responses. Membership in the American Academy of Actuaries (MAAA) was also added as an option for the first time. Actuarial credentials from outside North America came from the United Kingdom, Australia, Switzerland, Germany, Italy, France and Austria.



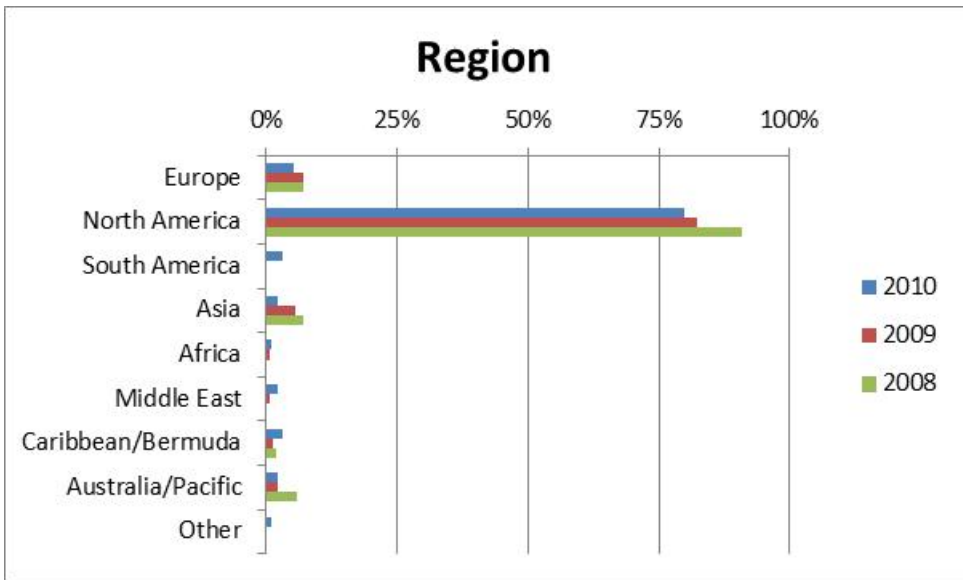
The survey asked respondents how long they have been a risk manager, and over one-third said they have over 10 years of experience in the role. This group is much more experienced than the norm and responses have revealed many best practices.



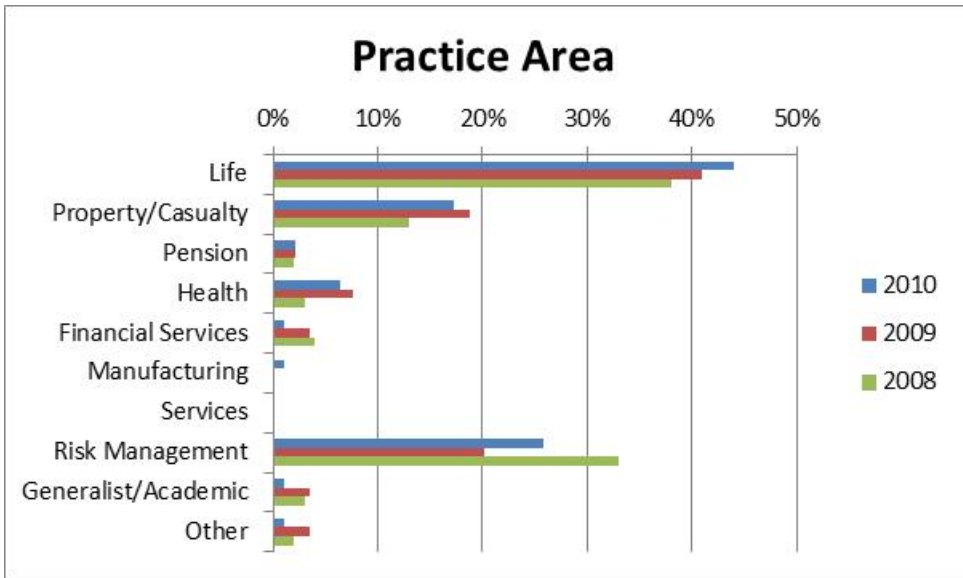
Most survey respondents are employed by either an insurance company/reinsurer (69%) or as a consultant (17%). The distribution is similar to that in the earlier survey. Note that multiple responses are allowed.



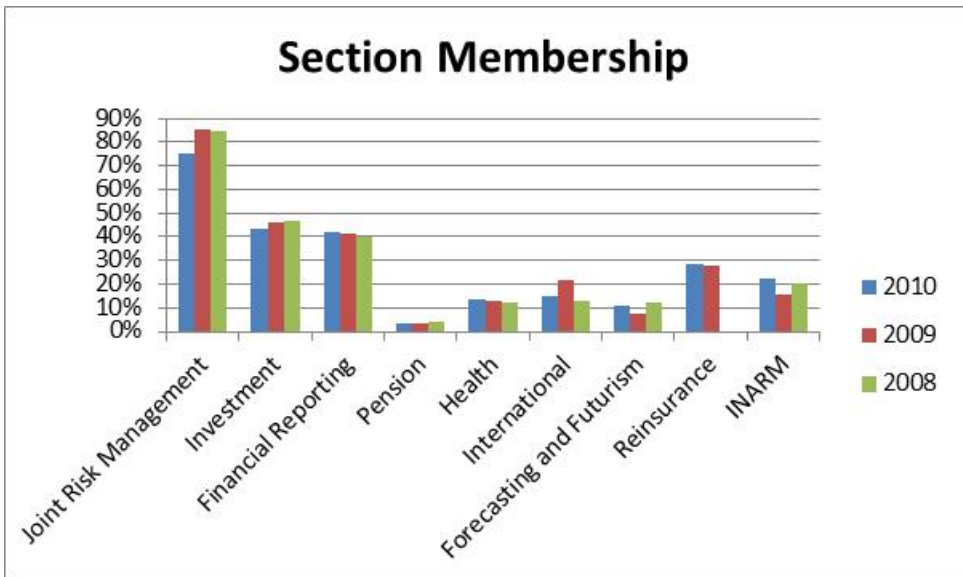
The survey is dominated by North Americans, but this becomes less prevalent each year. This year surveys were completed by risk managers in South American, the Caribbean/Bermuda, Africa and the Middle East. Prior to 2009, surveys allowed multiple responses to this question while now only the primary region is requested.



The primary area of practice continues to be dominated by life insurance (44%), risk management (26%) and property/casualty insurance (17%) accounting for the vast majority of the results. Manufacturing is represented for the first time.



The actuarial profession operates special interest sections logistically located in the structure of the Society of Actuaries but sometimes with additional partners. The survey found that 75% of the respondents belonged to the Joint Risk Management Section (sponsored by the Casualty Actuarial Society, Canadian Institute of Actuaries and SOA), with the Investment Section and Financial Reporting Section also heavily represented (as was the case in past years). 22% reported belonging to the INARM list serve, up from 15% in the previous survey. The survey was sent to JRMS and INARM members, along with some targeted social media groups on Linked in. Many risk managers reported belonging to multiple special interest sections (3.6 average from 58 responses).



Future Recommendations

Future surveys should continue to probe the anchoring issue and look for concrete examples where leading indicators changed strategic planning decisions. As managing emerging risks is an evolving discipline, the survey should continue to ask open-ended questions and use the answers to develop future questions. Utilizing the experience of the POG has worked very well so far in developing questions and should continue. The survey should be distributed more widely in order to gain the perspective of those outside North America and outside the insurance industry. Perhaps a partnership could be reached with UK and Australian actuarial risk managers or with the CRO Forum. Additional groups should be encouraged to complete the survey to reduce the reliance on actuaries.

In the next survey a conscious decision needs to be made regarding the original 23 risks. The World Economic Forum has expanded the list to 35 risks, many of which are more detailed versions of the original set. However, some new risks should be considered for this survey.

The survey should continue to probe risk combinations and staffing levels.

Appendix I - Glossary of Risks

The following 23 core risks were defined in Global Risks 2007: A Global Risk Network Report, and can be found at www.weforum.org/pdf/CSI/Long_Global_Risk_Report_2007.pdf. What follows is a summary of the risks.

23 risks

Economic

- Oil price shock
- Fall in value of US \$
- Chinese economic hard landing
- Fiscal crises caused by demographic shift
- Blow up in asset prices

Environmental

- Climate change
- Loss of freshwater services
- Natural catastrophe: Tropical storms
- Natural catastrophe: Earthquakes
- Natural catastrophe: Inland flooding

Geopolitical

- International terrorism
- Proliferation of weapons of mass destruction (WMD)
- Interstate and civil wars
- Failed and failing states
- Transnational crime and corruption
- Retrenchment from globalization
- Regional instability

Societal

- Pandemics
- Infectious diseases
- Chronic disease
- Liability regimes

Technological

- Breakdown of critical information infrastructure (CII)
- Nanotechnology

Economic Risks

- Oil price shock – Oil prices rise steeply due to major supply disruption.
- Fall in value of US dollar - US current account deficit triggers a major fall in the dollar.
- Chinese economic hard landing – China’s economic growth slows, potentially as a result of protectionism, internal political or economic difficulties.
- Fiscal crises caused by demographics shift – Aging populations in developed economies drive economic stagnation by forcing governments to raise taxes or borrowing.
- Blow up in asset prices – Personal assets, such as housing, collapse in the US and Europe, fueling a recession.

Environmental Risks

- Climate change – Climate change generates both extreme events and gradual changes, impacting infrastructure, agricultural yields and human lives.
- Loss of freshwater services – Water shortages impact agriculture, businesses and human lives.
- Natural Catastrophe: Tropical Storms – Hurricane or typhoon passes over heavily populated area, leading to catastrophic economic losses and/or high human death tolls.
- Natural Catastrophe: Earthquakes – Strong earthquake(s) occur in heavily populated areas.
- Natural Catastrophe: Inland Flooding – Flooding associated with rivers causes significant economic losses, fatalities and disruption.

Geopolitical Risks

- International Terrorism – Attacks disrupt economic activity, causing major human and economic losses. Indirectly, attacks aid retrenchment from globalization.
- Proliferation of Weapons of Mass Destruction – Trend fatally weakens nuclear Non-Proliferation Treaty and leads to spread of nuclear technologies.
- Interstate and civil wars – Major interstate or civil war breaks out.
- Failed and failing states – Trend of widening gap between order and disorder.
- Trans-national crime and corruption – Corruption continues to be endemic and organized crime successfully penetrates the global economy.
- Regional instability – A variety of hot spots are prevalent around the world. These include the Middle East and the Korean peninsula.
- Retrenchment from globalization – Rising concerns about cheap imports and immigration sharpen protectionism in developed countries. Emerging economies become more nationalist and state-oriented.

Societal Risks

- Pandemics – A pandemic emerges with high mortality among economically productive segments of the population.
- Infectious disease – Incidence of HIV/AIDS continues to spread geographically. Other diseases could develop.
- Chronic disease – Obesity, diabetes and cardiovascular diseases become widespread.
- Liability Regimes – US liability costs rise by multiples of GDP growth, with litigiousness spreading to Europe and Asia.

Technological Risks

- Breakdown of Critical Information Infrastructure (CII) – A major disruption of the availability, reliability and resilience of CII caused by cyber crime, terrorist attack or technical failure. Results are felt in major infrastructure: power distribution, water supply, transportation, telecommunication, emergency services and finance.

- Nanotechnology – Studies indicate health impairment due to under-regulated exposure to a class of commonly-used nanoparticles (used in paint, nano-coated clothing, cosmetics or healthcare) exhibiting unexpected, novel properties and easily entering the human body.

Appendix II - Survey Results 2010

The following includes both the survey as well as the responses. There were 141 respondents to the survey. Not all respondents answered every question. The percentages below reflect the number of responses received divided by the number who answered the specific question. Some totals may not add to 100% due to rounding.

Emerging risks have either not previously occurred or have not occurred for so long that they are not considered possible. The lack of credible historical data creates a formidable challenge for risk managers. These risks often seem obvious after they occur but are not considered in advance. Many risk managers are trying to be better prepared by identifying potential emerging risks and prioritizing those that might have the greatest potential impact on society. While completing the survey please consider a time horizon that extends beyond a business plan time frame (often 3-5 years). This survey is sponsored by the Joint Risk Management Section (Canadian Institute of Actuaries, Casualty Actuarial Society and Society of Actuaries). The complete results will be available on the Section webpage at www.soa.org. A summary article is also expected to be published in an upcoming JRMS newsletter.

Default Question Block

Previous surveys have found that respondents tend to be anchored in the present with their responses. It is thought that knowledge of that tendency will help you understand and compensate for it, so we will start by asking you about today's risks. The following questions will ask you to identify emerging risks that you expect to have the greatest impact over the next few years.

Greatest impact can have various meanings. How do you define it?

