

Emerging Risks Survey - 2014



December 2015



Emerging Risks Survey - 2014

SPONSOR

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Eighth Risk Manager Survey of Emerging Risks

Risk management can be looked at in many ways—everything from how the volatility of an individual risk impacts profit distribution to how it threatens solvency. Emerging risks fall into the latter category. Risk managers seek out risks that, over a long time horizon, could have great impact on an entity's survival. By identifying these risks, a firm can start thinking about how to react if they occur. This planned resiliency can make a big difference in combatting and managing risk as time may be short and key decision-makers unavailable. It is impossible to anticipate every risk scenario, but setting up redundancies and recognizing where a firm is fragile can be the difference between survival and failure.

Some risks evolve in uncertain ways, have been forgotten in their dormancy, or are new. Known-unknowns cover risks we understand exist but where the implications are unclear. The ultimate effects of asbestos, many years after it was declared a health hazard, are still not fully understood. Unknown-knowns are a bigger problem, where we think we understand a risk distribution but do not. An example might be when a disease enters the human realm and becomes endemic without any real solution to reduce the additional mortality. These types of risks, that either act in isolation or in combination with other risks, are termed emerging. They require more thought to manage and will not look the same to all risk managers.

This survey attempts to track the thoughts of risk managers about emerging risks across time. It is the Eighth Survey of Emerging Risks conducted by the Joint Risk Management Section, a collaboration of the Canadian Institute of Actuaries, Casualty Actuarial Society, and Society of Actuaries. Trends are as important as absolute responses, helping risk managers contemplate individual risks, combinations of risks, and unintended consequences of actions. The survey responses, especially the comments, provide a tool for risk managers to network with peers and share new ways they are thinking about risk. Each iteration of the survey enhances the knowledge of those who participate by helping them think more deeply about the topic!

Note that detailed survey results can be found in Appendix II.

Executive Summary

Risk management practices continue to evolve as new techniques become available and new regulations are enacted. Some feel a new asset bubble may have formed, with leading indicators such as margin debt matching pre-crisis highs. Non-economic emerging risks dominated the news in 2014 as Geopolitical risks were driven by Russia's involvement in the former Soviet states of Crimea and Ukraine, and an Ebola outbreak in West Africa reminded us how destructive infectious diseases can be to economic growth. Cyberrisk continues to evolve in new and scary ways, with companies and governments fighting a losing battle to stay ahead of hackers. This year's Survey of Emerging Risks, the eighth, captures this shift. Geopolitical and Technological emerging risks have increased, taking share from Economic risks.

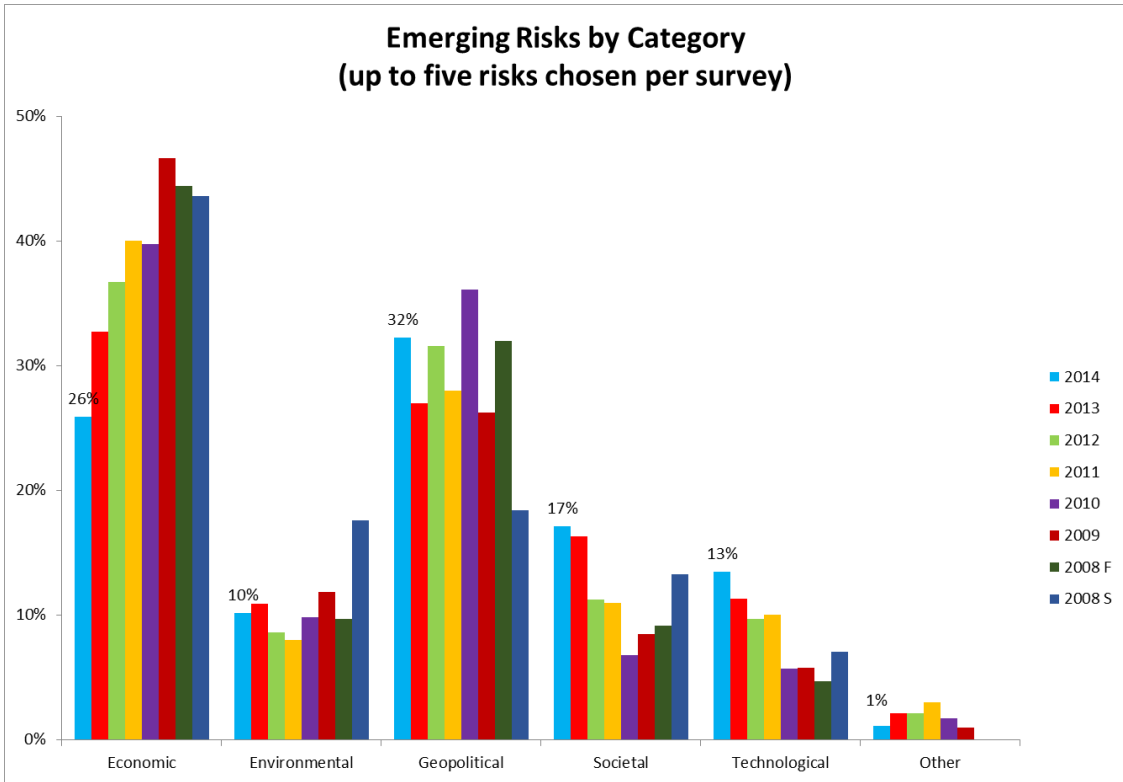
Unfortunately, the media interprets any emerging risk survey as a review of today's primary risks. This survey attempts to interpret emerging risks over a longer time horizon. Each year another data point is added. In addition, the evolving role of emerging risks in an enterprise risk management (ERM) environment is explored (often based on comments shared in prior surveys). This survey will continue to explore the perceived usefulness of emerging risks and ERM.