- 49 responses 35% Financial impact on the world economy
- 62 responses 44% Disruption to the world economy
- 8 responses 6% Financial impact on me personally
- 21 responses 15% Other
 - Quality of life on this planet
 - Financial impact on my company
 - Pandemic, nuclear, catastrophe, etc.
 - Greatest impact on large insurers' financial condition
 - Impact is defined relative to economic profits and/or capital
 - Financial impact to firm
 - Financial impact on my employer
 - Disruption to insurance company operation
 - Impact on viability of life insurance industry
 - Financial impact on a specific industry – in this case insurance
 - Greatest impact on my company
 - To my clients' companies
 - Societal and economic disruption

- Financial impact on company I work for
- A disruption to finances, economy, services, etc.
- Impact on my company
- Impacting US business environment
- The ones affecting wider areas for longer duration
- Financial impact on US economy
- Current and future activities of company and industry

What is the risk that currently has the greatest impact?

The 23 risks shown were developed by the World Economic Forum in 2007. More detailed definitions of these risks can be found at the World Economic Forum website (also summarized in Appendix I).

174 total responses

Economic – 64 responses (46%)

- 7 responses 5% Oil price shock
- 16 responses 11% 2 Fall in value of US \$
- 11 responses 8% T3 Chinese economic hard landing
- 10 responses 7% 5 Fiscal crises caused by demographic shift
- 20 responses 14% 1 Blow up in asset prices

Environmental – 17 responses (10%)

- 8 responses 6% Climate change
- 4 responses 3% Loss of freshwater services
- 1 responses 1% Natural catastrophe: Tropical storms
- 0 responses 0% Natural catastrophe: Earthquakes
- 1 response 1% Natural catastrophe: Inland flooding

Geopolitical – 28 responses (16%)

- 6 responses 4% International terrorism
- 6 responses 4% Proliferation of weapons of mass destruction (WMD)
- 7 responses 5% Interstate and civil wars
- 6 responses 4% Failed and failing states
- 1 responses 1% Transnational crime and corruption
- 5 responses 4% Retrenchment from globalization
- 2 responses 1% Regional instability

Societal – 5 responses (3%)

- 5 responses 4% Pandemics
- 0 responses 0% Infectious diseases
- 2 responses 1% Chronic diseases
- 0 responses 0% Liability regimes

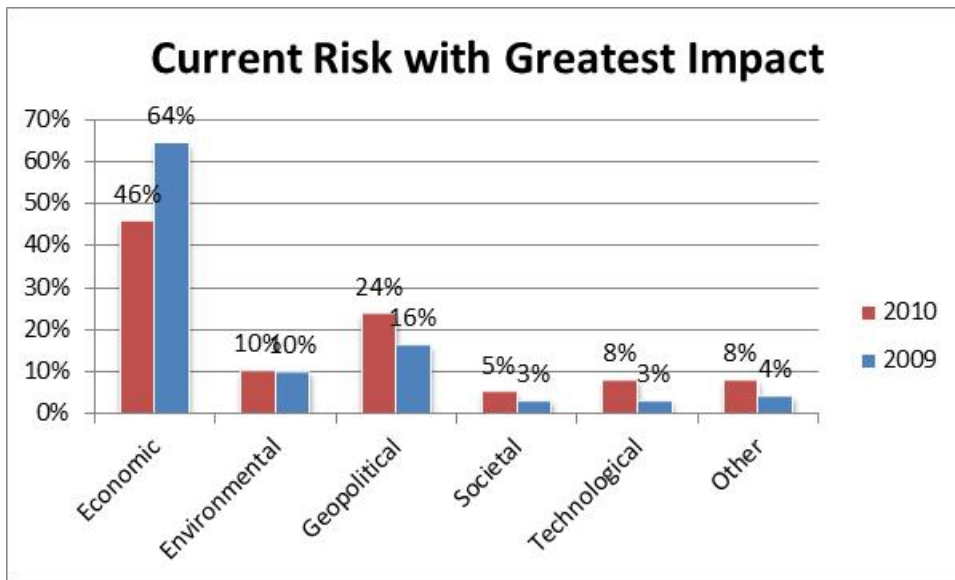
Technological – 5 responses (3%)

- 11 responses 8% T3 Breakdown of critical information infrastructure (CII)
- 0 responses 0% Nanotechnology

Other – 11 responses (8%)

- Social instability due to unemployment
- Continued growth of and dependence on government
- Failing US economy, particularly its impact on the commercial mortgage sector

- Decline in general interest rates
- Low interest rate environment
- Off balance sheet liabilities of governments in the developed world
- Fiat currencies
- Indebtedness
- Environmental damage
- Extended political, fiscal, policy &/or regulatory uncertainty



Section 1: Emerging Risks

Question 1. Please choose up to five (5) emerging risks that you feel will have the greatest impact over the next few years.

631 total responses from 134 surveys

Divisor in percentages for major categories is 631 – for individual categories it is 134.

- 0 7 surveys
- 1 1 survey (1%)
- 2 1 survey (1%)
- 3 9 surveys (7%)
- 4 14 surveys (10%)
- 5 109 surveys (81%)

Economic – 251 responses 40% (previous surveys F2009/F2008/S2008 47%/44%/44%)

- 54 responses 40% (45%)
 - 66 responses 49% (66%)
 - 55 responses 41% (33%)
 - 35 responses 26% (27%)
 - 41 responses 31% (49%)
- 4 Oil price shock
 - 1 Fall in value of US \$
 - 3 Chinese economic hard landing
 - Fiscal crises caused by demographic shift
 - Blow up in asset prices

Environmental – 62 responses 10% (12%/10%/18%)

- 34 responses 25% (27%) Climate change
- 12 responses 9% (10%) Loss of freshwater services
- 6 responses 4% (8%) Natural catastrophe: Tropical storms
- 7 responses 5% (7%) Natural catastrophe: Earthquakes
- 3 responses 2% (5%) Natural catastrophe: Inland flooding

Geopolitical – 228 responses 36% (26%/32%/18%)

- 57 responses 43% (30%) 2 International terrorism
- 24 responses 18% (14%) Proliferation of weapons of mass destruction (WMD)
- 13 responses 10% (9%) Interstate and civil wars
- 51 responses 38% (18%) 5 Failed and failing states
- 16 responses 12% (7%) Transnational crime and corruption
- 33 responses 25% (18%) Retrenchment from globalization
- 34 responses 25% (28%) Regional instability

Societal – 43 responses 7% (8%/9%/13%)

- 23 responses 17% (25%) Pandemics
- 7 responses 5% (5%) Infectious diseases
- 5 responses 4% (4%) Chronic diseases
- 8 responses 6% (6%) Liability regimes

Technological – 36 responses 6% (6%/5%/7%)

- 31 responses 23% (21%) Breakdown of critical information infrastructure (CII)
- 5 responses 4% (7%) Nanotechnology

Other – 11 responses (2%)

- Solar storms
- Pollution
- Failure of European Fiscal Union
- Decline in general interest rates
- Off balance sheet liabilities of governments in developed markets
- Fiat currencies
- Indebtedness
- Cyber crime
- Political, policy, fiscal or regulatory uncertainty
- Peak oil
- Eurozone break up

Another way to review this data is as a percent of the total responses. For example, Climate change had 34 responses in this survey. In the previous analysis just shared, $34/134 = 25\%$. In this next section we will look at $34/631 = 5\%$ and compare the results from all 4 surveys. **Bold** signifies higher than the average in the current survey and *Italics* signifies lower than the average.

Economic (43% average – 40%/47%/43%/42% November 2010, December 2009, November 2008, April 2008)

- 10% - 9%/10%/8%/13% *Oil price shock*
- 11% - 10%/14%/10%/9% *Fall in value of US \$*
- 8% - 9%/7%/6%/9% **Chinese economic hard landing**
- 6% - 6%/6%/5%/6% *Fiscal crises caused by demographic shift*
- 9% - 6%/10%/14%/5% *Blow up in asset prices*

Environmental (12% - 10%/12%/9%/17%)

- 6% - 5%/6%/5%/9% *Climate change*
- 2% - 2%/2%/2%/3% *Loss of freshwater services*
- 2% - 1%/2%/1%/2% *Natural catastrophe: Tropical storms*
- 1% - 1%/1%/1%/2% *Natural catastrophe: Earthquakes*
- 1% - 0%/1%/0%/1% *Natural catastrophe: Inland flooding*

Geopolitical (28% - 36%/26%/31%/18%)

- 6% - 9%/6%/6%/4% **International terrorism**
- 4% - 4%/3%/3%/4% *Proliferation of weapons of mass destruction (WMD)*
- 2% - 2%/2%/2%/3% *Interstate and civil wars*
- 5% - 8%/4%/6%/2% **Failed and failing states**
- 2% - 3%/2%/2%/2% **Transnational crime and corruption**
- 4% - 5%/4%/5%/2% **Retrenchment from globalization**
- 5% - 5%/6%/7%/1% *Regional instability*

Societal (9% - 7%/8%/9%/12%)

- 5% - 4%/5%/5%/6% *Pandemics*
- 2% - 1%/1%/2%/2% *Infectious diseases*
- 1% - 1%/1%/1%/2% *Chronic diseases*
- 1% - 1%/1%/1%/2% *Liability regimes*

Technological (6% - 6%/5%/4%/7%)

- 4% - 5%/4%/3%/5% **Breakdown of critical information infrastructure (CII)**
- 1% - 1%/1%/1%/2% *Nanotechnology*

Question 2. Out of these five, what one emerging risk would you rank number one as having the greatest impact?

116 total responses

Economic – 56 responses

48% (63%/65% Fall 2009/Fall 2008)

- 11 responses 9% (6%/12%) T4 *Oil price shock*
- 13 responses 11% (26%/18%) 2 *Fall in value of US \$*
- 16 responses 14% (4%/3%) 1 **Chinese economic hard landing**
- 4 responses 3% (5%/7%) *Fiscal crises caused by demographic shift*
- 12 responses 10% (22%/25%) 3 *Blow up in asset prices*

Environmental – 8 responses

7% (12%/4%)

- 5 responses 4% (6%/3%) *Climate change*
- 2 response 2% (3%/1%) *Loss of freshwater services*
- 1 responses 1% (2%/0%) *Natural catastrophe: Tropical storms*
- 0 responses 0% (1%/0%) *Natural catastrophe: Earthquakes*
- 0 responses 0% (0%/0%) *Natural catastrophe: Inland flooding*

Geopolitical – 32 responses

• 5 responses 4% (2%/3%)

• 8 responses 7% (4%/3%)

(WMD)

• 6 responses 5% (1%/1%)

• 9 responses 8% (2%/2%)

• 0 responses 0% (1%/1%)

• 3 responses 3% (1%/2%)

• 1 responses 1% (3%/4%)

Societal – 5 responses

• 4 responses 3% (2%/2%)

• 0 responses 0% (0%/0%)

• 1 responses 1% (0%/0%)

• 0 responses 0% (0%/0%)

Technological – 11 responses• 11 responses 9% (4%/6%) T4
(CII)

• 0 response 0% (1%/0%)

Other – 4 responses

- Off balance sheet liabilities of governments in developed markets
- Fiat currencies
- Political, policy, fiscal or regulatory uncertainty
- Peak oil

28% (14%/18%)

International terrorism

Proliferation of weapons of mass destruction

Interstate and civil wars

Failed and failing states

Transnational crime and corruption

Retrenchment from globalization

Regional instability

4% (2%/2%)

Pandemics

Infectious diseases

Chronic diseases

Liability regimes

9% (6%/6%)

Breakdown of critical information infrastructure

Nanotechnology

3% (3%/3%)

Question 3. Of the 23 emerging risks, are there combinations that you believe will have a large impact over the next few years? These could occur at the same time (concurrent) or follow each other (sequential). Select up to three combinations of two risks each.

Total mentions (risks are numbered)

Economic – 45% (53%/49% in previous surveys)

• 10% (13%/12%) 1 T2 Oil price shock

• 13% (18%/12%) 2 1 Fall in value of US \$

• 10% (8%/6%) 3 T2 Chinese economic hard landing

• 5% (4%/6%) 4 Fiscal crises caused by demographic shift

• 7% (11%/14%) 5 6 Blow up in asset prices

Environmental – 11% (13%/9%)

• 5% (6%/4%) 6 Climate change

• 3% (2%/2%) 7 Loss of freshwater services

• 2% (2%/2%) 8 Natural catastrophe: Tropical storms

• 1% (1%/0%) 9 Natural catastrophe: Earthquakes

• 1% (2%/1%) 10 Natural catastrophe: Inland flooding

Geopolitical – 35% (25%/32%)

- 9% (6%/8%) 11 4 International terrorism
- 4% (4%/3%) 12 Proliferation of weapons of mass destruction (WMD)
- 4% (1%/3%) 13 Interstate and civil wars
- 8% (3%/5%) 14 5 Failed and failing states
- 2% (1%/1%) 15 Transnational crime and corruption
- 4% (3%/4%) 16 Retrenchment from globalization
- 5% (6%/8%) 17 Regional instability

Societal – 5% (5%/8%)

- 2% (3%/5%) 18 Pandemics
- 2% (1%/2%) 19 Infectious diseases
- 0% (1%/1%) 20 Chronic disease
- 0% (1%/0%) 21 Liability regimes

Technological – 4% (3%/2%)

- 3% (2%/1%) 22 Breakdown of critical information infrastructure (CII)
- 0% (1%/0%) 23 Nanotechnology

Two risk combinations – 315 total responses

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1		15	11	2	6	4	4	1	0	0	8	0	1	1	1	1	2	0	0	0	0	3	0
2			24	7	10	2	0	0	0	0	3	0	0	7	1	7	1	1	0	0	0	3	0
3				1	10	0	0	0	0	0	1	0	0	2	1	7	3	0	0	0	0	0	0
4					5	2	0	1	0	0	0	0	1	6	0	1	2	2	0	0	0	1	1
5						2	0	0	0	0	0	0	0	6	0	2	1	1	0	1	1	1	0
6							7	6	1	4	1	1	1	1	0	0	1	0	0	0	0	0	0
7								0	1	0	1	0	1	1	0	0	1	1	1	0	0	0	0
8									0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
9										1	1	0	0	0	0	0	0	1	1	0	0	0	0
10											0	0	0	0	0	0	0	0	1	0	0	0	0
11												13	7	8	3	0	3	0	1	0	0	4	0
12													5	2	1	1	2	0	1	0	0	0	0
13														4	1	0	3	0	0	0	0	0	0
14															0	3	3	1	2	0	0	1	0
15																0	1	0	0	0	0	4	0
16																	3	0	0	0	0	0	0
17																		2	0	0	0	1	0
18																			5	0	0	0	0
19																				1	0	0	0
20																					0	0	1
21																						2	0
22																							1
23																							

Leading combinations were

1. 24 responses
 - Fall in value of US \$
 - Chinese economic hard landing
2. 15 responses
 - Oil price shock
 - Fall in value of US \$
3. 13 responses (not in top 5 in 2009)
 - a. International terrorism
 - b. Proliferation of weapons of mass destruction (WMD)
4. 10 responses (leading response in 2009)
 - Fall in value of US \$
 - Blow up in asset prices
5. 10 responses (not in top 5 in 2009)
 - Chinese economic hard landing
 - Blow up in asset prices
6. 8 responses
 - a. Oil price shock
 - International terrorism
7. 8 responses
 - International terrorism
 - Failed and failing states
9. 7 responses
 - Fall in value of US \$
 - Fiscal crises caused by demographic shift
10. 7 responses
 - Climate change
 - Loss of freshwater services
11. 7 responses
 - International terrorism
 - Failed and failing states
12. 7 responses
 - Fall in value of US \$
 - Failed and failing states
13. 7 responses
 - Fall in value of US \$
 - Retrenchment from globalization
14. 7 responses
 - Chinese economic hard landing
 - Retrenchment from globalization

Combinations by category

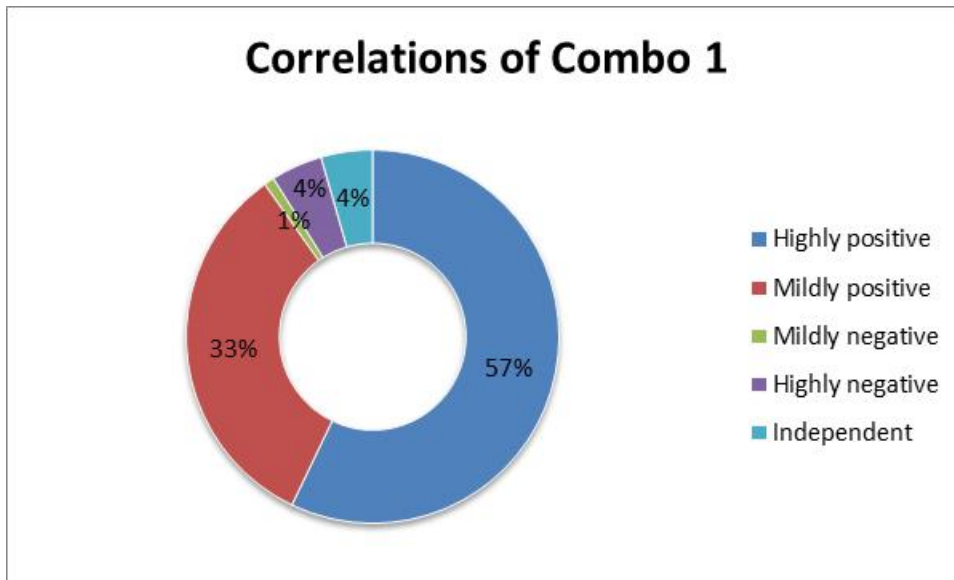
		2010	2010%	2009%	2008%
Economic	Economic	91	29%	42%	34%
Economic	Environmental	16	5%	3%	2%
Economic	Geopolitical	66	21%	16%	22%
Economic	Societal	6	2%	3%	2%
Economic	Technological	9	3%	1%	1%
Environmental	Environmental	21	7%	9%	7%
Environmental	Geopolitical	11	3%	2%	2%
Environmental	Societal	5	2%	3%	5%
Environmental	Technological	0	0%	0%	0%
Geopolitical	Geopolitical	63	20%	14%	16%
Geopolitical	Societal	7	2%	2%	4%
Geopolitical	Technological	10	3%	2%	1%
Societal	Societal	6	2%	1%	2%
Societal	Technological	3	1%	0%	1%
Technological	Technological	1	0%	1%	0%
		315	100%	99%	99%

Combinations by choice 1, 2, 3

		Combo 1	Combo 2	Combo 3	Total	Combo 1	Combo 2/3
Economics	Economics	46	25	20	91	41%	29%
Economics	Environmental	5	6	5	16	4%	5%
Economics	Geopolitical	23	28	15	66	20%	21%
Economics	Societal	2	2	2	6	2%	2%
Economics	Technological	3	3	3	9	3%	3%
Environmental	Environmental	9	7	5	21	8%	7%
Environmental	Geopolitical	3	3	5	11	3%	3%
Environmental	Societal	0	1	4	5	0%	2%
Environmental	Technological	0	0	0	0	0%	0%
Geopolitical	Geopolitical	17	24	22	63	15%	20%
Geopolitical	Societal	0	1	6	7	0%	2%
Geopolitical	Technological	3	5	2	10	3%	3%
Societal	Societal	2	2	2	6	2%	2%
Societal	Technological	0	2	1	3	0%	1%
Technological	Technological	0	0	1	1	0%	0%
		113	109	93	315	100%	100%

Question 4. For the first combination listed in Question 3, do you feel that the risks chosen will operate independently or be correlated?

- 64 responses 57% Highly positively correlated
- 37 responses 33% Mildly positively correlated
- 1 response 1% Mildly negatively correlated
- 5 responses 4% Highly negatively correlated
- 5 responses 4% Independent
- 0 responses 0% Not applicable



Question 5. Many of the emerging risks could lead to major changes in China’s financial relationship with the rest of the world. For this question, consider primarily changes in currency, commercial and investment relationships. Which risks, in your opinion, would be most likely to lead to this potential event? (please select no more than three)

113 respondents chose at least one for a total of 308 responses (2.7 average)

Economic – 224 responses (73%)

- 49 responses 16% 3 Oil price shock
- 74 responses 24% 1 Fall in value of US \$
- 70 responses 23% 2 Chinese economic hard landing
- 14 responses Fiscal crises caused by demographic shift
- 17 responses 6% 5 Blow up in asset prices

Environmental – 13 responses (4%)

- 4 responses Climate change
- 8 responses Loss of freshwater services
- 0 responses Natural catastrophe: Tropical storms
- 0 responses Natural catastrophe: Earthquakes
- 1 response Natural catastrophe: Inland flooding

Geopolitical – 58 responses (19%)

- 2 responses International terrorism
- 1 response Proliferation of weapons of mass destruction (WMD)
- 5 responses Interstate and civil wars
- 8 responses Failed and failing states
- 3 responses Transnational crime and corruption
- 29 responses 9% 4 Retrenchment from globalization
- 10 responses Regional instability

Societal – 4 responses (1%)

- 2 responses Pandemics
- 2 responses Infectious diseases
- 0 responses Chronic diseases
- 0 responses Liability regimes

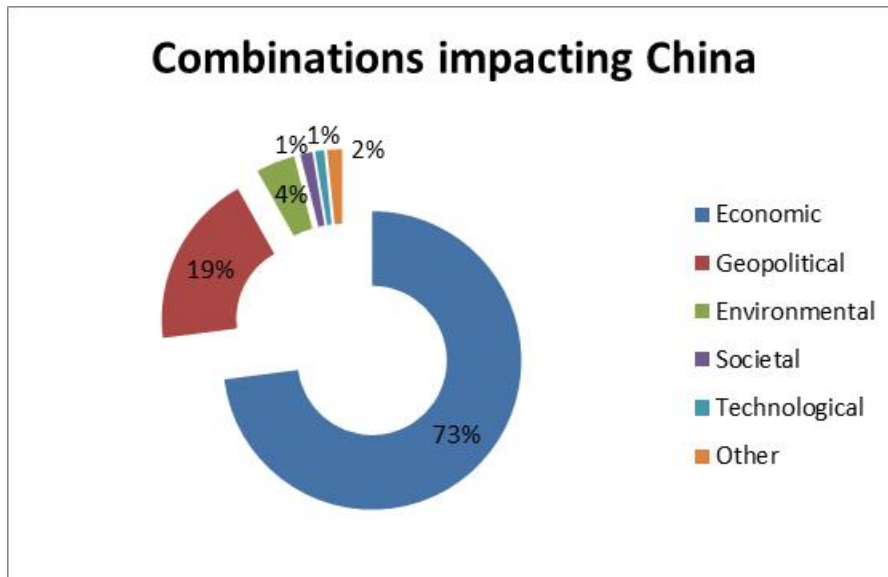
Technological – 3 responses (1%)

- 3 responses Breakdown of critical information infrastructure (CII)
- 0 responses Nanotechnology

Not Sure – 1 response (0%)

Other – 5 responses (1%)

- Falling interest rates
- Pollution (China)
- Government deficits
- Population vs. food pressures
- Eurozone break-up



Question 6. Some risk managers seek ways to exploit risk by finding opportunities to add those that are mispriced or provide diversification. Which, if any, emerging “opportunities” do you monitor?

- Acquisition, climate change/sustainability, demographic shift

- \$US
- Exchange rate opportunities
- Precious metals
- Federal Reserve activity will likely drive down US dollar, leading to increase in the quoted price of oil
- Exploit risk by finding opportunities to add those that are mispriced
- None
- None
- All
- Asset price dislocations
- Underpriced assets
- Hedging opportunities
- Generally scanning for opportunities when asset prices decline to unreasonable levels
- Potential regulatory changes affecting product design
- None
- Electromagnetic pulse from geomagnetic storm (from the sun) or high altitude nuclear attack
- Convergence of social and private protection schemes (European point of view)
- US exchange rates
- None
- Regulatory risk
- None
- Correlation
- Price of gold and commodities
- None
- Prices to insure against terrorism, nat cats and pandemic
- Fall in value of US dollar
- N/A
- None
- Fear of asset prices dropping hard/oil
- None
- None
- Diversification
- Commodities
- The commodities markets – artificially underpriced at the moment – this is supported by governments (mainly US, China and EU) – they may no longer be able to afford to do so
- None
- I watch countries to see which ones are opening up their markets to trade vs. retrenching with tariffs and other constraints
- Commodity prices, US\$, globalization/trade
- Climate change
- Market opportunities in the life insurance industry resulting from other companies becoming more capital-stressed, earnings-stressed, and growth-challenged in the

wake of poor variable annuity experience or other market melt-down balance sheet challenges

Section 2: Leading Indicators

Question 1. Once an emerging risk is identified, do you select leading indicators to measure changing likelihoods? (Example: In 2009, the threat of missiles fired by North Korea received much publicity. One company monitored investment flows to/from North or South Korea as an advance indication of this threat.)

107 responses (Fall 2009 for comparison) percentages back out those stating question is not applicable to them

- 3 responses 3% (5%) Yes for all
- 49 responses 49% (35%) Yes for some
- 13 responses 13% (19%) No
- 20 responses 20% (26%) We do not formally identify emerging risks
- 14 responses 14% (15%) Not sure
- 8 responses Not applicable

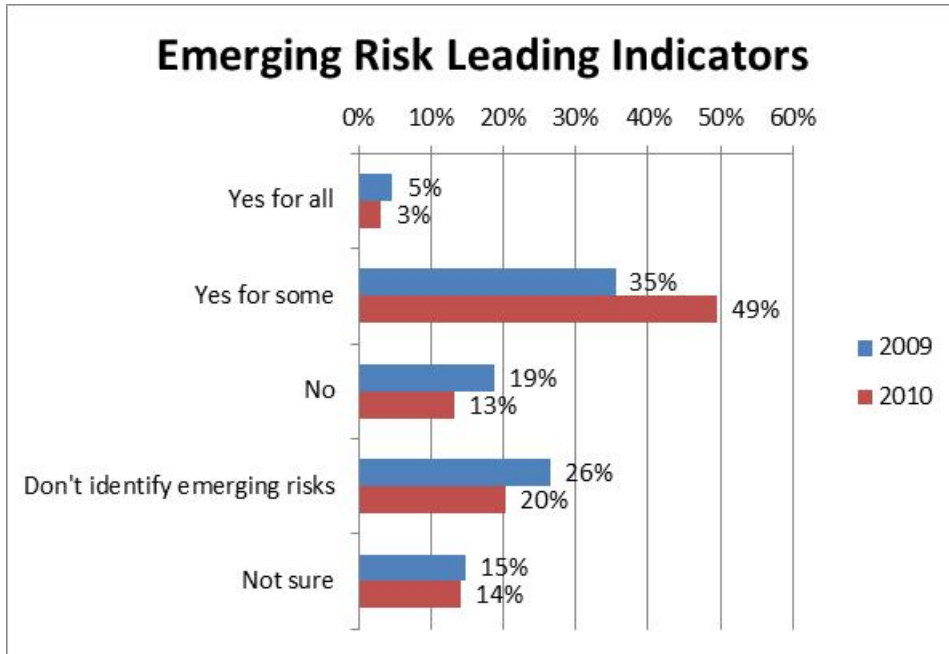
Question 2. If yes, please provide examples.

- ALM for markets/interest rates
- Analysis based upon the most comprehensive data available. Also, many “what if” scenarios considered.
- Water supplies, climate change
- Choose not to share.
- Example
- Early warning indicators (e.g., Pandemics – world wide monitoring of flu outbreaks and combinations), Exposure concentrations studies, Scenario analysis (e.g., impact of demographic shifts on insurance liability payments), market based pricing (e.g., market price of oil, currency, etc.)
- Probability of Broker Default – Watch the CDS price moves over time
- As they relate to the Employee (Group) Benefits market:/1. 2008 financial meltdown and subsequent economic downturn: ad hoc groups formed to monitor gov’t spending proposals, interest rates and employment statistics./ 2. Healthcare reform: ad hoc groups formed to analyze the law and surrounding news & research to anticipate the impact on brokers, employers and the healthcare industry (both as a buyer and supplier).
- Unemployment is a leading indicator for home price appreciation (depreciation) and mortgage defaults.
- Unfortunately, there aren’t a lot of good leading indicators. One has to get in the trenches and dig for information on a regular basis. I monitor hundreds of articles and newsletters on a daily basis concerning financial risks and international conflict. From my experience, to get serious about monitoring emerging risks

means that one must subscribe to a service such as that provided by Stratfor.Com. I run my own free service on emerging risks. Before the global financial crisis hit in 2008, there was a noticeable change in articles pointing out that disaster was coming. Not exactly a flood of articles, but enough to notice. The last straw for me was when the chief economist of Merrill Lynch produced a new report in December, 2007 indicating a 100% probability of recession in 2008. I have been noticing a similar trend in articles that point out something new is going on in the Middle East. War is coming, but it will be different this time. It will be unlike anything we've ever seen before. It is likely that this will be a huge shock. I am also picking up reports that indicate China will run into big trouble in the not too distant future. For example, just yesterday Chinese Communist elders called for free speech in China. Also the fact that China must maintain a growth rate of 8% or more in order to maintain social stability indicates that big problems are ahead. Another emerging risk that is almost impossible for people to take seriously is the possibility of nuclear war. Of course, the fact that people don't take it seriously is a warning sign. The key indicators are based on the 20th century historical signs of war. The key leading indicator is empires in decline – America. Another indicator is economic volatility, such as the volatility caused by the global economic crisis. The last indicator is ethnic conflict, such as conflict in the Middle East. When all three are present – like they are today – then the risk of a major war is very real. For example, war in the Middle East could act as a catalyst for a war involving America, Russia and China.

- Pandemic alert level
- CDS as indicator for Credit Risk, Events happening in U.K. and European insurance industry can be a leading indicator to North America regarding the regulatory risk.
- We track changes in climate and solar activity.
- Actions taken by governments to reduce pension and medical benefits for current and future retirees.
- Political risk indicators
- Inflation, government debt
- Growing hostilities between two countries
- Value of dollar. Price of gold. Size of US deficit and debt.
- For retreat of globalization, political shift in major countries.
- N/A
- We look at CDS swap spreads as an indication of the strength of sovereign debt.
- Monitoring of pandemics.
- Delphi analysis
- The amount of Euro investments China will make instead of USD
- Pandemics, WHO and CDC outputs
- We try to identify any area where there is significant increase in growth rate.
- Climate change – CO2 level in atmosphere
- Inflation can be measured by CPI, and is highly correlated with GDP and interest rates, but it is not clear which of the three will be the leading indicator, so watching them all. Our big concern is the rise in interest rates.

- Sea surface temperatures as a guide to how active a windstorm season in the Gulf of Mexico will be.



Question 3. If you identify leading indicators of emerging risks, do you have criteria for when to take action to mitigate (or accept) the risk?

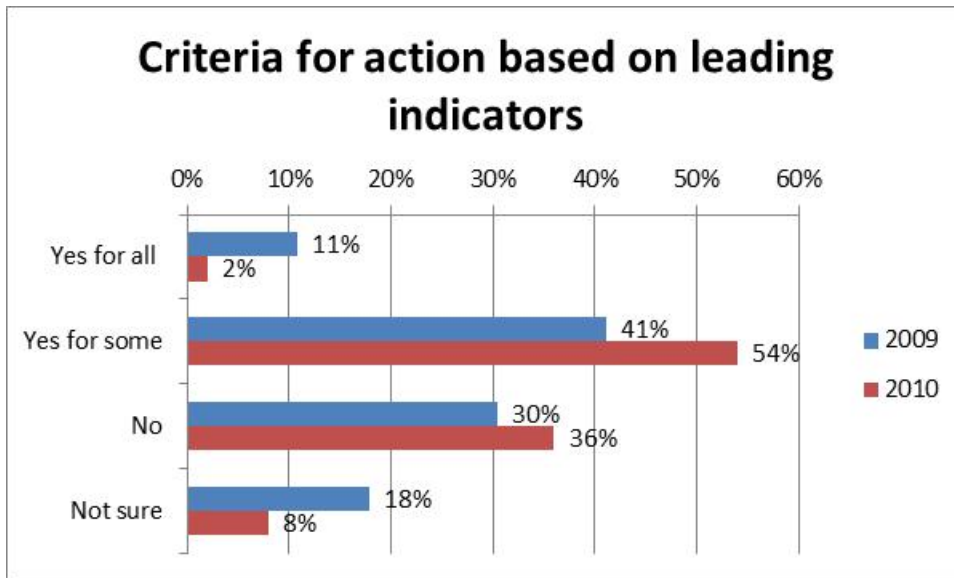
57 responses

- 1 responses 2% (10%) Yes for all
- 27 responses 54% (39%) Yes for some
- 18 responses 36% (29%) No
- 18 responses 8% (17%) Not sure
- 4 responses (5%) Not applicable

Question 4. If yes, please provide examples.

- Risk appetite and tolerance limits.
- Currently, mostly by the seat of our pants.
- Example
- Prioritization based on assessed impact and assessment relative to ERM internal impact limits.
- If the equity market exposure exceeds a risk tolerance, we will increase our hedge position. We can also re-price, stop new sales, increase fee etc.
- Product design, hedging
- Purchase gold and commodities
- N/A
- Sell USD Investments

- Pandemic – planned several scenarios for how our business would continue.
- The increase in Alt-A and Subprime production in 2006 & 2007 prompted a flag for recent vintage collateral.



Question 5. Once an emerging risk is identified, do you have a process to measure, monitor, and/or mitigate the risk?

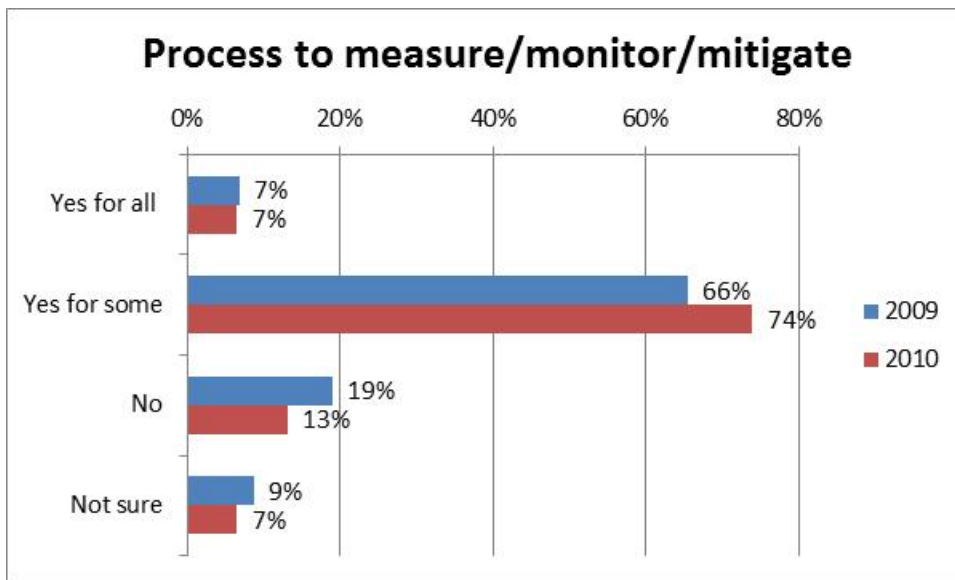
58 responses

- 3 responses 7% (7%) Yes for all
- 34 responses 74% (66%) Yes for some
- 6 responses 13% (19%) No
- 3 responses 7% (9%) Not sure

Question 6. If yes, please provide examples.

- Again, seat of the pants. Nothing that would be worthy of the North American Actuarial Journal.
- Quantify sensitivity of Economic balance sheet to plausible but highly unfavorable shock in the emerging risk factor.
- Example
- Given the large number of emerging risks, tracking, monitoring and engaging in actions to mitigate the risk requires prioritization. We have an internal team dedicated to this process for a large number of emerging risks.
- See previous answer
- Ad hoc depending on particulars of risk
- Using the previous example, the hedge position and the investment process is pre-determined. When the equity risk exposure reaches certain limit, the investment area will increase the hedge position accordingly.

- We don't need to make changes.
- Web scanning
- Purchase gold and commodities
- N/A
- Go to long term low risk investments (e.g., buying land)
- We stopped investment in recent vintage collateral
- Inflation/rising interest rates: Model the risk; monitor interest rates, CPI, GDP; hedge tail risk
- We have a regular forum where actions to monitor, mitigate and/or measure Emerging Risks are decided. Impact of a China hard landing, for example, is actioned through our Stress & Scenario testing group in conjunction with actuaries.



Section 3: Methodology

Question 1. During the recent financial crisis reliance on models was considered part of the problem. How have your modeling practices improved over the past year? (please select all that apply)

215 responses from 97 (2.2 average)

- 14 responses 17% No changes
- 33 responses 39% Communication
- 37 responses 44% Transparency
- 36 responses 43% Peer review
- 30 responses 36% More sophisticated techniques
- 5 responses 6% Less detailed
- 22 responses 26% Staffing levels
- 12 responses 14% Increased ties to market value

- 2 responses 2% Decreased ties to market value
- 13 responses Not applicable
- 11 responses 13% Other
 - Explicit consideration of deterministic tail scenarios
 - Controls -> loss of flexibility
 - More attention to tail events
 - Supplement with scenario testing
 - Less reliance on models, more reliance on imagination
 - Less use of modeling in general
 - More conservatism
 - Faster processing speed
 - Model policy requires documentation, etc.
 - More sense checks using simpler methods
 - Higher classification details for stress test manipulation

Question 2. When generating financial models for internal economic capital purposes, how many years do you run them out? (please select one)

96 responses

- 8 responses 11% Short (e.g., 1 year)
- 23 responses 30% Intermediate (e.g., 3-5 years)
- 34 responses 45% Long (e.g., 30 years)
- 7 responses 9% Not Sure
- 3 responses Not calculated
- 17 responses Not applicable
- 4 responses 5% Other
 - 1-year shock, implications modeled long-term
 - We use a variety of timeframes (e.g., 1-year MCEV, Scenario Analysis over multi-year horizon, etc.)
 - 10
 - To ultimate

Question 3. Do you include new business in your analysis for Question 2?

72 responses

- 41 responses 57% Yes
- 26 responses 36% No
- 0 responses 0% Economic capital is not calculated
- 5 responses 7% Not applicable

Question 4. What do you expect to be the primary source of modeling improvements in the next few years? (please select one)

96 responses

- 15 responses 16% Dependency metrics
- 21 responses 22% Tail Correlations (e.g., using copulas)
- 31 responses 32% Model efficiencies (fewer scenarios, faster run time)
- 16 responses 17% Not sure
- 13 responses 14% Other
 - Stochastics
 - Extreme value theory
 - Managing model risk
 - Refresh speed
 - Replicating portfolio technology
 - Black swan events
 - New software
 - Better reflection of underlying processes
 - Less faith in models
 - Consensus on economic capital modeling – 1 yr vs. run out
 - Blending stochastic models with stress/scenario testing
 - Varied correlation and interdependency modeling
 - Data granularity

Question 5. Please share instances where quantification efforts have enabled better decision making.

24 responses

- ALM
- Too early to tell
- Whether to macro hedge equity risk
- None yet
- Quantification of plausible range of losses due to tracking error and differences in realized from implied volatility made hedge solely using rebalanced futures appear less preferable than hedge with a static component.
- Quantification of tail risk by use of “quasi” extreme value theory
- Product line decision making (in/out of products)
- Improved modeling gave better assessment of guaranteed living benefits risks, leading to changes in product design to offer less risky benefits.
- Better understanding of mortality and lapse experience
- Reinsurance decision making/evaluation of new business opportunities
- Quantification efforts are used to understand the interconnectivities between various factors and to confirm some management decisions. After all, if the results don’t make sense, we’ll question if the model is working properly.

- Study of correlation among assets and assets and asset sectors led to better understanding of true risk in investment portfolio.
- We have not used quantification for decision making. We depend more on qualitative information.
- VaR Modeling of \$ impact of position limits
- New fixed rate annuity was priced stochastically using VaR and CTE measures.
- The introduction of property catastrophe models
- N/A
- Tail hedging
- Identifying and measuring volatility risk (vega).
- Catastrophe reinsurance, providing ranges around expected operating/strategic plan projections
- Better diversification using quantified classification across and within asset classes. Forced product asset allocation diversification aligned incentives with policyholders.
- Reduced exposure to pandemic risk
- Modeling interest rate tail risk resulted in hedging tail risk with swaptions.
- Capital planning; reinsurance purchase; strategy

Question 6. Please share instances where qualitative analysis has enabled better decision making.

18 responses

- Risk profile discussion and analysis
- Too early to tell
- None yet
- Analysis of likely liquidity of liabilities varying by distribution channel based on qualitative explanation of why liquidity would vary helped in liquidity planning.
- Use of heat maps to prioritize risks
- Better understanding of mortality and lapse experience
- Monitoring of risk aggregation/Supplement stochastic models
- Since historical data has limitation (or isn't relevant) to be used for future projection, qualitative analysis is always important, such as to identify the 'unexpected' events.
- Our strategic objectives were built using qualitative analysis.
- Using two models – one a very simple model to check direction and magnitude of larger model
- Qualitative inputs to quantification of asbestos liabilities/recognition that property cat models do not provide answers and must be augmented with qualitative analyses
- N/A
- Scenario analysis
- My company avoided Freddie Mac and Fannie Mae direct investments by noticing when board members dumped their stock and left the board and then

investigating further to notice that risk culture had deteriorated and lobbying and turf protection had taken over.

- Underlying credit analysis and underwriting and timely proactive exit or restructurings.
- Reduced exposure to political risk
- Showing relative cost of persisting low interest rate risk vs. rising interest rates, and showing results under two dramatically different views of interest rate volatility led to decision not to hedge low interest rate risk and not to make business decisions based on any single scenario or any single general direction of future interest rates.
- Stress and scenario testing e.g., stagflation; US downgrade

Section 4: Predictions

Question 1. Is it possible to anticipate/predict a crisis? (please select one)

96 responses

- 40 responses 56% Yes
- 15 responses 21% No
- 17 responses 24% Not sure

Unfortunately the survey did not allow both a comment and a vote. The researcher has attempted to categorize each comment into the categories Yes/No/Not sure.

- 56 responses 58% Yes
- 20 responses 21% No
- 20 responses 21% Not sure

24 comments

- Sometimes
- Anticipate = make preparations for bad luck
- Someone always makes the right guess
- It is possible to predict the “increased likelihood of a crisis” but not possible to definitively predict an actual crisis
- A few contrarians appear to see it coming, but most observers grossly underestimate the severity.
- You can likely anticipate crises in a general sense, but it’s difficult to predict how they will play out.
- Depends on the nature of the crisis
- Yes...if data is there, but it’s being ignored. No...if crisis is a result of unforeseen circumstances
- Sometimes. We knew there was a real estate bubble but few responded to it until it was too late.
- The fundamental cause of a crisis is that is very difficult to predict and be believed
- Depends on the crisis

- Limited predictive ability, generally not including ability to estimate timing or magnitude
- Not with any consistency
- It is possible to anticipate some crisis but it's a minority
- Depends on the crisis
- Sometimes, but timing difficult to predict
- Sometimes
- Sometimes
- Anticipate – yes; predict – no
- To be prepared to react is the goal
- A crisis that can be predicted may be avoidable. The point is to be prepared if an unpredicted crisis happens.
- While markets are mostly efficient, the astute investor will notice potential bubbles along the way. Even by avoiding 2 potential bubbles for each one that plays out it is a successful strategy.
- It is possible to be opportunistically defensive and proactive to dynamically adjust risk appetite to minimize losses
- Sometimes

Question 2. If you consider yourself a risk manager, is predicting the future part of your job?

94 responses

- 36 responses 63% Yes
- 21 responses 37% No
- 20 responses Not applicable

Unfortunately the survey did not allow both a comment and a vote. The researcher has attempted to categorize each comment into the categories Yes/No/Not applicable (considering multiple futures was labeled yes).

- 71 responses 77% Yes
- 21 responses 23% No
- 20 responses Not applicable

17 comments

- Yes and no. predicting the future is not part of my job. But, making sound decisions based on models (with limitation) is.
- Oracle/soothsayer is the name of that job
- Job is to predict a wide range of possible future outcomes, not to predict “the” future
- Forecasting a range of possible outcomes (not “predicting”)
- Defining possible scenarios is part of my job.
- In some cases, when leading indicators are available
- Considering as many futures as possible is part of the job

- Demonstration of trends can indicate what could happen in the future.
- Rather pointing out likely developments – not so much one specific future
- No, is predicting and analyzing probability of future scenario and identifying mitigation actions
- Stress testing
- Not right wording choice
- Contemplating possible futures and laying out contingency plans is part of the job, not predicting the exact future.
- To be prepared to react is the goal
- While a risk manager should have a view of the future, he should be prepared for any realization of that future.
- It is possible to be opportunistically defensive and proactive to dynamically adjust risk appetite to minimize losses
- Yes but with difficulty

Section 5: Current topics

Question 1. Do you manage your personal investments?

94 responses

- 63 responses 67% (71%) Yes, for more than 50% of portfolio
- 14 responses 15% (13%) No
- 17 responses 18% (16%) Yes, for less than 50% of portfolio

Question 2. Currently, your personal investment portfolio is:

95 responses

- 39 responses 41% (36%/26%) More conservative than usual
- 41 responses 43% (48%/54%) Same as usual
- 8 responses 8% (11%/20%) More aggressive than usual
- 0 responses 0% (2%/0%) Not sure
- 7 responses 7% (2%/0%) Prefer not to answer

Question 3. Your expectations for the 2011 global economy are:

94 responses percentages are expectations for 2011 and previous expectations for 2010/2009

- 22 responses 23% (21%/61%) Poor
- 61 responses 65% (65%/35%) Moderate
- 9 responses 10% (13%/3%) Good
- 0 responses 0% (1%/0%) Strong
- 2 responses 2% (0%/1%) Not sure

Question 4. Did you experience a change in the level of ERM-focused activities for your organization or clients in 2010? (comparison is to similar question asked a year ago regarding anticipated changes, so the reader can think of it as an actual to expected comparison)

94 responses

- 62 responses 66% (66%/65%) Increased
- 1 responses 1% (1%/3%) Decreased
- 20 responses 21% (23%/21%) Stayed the same
- 3 responses 3% (9%/10%) Not sure
- 8 responses Not applicable

Question 5. Did your internal ERM staff increase in 2009?

94 responses

- 34 responses 41% (36%) Yes
- 34 responses 41% (56%) No
- 14 responses 17% (8%) Not sure
- 12 responses Not applicable

Question 6. Do you anticipate a change in the level of ERM-focused activities for your organization or clients in 2011 relative to 2010?

94 responses

- 56 responses 64% (62%/65%) Increase
- 1 response 1% (1%/3%) Decrease
- 25 responses 28% (30%/21%) Stay the same
- 6 responses 7% (6%/10%) Not sure
- 6 responses Not applicable

Question 7. Do you anticipate a change in the level of funding dedicated to ERM-focused activities for your organization or clients in 2011 relative to 2010?

94 responses

- 36 responses 41% (49%/33%) Increase
- 3 responses 3% (2%/8%) Decrease
- 37 responses 43% (39%/48%) Stay the same
- 11 responses 13% (10%/11%) Not sure
- 7 responses Not applicable

Question 8. Why do you use external experts for ERM? (please select all that apply)

109 responses from 88 surveys (1.2 average)

- 39 responses 36% Don't use external experts
- 34 responses 31% Topical expertise
- 28 responses 26% Outside perspective
- 8 responses 8% Other
 - Validation/review
 - Validation
 - Solvency II
 - Peer Review, comparison to industry
 - Validation
 - Model peer review
 - Model usage and validation

Section 6: Demographics

If you are retired, respond based on your most recent career path.

Question 1: What credentials do you currently hold? (please select all that apply)

212 responses from 96 surveys (2.2 average)

Percentages are based on 96 surveys.

- 22 responses 24% (28%/27% in previous surveys) CERA
- 63 responses 69% (87%) FSA/ASA
- 12 responses 13% (17%) FCAS/ACAS
- 13 responses 14% (13%) FCIA
- 41 responses 45% MAAA
- 4 responses 4% (2%) PRM
- 2 responses 2% (4%) FRM
- 12 responses 13% (12%) CFA
- 2 responses 2% FIA
- 2 responses 2% FIAA
- 9 responses 10% MBA
- 2 responses 2% CPA
- 7 responses 8% PhD
- 5 responses 5% Other actuarial credential (please specify)
 - 1 SAV-ONA – Switzerland
 - 2 Aktuar (DAV) – Germany
 - 1 Italian Actuarial Certification
 - 1 Actuaire Qualifie (France)
 - 1 Austrian
 - 1 AIA
- 11 responses 12% Other non-actuarial credential (please specify)
 - MSc

- ChFC
- PMP
- FLMI (4)
- FFSI
- CLU (2)
- MPA
- MA
- JD
- CQF
- RHU

Question 2: How long have you been a risk manager?

93 responses

- 29 responses 31% (31%) Not applicable
- 14 responses 15% (15%) Less than 3 years
- 28 responses 30% (27%) 3-10 years
- 22 responses 24% (26%) More than 10 years

Question 3. Employer type (please select all that apply)

105 responses with 94 unique (1.1 average)

- 16 responses 17% (21%/17%) Consultant
- 2 responses 2% (3%/1%) Software
- 1 responses 1% (3%/2%) Banking
- 4 responses 4% (3%/4%) Brokerage
- 2 responses 2% (3%/1%) Intermediary
- 65 responses 69% (54%/70%) Insurance/Reinsurance Company
- 2 responses 2% (4%/7%) Asset Management
- 4 responses 4% (3%/3%) Regulator/Rating Agency
- 6 responses 6% (3%/4%) Academic
- 1 response 1% (0%/0%) Manufacturing/Services
- 0 responses Energy
- 2 responses 2% (4%/3%) Other
 - Service provider
 - Commodity trade

Question 4: Primary Region (please select one)

94 responses

- 5 responses 5% (7%) Europe
- 75 responses 80% (82%) North America
- 3 responses 3% (0%) South America
- 2 responses 2% (6%) Asia
- 1 response 1% (1%) Africa

- 2 response 2% (1%) Middle East
- 3 responses 3% (1%) Caribbean/Bermuda
- 2 responses 2% (2%) Australia/Pacific
- 1 responses 1% (0%) Other
 - Worldwide sales

Question 5: Primary area of practice (please select one)

93 responses

- 41 responses 44% (41%/38%) Life
- 16 responses 17% (19%/13%) Prop/Cas (Gen'l Insurance, Non-Life)
- 2 responses 2% (2%/2%) Pension
- 6 responses 6% (8%/3%) Health
- 1 response 1% Financial Services (non Insurance)
- 1 response 1% Manufacturing
- 0 responses 0% Services
- 24 responses 26% (20%/33%) Risk Management
- 1 response 1% (3%/3%) Generalist/Academic
- 1 response 1% (3%/2%) Other
 - Investment Portfolio Management

Question 6. Which of these groups/sections of the SOA and its partners do you belong to?

206 responses from 58 surveys (3.6 average)

- 61 responses 75% (85%/85%) Joint Risk Management Section
- 35 responses 43% (46%/47%) Investment Section
- 34 responses 42% (42%/40%) Financial Reporting Section
- 3 responses 4% (3%/4%) Pension Section
- 11 responses 14% (13%/12%) Health Section
- 12 responses 15% (22%/13%) International Section
- 9 responses 11% (8%/12%) Forecasting and Futurism Section
- 23 responses 28% (28%) Reinsurance Section
- 18 responses 22% (15%/20%) International Network of Actuarial Risk Managers (INARM)

Question 7. Do you have any comments or suggestions for future iterations of this survey?

- Provide a facility for changing responses
- Shorter
- Make it possible to back up and edit responses.
- Survey seem reasonable...
- NO

- Importance of the emerging risks under consideration depends on the line of business one looks at. Suggestion to formulate corresponding questions accordingly.
- Regulatory reform, healthcare reform, pension reform, politics and country risk.

Thanks for your participation!

[Researcher's notes for future questions]

Add questions getting at

- For demographics ask specifically if respondent does not have an actuarial credential
- Does an emerging risk leading indicator ever get dropped? Why?
- What blogs and other sources do you follow?
- What actions have been taken because of work done on emerging risks?

Appendix III - Survey Results 2009

The following includes both the survey as well as the responses. There were 178 respondents to the survey. Not all respondents answered every question. The percentages below reflect the number of responses received divided by the number who answered the specific question. Some totals may not add to 100% due to rounding.

Emerging risks have either not previously occurred or have not occurred for so long that they are not considered possible. With no credible historical data, these risks challenge risk managers. They often seem obvious after they occur but are not considered in advance. Many risk managers are trying to be better prepared by identifying potential emerging risks and prioritizing those that might have the greatest potential impact on society. This survey is sponsored by the Joint Risk Management Section (Canadian Institute of Actuaries, Casualty Actuarial Society and Society of Actuaries). The complete results will be available on the Section webpage at www.soa.org. A summary article is also expected to be published in an upcoming JRMS newsletter. Thanks for participating.

Default Question Block

What is the top current risk?

The 23 risks shown were developed by the World Economic Forum in 2007. More detailed definitions of these risks can be found at the World Economic Forum website (also summarized in Appendix I).

174 total responses

Economic – 112 responses (64%)

- 8 responses 5% Oil price shock/energy supply interruptions
- 29 responses 17% 2 US current account deficit/fall in US dollar
- 10 responses 6% 5 Chinese economic hard landing
- 13 responses 7% T3 Fiscal crises caused by demographic shift
- 52 responses 30% 1 Blow up in asset prices/excessive indebtedness

Environmental – 17 responses (10%)

- 13 responses 7% T3 Climate change
- 3 responses 2% Loss of freshwater services
- 0 responses 0% Natural catastrophe: Tropical storms
- 1 responses 1% Natural catastrophe: Earthquakes
- 0 response 0% Natural catastrophe: Inland flooding

Geopolitical – 28 responses (16%)

- 5 responses 3% International terrorism
- 5 responses 3% Proliferation of weapons of mass destruction (WMD)
- 5 responses 3% Interstate and civil wars
- 5 responses 3% Failed and failing states
- 2 responses 1% Transnational crime and corruption
- 1 responses 1% Retrenchment from globalization
- 5 responses 3% Middle East instability

Societal – 5 responses (3%)

- 5 responses 3% Pandemics
- 0 responses 0% Infectious diseases in the developing world
- 0 responses 0% Chronic disease in the developed world
- 0 responses 0% Liability regimes
- Technological – 5 responses (3%)**
- 5 responses 3% Breakdown of critical information infrastructure (CII)
- 0 responses 0% Emergence of risks associated with nanotechnology

Other – 7 responses (4%)

- Potential power grid sabotage
- Runaway Washington spending
- Double dip recession/very prolonged levels of excess capacity in economy
- Prolonged low interest rates
- Underutilized productive capacity
- Inability of political process to address the other 23 risks
- Operational risk

Section 1: Emerging Risks

Question 1. Please choose up to 5 emerging risks that you feel will have the greatest impact over the next few years.

793 total responses from 168 surveys

Divisor in percentages for major categories is 793 – for individual categories it is 168.

- 0 8 surveys
- 1 1 survey (1%)
- 2 3 surveys (2%)
- 3 8 surveys (5%)
- 4 18 surveys (11%)
- 5 138 surveys (82%)

Economic – 370 responses 47% (previous surveys F2008/S2008 44%/44%)

- 76 responses 45% (39%) 3 Oil price shock/energy supply interruptions
- 111 responses 66% (48%) 1 US current account deficit/fall in US dollar
- 56 responses 33% (27%) 4 Chinese economic hard landing
- 45 responses 27% (22%) Fiscal crises caused by demographic shift
- 82 responses 49% (64%) 2 Blow up in asset prices/excessive indebtedness

Environmental – 94 responses 12% (10%/18%)

- 45 responses 27% (25%) Climate change
- 17 responses 10% (10%) Loss of freshwater services
- 13 responses 8% (3%) Natural catastrophe: Tropical storms
- 11 responses 7% (4%) Natural catastrophe: Earthquakes
- 8 responses 5% (1%) Natural catastrophe: Inland flooding

Geopolitical – 161 responses 26% (32%/18%)

- 50 responses 30% (29%) 5 International terrorism

- 24 responses 14% (13%) Proliferation of weapons of mass destruction (WMD)
- 15 responses 9% (10%) Interstate and civil wars
- 30 responses 18% (26%) Failed and failing states
- 12 responses 7% (8%) Transnational crime and corruption
- 30 responses 18% (25%) Retrenchment from globalization
- 47 responses 28% (34%) Middle East instability

Societal – 67 responses 8% (9%/13%)

- 42 responses 25% (22%) Pandemics
- 8 responses 5% (9%) Infectious diseases in the developing world
- 7 responses 4% (6%) Chronic disease in the developed world
- 10 responses 6% (4%) Liability regimes

Technological – 46 responses 6% (5%/7%)

- 35 responses 21% (16%) Breakdown of critical information infrastructure (CII)
- 11 responses 7% (6%) Emergence of risks associated with nanotechnology

Other – 8 responses (1%)

- Infrastructure failures
- Pricing of generic drugs
- Economic instability and low growth
- Digital crime
- 2008 crisis recovery policies fail, re-enter recession
- Growing income disparity
- Regulatory risk
- Operational risk

Another way to review this data is as a percent of the total responses. For example, Climate change had 45 responses in this survey. In the previous analysis just shared, $45/168 = 27\%$. In this next section we will look at $45/793 = 6\%$ and compare the results from all 3 surveys. **Bold** signifies higher than the average in the current survey

Economic (44% average – 47%/43%/42% December 2009, November 2008, April 2008)

- 10% - 10%/8%/13% Oil price shock/energy supply interruptions
- 11% - 14%/10%/9% **US current account deficit/fall in US dollar**
- 7% - 7%/6%/9% Chinese economic hard landing
- 6% - 6%/5%/6% Fiscal crises caused by demographic shift
- 10% - 10%/14%/5% Blow up in asset prices/excessive indebtedness

Environmental (13% - 12%/9%/17%)

- 7% - 6%/5%/9% Climate change
- 2% - 2%/2%/3% Loss of freshwater services
- 2% - 2%/1%/2% Natural catastrophe: Tropical storms
- 1% - 1%/1%/2% Natural catastrophe: Earthquakes
- 1% - 1%/0%/1% Natural catastrophe: Inland flooding

Geopolitical (25% - 26%/31%/18%)

- 5% - 6%/6%/4% **International terrorism**
- 3% - 3%/3%/4% Proliferation of weapons of mass destruction (WMD)
- 2% - 2%/2%/3% Interstate and civil wars
- 4% - 4%/6%/2% Failed and failing states

- 2% - 2%/2%/2% Transnational crime and corruption
- 4% - 4%/5%/2% Retrenchment from globalization
- 5% - 6%/7%/1% **Middle East instability**

Societal (10% - 8%/9%/12%)

- 5% - 5%/5%/6% Pandemics
- 2% - 1%/2%/2% Infectious diseases in the developing world
- 1% - 1%/1%/2% Chronic disease in the developed world
- 1% - 1%/1%/2% Liability regimes

Technological (6% - 5%/4%/7%)

- 4% - 4%/3%/5% Breakdown of critical information infrastructure (CII)
- 1% - 1%/1%/2% Emergence of risks associated with nanotechnology

Question 2. Out of these five, what one emerging risk would you rank number one as having the greatest impact?

157 total responses

Economic – 99 responses

63% (65% in last survey)

- 10 responses 6% (12%) T3 Oil price shock/energy supply interruptions
- 41 responses 26% (18%) 1 US current account deficit/fall in US dollar
- 6 responses 4% (3%) Chinese economic hard landing
- 8 responses 5% (7%) 5 Fiscal crises caused by demographic shift
- 34 responses 22% (25%) 2 Blow up in asset prices/excessive indebtedness

Environmental – 19 responses

12% (4%)

- 10 responses 6% (3%) T3 Climate change
- 5 response 3% (1%) Loss of freshwater services
- 3 responses 2% (0%) Natural catastrophe: Tropical storms
- 1 responses 1% (0%) Natural catastrophe: Earthquakes
- 0 responses 0% (0%) Natural catastrophe: Inland flooding

Geopolitical – 22 responses

14% (18%)

- 3 responses 2% (3%) International terrorism
- 7 responses 4% (3%) Proliferation of weapons of mass destruction (WMD)
- 1 responses 1% (1%) Interstate and civil wars
- 3 responses 2% (2%) Failed and failing states
- 1 responses 1% (1%) Transnational crime and corruption
- 2 responses 1% (2%) Retrenchment from globalization
- 5 responses 3% (4%) Middle East instability

Societal – 3 responses

2% (2%)

- 3 responses 2% (2%) Pandemics
- 0 responses 0% (0%) Infectious diseases in the developing world
- 0 responses 0% (0%) Chronic disease in the developed world
- 0 responses 0% (0%) Liability regimes

Technological – 9 responses

6% (6%)

- 7 responses 4% (6%) Breakdown of critical information infrastructure (CII)
- 2 response 1% (0%) Emergence of risks associated with nanotechnology

Other – 5 responses

3% (3%)

- Pricing of generic drugs

- Economic instability and low growth
- 2008 crisis recovery policies fail, re-enter recession
- Regulatory risk
- Operational risk

Question 3. Of the 23 emerging risks, are there combinations that you believe will have a large impact over the next few years? These could occur at the same time (concurrent) or follow each other (sequential). Select up to three combinations of two risks each.

Total mentions (risks are numbered) (Fall 2009/Fall 2008)

Economic – 45% (53%/49% in last survey)

- 9% (13%/12%) 1 T3 Oil price shock/energy supply interruptions
- 13% (18%/12%) 2 1 Fall in value of US \$
- 10% (8%/6%) 3 2 Chinese economic hard landing
- 5% (4%/6%) 4 Fiscal crises caused by demographic shift
- 7% (11%/14%) 5 3 Blow up in asset prices

Environmental – 11% (13%/9%)

- 4% (6%/4%) 6 Climate change
- 3% (2%/2%) 7 Loss of freshwater services
- 2% (2%/2%) 8 Natural catastrophe: Tropical storms
- 1% (1%/0%) 9 Natural catastrophe: Earthquakes
- 1% (2%/1%) 10 Natural catastrophe: Inland flooding

Geopolitical – 35% (25%/32%)

- 9% (6%/8%) 11 T3 International terrorism
- 4% (4%/3%) 12 Proliferation of weapons of mass destruction (WMD)
- 4% (1%/3%) 13 Interstate and civil wars
- 8% (3%/5%) 14 5 Failed and failing states
- 2% (1%/1%) 15 Transnational crime and corruption
- 4% (3%/4%) 16 Retrenchment from globalization
- 5% (6%/8%) 17 Regional instability

Societal – 5% (5%/8%)

- 2% (3%/5%) 18 Pandemics
- 2% (1%/2%) 19 Infectious diseases
- 0% (1%/1%) 20 Chronic disease
- 0% (1%/0%) 21 Liability regimes

Technological – 4% (3%/2%)

- 3% (2%/1%) 22 Breakdown of critical information infrastructure (CII)
- 0% (1%/0%) 23 Nanotechnology

Two risk combinations - 315 total check this table row sum not equal to column sum

responses

315	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1		15	11	2	6	4	4	1	0	0	8	0	1	1	1	1	2	0	0	0	0	3	0
2			24	7	10	2	0	0	0	0	3	0	0	7	1	7	1	1	0	0	0	3	0
3				1	10	0	0	0	0	0	1	0	0	2	1	7	3	0	0	0	0	0	0
4					5	2	0	1	0	0	0	0	1	6	0	1	2	2	0	0	0	1	1
5						2	0	0	0	0	0	0	0	6	0	2	1	1	0	1	1	1	0
6							7	6	1	4	1	1	1	1	0	0	1	0	0	0	0	0	0
7								0	1	0	1	0	1	1	0	0	1	1	1	0	0	0	0
8									0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
9										1	1	0	0	0	0	0	0	1	1	0	0	0	0
10											0	0	0	0	0	0	0	0	1	0	0	0	0
11												13	7	8	3	0	3	0	1	0	0	4	0
12													5	2	1	1	2	0	1	0	0	0	0
13														4	1	0	3	0	0	0	0	0	0
14															0	3	3	1	2	0	0	1	0
15																0	1	0	0	0	0	4	0
16																	3	0	0	0	0	0	0
17																		2	0	0	0	1	0
18																			5	0	0	0	0
19																				1	0	0	0
20																					0	0	1
21																						2	0
22																							1
23																							

Leading combinations are

- 24 responses
 - Fall in value of US \$
 - Chinese economic hard landing
- 15 responses
 - Oil price shock/energy supply interruptions
 - Fall in value of US \$
- 13 responses
 - International terrorism
 - Proliferation of weapons of mass destruction (WMD)
- 11 responses
 - Oil price shock/energy supply interruptions
 - Chinese economic hard landing
- 10 responses
 - Fall in value of US \$
 - Blow up in asset prices
- 10 responses
 - Chinese economic hard landing
 - Blow up in asset prices
- 8 responses
 - Oil price shock/energy supply interruptions
 - International terrorism
- 8 responses
 - International terrorism
 - Failed and failing states
- 7 responses

- Fall in value of US \$
- Fiscal crises caused by demographic shift
- 7 responses
 - Climate change
 - Loss of freshwater services
- 7 responses
 - International terrorism
 - Interstate and civil wars
- 7 responses
 - Fall in value of US \$
 - Failed and failing states
- 7 responses
 - Fall in value of US \$
 - Retrenchment from globalization
- 7 responses
 - Chinese economic hard landing
 - Retrenchment from globalization

Combinations by category

		2010	2010%	2009%	2008%
Economic	Economic	91	29%	42%	34%
Economic	Environmental	16	5%	3%	2%
Economic	Geopolitical	66	21%	16%	22%
Economic	Societal	6	2%	3%	2%
Economic	Technological	9	3%	1%	1%
Environmental	Environmental	21	7%	9%	7%
Environmental	Geopolitical	11	3%	2%	2%
Environmental	Societal	5	2%	3%	5%
Environmental	Technological	0	0%	0%	0%
Geopolitical	Geopolitical	63	20%	14%	16%
Geopolitical	Societal	7	2%	2%	4%
Geopolitical	Technological	10	3%	2%	1%
Societal	Societal	6	2%	1%	2%
Societal	Technological	3	1%	0%	1%
Technological	Technological	1	0%	1%	0%
		315	100%	99%	99%

Question 4. For the first combination listed in question 3, do you feel that the risks chosen will operate independently or be correlated?

112 responses

- 64 responses 57% Highly positively correlated
- 37 responses 33% Mildly positively correlated

- 1 responses 1% Mildly negatively correlated
- 5 responses 4% Highly negatively correlated
- 5 responses 4% Independent
- 0 responses 0% Not applicable

Question 5. Many of the emerging risks could lead to major changes in China's financial relationship with the rest of the world. For this question, consider primarily changes in currency, commercial and investment relationships. Which risks, in your opinion, would be most likely to lead to this potential event? (please select no more than three)

113 respondents chose at least one for a total of 308 responses (2.7 average)

Economic – 224 responses (73%)

- 49 responses 16% 3 Oil price shock/energy supply interruptions
- 74 responses 24% 1 US current account deficit/fall in US dollar
- 70 responses 23% 2 Chinese economic hard landing
- 14 responses Fiscal crises caused by demographic shift
- 17 responses 6% 5 Blow up in asset prices/excessive indebtedness

Environmental – 13 responses (4%)

- 4 responses Climate change
- 8 response Loss of freshwater services
- 0 responses Natural catastrophe: Tropical storms
- 0 responses Natural catastrophe: Earthquakes
- 1 responses Natural catastrophe: Inland flooding

Geopolitical – 58 responses (19%)

- 2 response International terrorism
- 1 response Proliferation of weapons of mass destruction (WMD)
- 5 responses Interstate and civil wars
- 8 responses Failed and failing states
- 3 responses Transnational crime and corruption
- 29 responses 9% 4 Retrenchment from globalization
- 10 responses Middle East instability

Societal – 4 responses (1%)

- 2 responses Pandemics
- 2 responses Infectious diseases in the developing world
- 0 responses Chronic disease in the developed world
- 0 responses Liability regimes

Technological – 3 responses (1%)

- 3 responses Breakdown of critical information infrastructure (CII)
- 0 response Emergence of risks associated with nanotechnology

Not Sure – 1 response (0%)

Other – 5 responses (2%)

- Falling interest rates
- Pollution (China)
- Government deficits

- Population vs. food pressures
- Eurozone break-up

Question 6. Some risk managers seek ways to exploit risk by finding opportunities to add those that are mispriced or provide diversification. Which, if any emerging “opportunities” do you monitor?

- Acquisition, climate change/sustainability, demographic shift
- \$US
- Exchange rate opportunities
- Precious metals
- Federal Reserve activity will likely drive down US dollar, leading to increase in the quoted price of Oil.
- Exploit risk by finding opportunities to add those that are mispriced
- None
- None
- All
- Asset pricing dislocations
- Underpriced assets
- Hedging opportunities
- Generally scanning for opportunities when asset prices decline to unreasonable levels.
- Potential regulatory changes affecting product design.
- None
- Electromagnetic pulse from geomagnetic storm (from the sun) or high altitude nuclear attack
- Convergence of social and private protection schemes (European point of view)
- US exchange rates
- None
- Regulatory risk
- None
- Correlation
- Price of gold and commodities
- None
- Prices to insure against terrorism, nat cats and pandemic.
- Fall in value of US dollar
- N/A
- None
- Fear of asset prices dropping hard/oil
- None
- None
- Diversification
- Commodities

- The commodities markets – artificially underpriced at the moment – this is supported by governments (mainly US, China and EU) – they may no longer be able to afford to do so.
- None
- I watch countries to see which ones are opening up their markets to trade vs. retrenching with tariffs and other constraints.
- Commodity prices, US\$, globalization/trade
- Climate change
- Market opportunities in the life insurance industry resulting from other companies becoming more capital-stressed, earnings-stressed, and growth-challenged in the wake of poor variable annuity experience or other market melt-down balance sheet challenges.
- Euro zone fragilities; climate change; inter-state and civil wars and failing states and regional instability (for insurance opportunities)

Section 2: Leading Indicators

Question 1. Once an emerging risk is identified, do you select leading indicators to measure changing likelihoods? (Example: In 2009, the threat of missiles fired by North Korea received much publicity. One company monitored investment flows to/from North or South Korea as an advance indication of this threat.)

107 responses (percentages as a total of those responding that the question is applicable to them – 2009 for comparison)

- 3 responses 3% (5%) Yes for all
- 49 responses 49% (35%) Yes for some
- 13 responses 13% (19%) No
- 20 responses 20% (26%) We do not formally identify emerging risks
- 14 responses 14% (15%) Not sure
- 8 responses Not applicable

Question 2. If yes, please provide examples.

- ALM for markets/interest rates
- Analysis based upon the most comprehensive data available. Also, many “what if” scenarios considered.
- Water supplies, climate change
- Choose not to share.
- Example
- Early warning indicators (e.g., Pandemics – world wide monitoring of flu outbreaks and combinations), Exposure concentration studies, Scenario analysis (e.g., impact of demographic shifts on insurance liability payments), market based pricing (e.g., market price of oil, currency, etc.)
- Probability of Broker Default – Watch the CDS price moves over time
- As they relate to the Employee (Group) Benefits market: 1. 2008 financial meltdown and subsequent economic downturn: ad hoc groups formed to monitor

- gov't spending proposals, interest rates and employment statistics. 2. Healthcare reform: ad hoc groups formed to analyze the law and surrounding news & research to anticipate the impact on brokers, employers and the healthcare industry (both as a buyer and supplier).
- Unemployment is a leading indicator for home price appreciation (depreciation) and mortgage defaults.
 - Unfortunately, there aren't a lot of good leading indicators. One has to get in the trenches and dig for information on a regular basis. I monitor hundreds of articles and newsletters on a daily basis concerning financial risks and international conflict. From my experience, to get serious about monitoring emerging risks means that one must subscribe to a service such as that provided by Stratfor.Com. I run my own free service on emerging risks. Before the global financial crisis hit in 2008, there was a noticeable change in articles pointing out that disaster was coming. Not exactly a flood of articles, but enough to notice. The last straw for me was when the chief economist of Merrill Lynch produced a new report in December, 2007 indicating a 100% probability of recession in 2008. I have been noticing a similar trend in articles that point out something new is going on in the Middle East. War is coming, but it will be different this time. It will be unlike anything we've ever seen before. It is likely that this will be a huge shock. I am also picking up reports that indicate China will run into big trouble in the not too distant future. For example, just yesterday Chinese Communist elders called for free speech in China. Also the fact that China must maintain a growth rate of 8% or more in order to maintain social stability indicates that big problems are ahead. Another emerging risk that is almost impossible for people to take seriously is the possibility of nuclear war. Of course, the fact that people don't take it seriously is a warning sign. The key indicators are based on the 20th century historical signs of war. The key leading indicator is empires in decline – America. Another indicator is economic volatility, such as the volatility caused by the global economic crisis. The last indicator is ethnic conflict, such as conflict in the Middle East. When all three are present – like they are today – then the risk of a major war is very real. For example, war in the Middle East could act as a catalyst for a war involving America, Russia and China.
 - Pandemic alert level
 - CDS as indicator for Credit Risk, Events happening in U.K. and European insurance industry can be a leading indicator to North America regarding the regulatory risk.
 - We track changes in climate and solar activity.
 - Actions taken by governments to reduce pension and medical benefits for current and future retirees
 - Political risk indicators
 - Inflation government debt
 - Growing hostilities between two countries
 - Value of US dollar. Price of gold. Size of US deficit and debt.
 - For retreat of globalization, political shift in major countries
 - N/A
 - We look at CDS swap spreads as an indication of the strength of sovereign debt.

- Monitoring of pandemics.
- Delphi analysis
- The amount of Euro investments China will make instead of USD
- Pandemics, WHO and CDC outputs
- We try to identify any area where there is significant increase in growth rate.
- Climate change – CO2 level in atmosphere
- Inflation can be measured by CPI, and is highly correlated with GDP and interest rates, but it is not clear which of the three will be the leading indicator, so watching them all. Our big concern is the rise in interest rates.
- Sea surface temperatures as a guide to how active a windstorm season in the Gulf of Mexico will be.

Question 3. If you identify leading indicators of emerging risks, do you have criteria for when to take action to mitigate (or accept) the risk?

57 responses

- 1 responses 2% (10%) Yes for all
- 27 responses 54% (39%) Yes for some
- 18 responses 36% (29%) No
- 4 responses 8% (17%) Not sure
- 7 responses Not applicable

Question 4. If yes, please provide examples.

- Risk appetite and tolerance limits.
- Currently, mostly by the seat of our pants.
- Example
- Prioritization based on assessed impact and assessment relative to ERM internal impact limits.
- If the equity market exposure exceeds a risk tolerance, we will increase our hedge position. We can also re-price, stop new sales, increase fee etc.
- Product design, hedging
- Purchase gold and commodities.
- N/A
- Sell USD Investments
- Pandemic – planned several scenarios for how our business would continue.
- The increase in Alt-A and Subprime production in 2006 & 2007 prompted a flag for recent vintage collateral.
- Modify product based on feedback
- I look at trends 5 to 20 years in the future. As we get within a few years of a tipping point then I start recommending that we focus more closely.
- As a regulator we would ask the institutions we supervise for their exposures and potential impact in the event the risk emerged

- Details are proprietary
- Education is the key.
- For solvency ratio risk, the company established an operational target (a little bit higher than regulatory minimum) which once falling hit the threshold, a set of predefined actions (capital injection for instance) will be taken.
- Inflation thresholds trigger investment actions.
- LOC capacity and cost
- Storage, lower gas cars...
- Determine what corrective actions are the most appropriate to take.
- Limits based on capital %
- Various “value-at-risk” type measures calibrated to pre-established thresholds/control points
- More than x% change in interest rates leads expected increase in loan defaults.
- Values outside range

Question 5. Once an emerging risk is identified, do you have a process to measure, monitor, and/or mitigate the risk?

53 responses

- 3 responses 7% (7%) Yes for all
- 34 responses 74% (66%) Yes for some
- 6 responses 13% (19%) No
- 3 responses 7% (9%) Not sure
- 7 responses Not applicable

Question 6. If yes, please provide examples.

- Again, seat of the pants. Nothing that would be worthy of the North American Actuarial Journal.
- Quantify sensitivity of Economic balance sheet to plausible but higher unfavorable shock in the emerging risk factor.
- Example
- Given the large number of emerging risks, tracking, monitoring and engaging in actions to mitigate the risk requires prioritization. We have an internal team dedicated to this process for a large number of emerging risks.
- See previous answer
- Ad hoc depending on particulars of risk
- Using the previous example, the hedge position and the investment process is pre-determined. When the equity risk exposure reaches certain limit, the investment area will increase the hedge position accordingly.
- We don't need to make changes.
- Web scanning
- Purchase gold and commodities
- N/A

- Go to long term low risk investments (e.g., buying land)
- We stopped investment in recent vintage collateral.
- Inflation/rising interest rates: Model the risk; monitor interest rates, CPI, GDP; hedge tail risk
- We have a regular forum where actions to monitor, mitigate and/or measure Emerging Risks are decided. Impact of a China hard landing, for example, is actioned through our Stress & Scenario testing group in conjunction with actuaries.

Section 3: Methodology

Question 1. During the recent financial crisis reliance on models was considered part of the problem. How have your modeling practices improved over the past year? (please select all that apply)

97 responses with 215 total choices (2.2 average)

- 14 responses 17% No changes
- 33 responses 39% Communication
- 37 responses 44% Transparency
- 36 responses 43% Peer review
- 30 responses 36% More sophisticated techniques
- 5 responses 6% Less detailed
- 22 responses 26% Staffing levels
- 12 responses 14% Increased ties to market value
- 2 responses 2% Decreased ties to market value
- 13 responses Not applicable
- 11 responses 13% Other
 - Explicit consideration of deterministic tail scenarios
 - Controls ->loss of flexibility
 - More attention to tail events
 - Supplement with scenario testing
 - Less reliance on models, more reliance on imagination
 - Less use of modeling in general
 - More conservatism
 - Faster processing speed
 - Model policy requires documentation, etc.
 - More sense checks using simpler methods
 - Higher classification details for stress test manipulation

Question 2. When generating financial models for internal economic capital purposes, how many years do you run them out? (please select one)

96 responses

- 8 responses 11% Short (e.g., 1 year)

- 23 responses 30% Intermediate (e.g., 3-5 years)
- 34 responses 45% Long (e.g., 30 years)
- 7 responses 9% Not Sure
- 3 responses Not calculated
- 17 responses Not applicable
- 4 responses 5% Other
 - 1-year shock, implications modeled long-term
 - We use a variety of timeframes (e.g., 1-year MCEV, Scenario Analysis over multi-year horizon, etc.)
 - 10
 - To ultimate

Question 3. During the recent financial crisis reliance on models was considered part of the problem. How have your modeling practices improved over the past year? (please select all that apply)

303 responses

- 61 responses 20% Peer review
- 59 responses 19% Communication
- 59 responses 19% Transparency
- 35 responses 12% More sophisticated techniques
- 31 responses 10% No changes
- 25 responses 8% Staffing levels
- 14 responses 5% Increased ties to market value
- 5 responses 2% Decreased ties to market value
- 1 response 0.3% Less detailed
- 13 responses 4% Other
 - More consideration of extreme events
 - Focused on assumptions put into models
 - Addition of deterministic sample scenarios
 - n/a (2)
 - review and recalibration to changed environment
 - independent validation
 - introduced modeling
 - Calibration – missing actual loss amounts/risks added to modeled distributions
 - SII from SI now being implemented before legislation roll-out date
 - Better documentation
 - Understanding the limitations
 - Adding behavioral risk

Question 4. When generating financial models for internal economic capital purposes, how many years do you run them out? (please select one)

144 responses

- 28 responses 19% Short (e.g., 1 year)
- 36 responses 25% Intermediate (e.g., 3-5 years)
- 40 responses 28% Long (e.g., 30 years)
- 17 responses 12% Not sure
- 9 responses 6% Not calculated
- 14 responses 10% Other
 - Not performed
 - Lifetime of risks
 - 5-15 years
 - 50 years
 - 1 underwriting year, all liabilities to extinction
 - One year risk period, combined with terminal provision that reflects lifetime run off of the business
 - Not used internally
 - Multiple time horizons
 - 1 year for some calculations and 3-5 for all but 1 other (30 yrs in this last case)

Question 5. Do you include new business in your analysis for Question 4?

113 responses

- 70 responses 62% Yes
- 39 responses 35% No
- 4 responses 4% Not calculated

Question 6. What do you expect to be the primary source of modeling improvements in the next few years? (please select one)

144 responses

- 43 responses 30% (38%) Model efficiencies (fewer scenarios, faster run time)
- 39 responses 27% (28%) Tail correlations (e.g., using copulas)
- 22 responses 15% (19%) Dependency metrics
- 30 responses 21% (7%) Not sure
- 10 responses 7% (8%) Other
 - Computer power
 - Scenario generation techniques
 - Better assumptions
 - More scenarios

- More refined loss distributions (i.e., geographic breakdown, instead of countrywide)
- Management actions
- More data
- Faster run time allowing increased sensitivities hence better understanding of key assumptions
- Scenarios
- Better reflection of reality

Last survey's comments included

- Hard to effectively model random, rare events
- Correlation understanding
- Extreme scenario modeling

Section 4: Accounting

Question 1. Which accounting regime do you expect to be prevalent in your jurisdiction 10 years from now? (please select one)

149 responses

- 67 responses 47% European Embedded Value
- 22 responses 15% US Statutory (current)
- 17 responses 12% US GAAP
- 13 responses 9% IFRS (International Financial Reporting Standards)
- 8 responses 6% Solvency II
- 5 responses 3% Market consistent embedded value
- 5 responses 3% Canadian GAAP
- 1 responses 1% US Statutory (proposed principle-based approach)
- 0 responses 0% Cash flow based principles methodology
- 1 responses 1% Not sure
- 5 responses 3% Other (no comments were received)

Section 5: Current topics

Question 1. Do you manage your personal investments?

144 responses

- 102 responses 71% Yes
- 19 responses 13% No
- 23 responses 16% Yes, for less than 50% of portfolio

Question 2. Currently, your personal investment portfolio is:

143 responses

- 52 responses 36% (26%) More conservative than usual
- 69 responses 48% (54%) Same as usual
- 16 responses 11% (20%) More aggressive than usual
- 3 responses 2% (0%) Not sure
- 3 responses 2% (0%) Prefer not to answer

Question 3. Your expectations for the 2010 global economy are:

144 responses

- 30 responses 21% (61%) Poor
- 94 responses 65% (35%) Moderate
- 18 responses 13% (3%) Good
- 2 responses 1% (0%) Strong
- 0 responses 0% (1%) Not sure

Question 4. As a result of the recent turmoil in the financial markets, did you experience a change in the level of ERM-focused activities for your organization or clients in 2009? (comparison is to similar question asked a year ago regarding anticipated changes, so the reader can think of it as an actual to expected comparison)

143 responses

- 95 responses 66% (65%) Increased
- 2 responses 1% (3%) Decreased
- 33 responses 23% (21%) Stayed the same
- 13 responses 9% (10%) Not sure

Question 5. Did your internal ERM staff increase in 2009?

142 responses

- 51 responses 36% Yes
- 80 responses 56% No
- 11 responses 8% Not sure

Question 6. Do you anticipate a change in the level of ERM-focused activities for your organization or clients in 2010 relative to 2009?

142 responses

- 88 responses 62% (65%) Increase
- 2 responses 1% (3%) Decrease
- 43 responses 30% (21%) Stay the same
- 9 responses 6% (10%) Not sure

Question 7. Do you anticipate a change in the level of funding dedicated to ERM-focused activities for your organization or clients in 2010 relative to 2009?

144 responses

- 71 responses 49% (33%) Increase
- 3 responses 2% (8%) Decrease
- 56 responses 39% (48%) Stay the same
- 14 responses 10% (11%) Not sure

Section 6: Demographics

Question 1: What credentials do you currently hold? (please select all that apply)

285 responses from 109 surveys (144 completed this section)

Percentages are based on 144 surveys.

- 40 responses 28% (27% in last survey) CERA
- 85 responses 59% FSA
- 40 responses 28% ASA
- 17 responses 12% FCAS
- 7 responses 5% ACAS
- 18 responses 13% FCIA
- 3 responses 2% PRM
- 6 responses 4% FRM
- 17 responses 12% CFA
- 31 responses 22% Other actuarial credential (please specify)
 - MAAA (20) - USA
 - FIA (8) - UK
 - FIAA (3) - Australia
 - SAV-ONA – Switzerland
 - Aktuar (DAV) - Germany
 - FASSA – South Africa
- 21 responses 15% Other non-actuarial credential (please specify)
 - CPCU (4)
 - MBA (4)
 - CPA (2)
 - PhD (2)
 - MSc
 - ChFC

- PMP

Question 2: How long have you been a risk manager?

144 responses

- 45 responses 31% Not applicable
- 22 responses 15% Less than 3 years
- 39 responses 27% 3-10 years
- 38 responses 26% More than 10 years

Question 3. Employer type (please select all that apply)

160 responses

- 34 responses 21% (17%) Consultant
- 5 responses 3% (1%) Software
- 4 responses 3% (2%) Banking
- 4 responses 3% (4%) Brokerage
- 4 responses 3% (1%) Intermediary
- 86 responses 54% (70%) Insurance
- 7 responses 4% (7%) Asset Management
- 5 responses 3% (3%) Regulator/Rating Agency
- 5 responses 3% (4%) Academic
- 0 responses 0% (0%) Manufacturing/Services
- 6 responses 4% (3%) Other
 - Reinsurance (2)
 - Energy
 - Insurance company director
 - Retired (2)

Question 4: Primary Region (please select one) – in the past survey respondents could list multiple regions where they practice

142 responses

- 10 responses 7% (7%) Europe
- 117 responses 82% (91%) North America
- 0 responses 0% (0%) South America
- 8 responses 6% (7%) Asia
- 1 response 1% (0%) Africa
- 1 response 1% (0%) Middle East
- 2 responses 1% (2%) Caribbean/Bermuda
- 3 responses 2% (6%) Australia/Pacific
- 0 responses 0% (0%) Other

Question 5: Primary area of practice (please select one)

144 responses

- 59 responses 41% (38%) Life
- 27 responses 19% (13%) Property/Casualty (General Insurance, Non-Life)
- 3 responses 2% (2%) Pension
- 11 responses 8% (3%) Health
- 5 responses 3% (4%) Finance
- 29 responses 20% (33%) Risk Management
- 5 responses 3% (3%) Generalist/Academic
- 5 responses 3% (2%) Other
 - Life/Health risk management
 - Life and Health
 - Annuities
 - M&A
 - Investments

Question 6. Which of these groups/sections of the SOA and its partners do you belong to?

377 responses

- 123 responses 85% (85%) Joint Risk Management Section
- 66 responses 46% (47%) Investment Section
- 60 responses 42% (40%) Financial Reporting Section
- 5 responses 3% (4%) Pension Section
- 19 responses 13% (12%) Health Section
- 31 responses 22% (13%) International Section
- 11 responses 8% (12%) Forecasting and Futurism Section
- 40 responses 28% (NA) Reinsurance Section
- 22 responses 15% (20%) International Network of Actuarial Risk Managers (INARM)

Question 7. Do you have any comments or suggestions for future iterations of this survey?

- Shorten it
- No (4)
- The implication of the questions is that someone believes that risks can be managed via the use of increasingly sophisticated models. In that regard, we should take heed of Warren Buffett's quote: "Beware of geeks bearing formulas." Risk management should involve both quantitative tools and qualitative observations of the world around us. What formula would have told Microsoft ten years ago that its number one risk was Google?

- Your accounting question was a poor one as globally we are all headed to IFRS for public reporting. However, for solvency reporting there may be a variety of approaches which are different (i.e., Solv II, US stat, Canadian regulatory capital, etc.).
- Investigate the kind of professionals currently involved in the ERM/for example, actuaries/accountant/CERA/FRM others.
- List of risks probably needs updating for economic developments.
- I found it hard to rank emerging risks given such a large (23 choices!) and diverse list.
- Very easy to use.
- Add a not applicable to most questions/ask by which means/systems emerging risks are identified
- Great survey – but consider self signification before constructing survey questions.
- Update list of emerging risks (add to, clarify based on current events). Clarify meaning of “greatest impact” in emerging risk questions – what scope? Add more risk measures to modeling question choices (only VaR and CTE are there).
- Questions 1 & 2 need to be clearer. Impact on what?
- Doing this periodically is a very good idea...
- Not all risks can be counted and not all counted numbers are meaningful. I thought “people” play KEY role in risk management field rather than model.
- Focus on survey of understanding and management of Operational Risk. If defined correctly, operational risk exacerbates and is most combinatorial with all the other risks mentioned in this survey.
- One technical comment: I got fouled up when I hit the “back” button of my browser. You should add a statement at the bottom of each page instructing the surveyor to not hit the back button. Other than that, this is good. I’m interested to see the results (and how they will change over time...)
- 1) “Do you have a reporting standard which you would most prefer to have in your jurisdiction?” (rather than what you think you will have) 2) definition/alternate to “few years”: if “emerging”, I’m more concerned 10-20 years out, but don’t consider that “few”.

Thanks for your participation!

[Researcher’s notes for future questions]

Add questions getting at

- Is accounting useful – why or why not?
- Section 3 Question 5 – how do you integrate new business
- For demographics ask specifically if respondent does not have an actuarial credential
- Does an emerging risk leading indicator ever get dropped? Why?