Emerging Risks

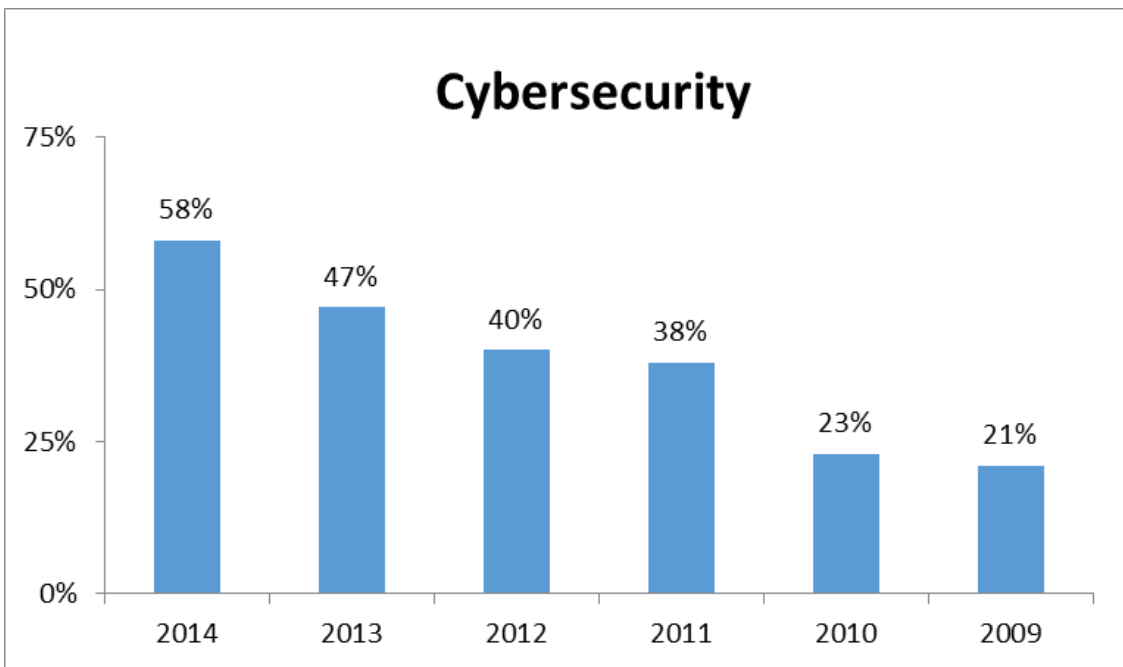
Risks that have recently occurred are most easily recalled. Respondents are reminded of this at the beginning of the survey, and the initial question looks at the top current risks before addressing those that are expected to emerge over a longer time horizon. Risk combinations also show surprises, as some risks are common when viewed with others but not by themselves.

Top Five Emerging Risks

Each time this survey is completed (spring 2008, fall 2008, then annually) there are nuanced shifts in sentiment, sometimes due to recent events and sometimes due to the evolving experience of the respondents. The Economic category of risks ceded ground to both Geopolitical and Technological risks (when up to five emerging risks were selected), falling to a low of 26 percent. The Societal (up slightly to a new high) and Environmental (down slightly) categories both recorded double-digit results. Finishing first overall (32 percent), five of the seven Geopolitical risks increased. Top choices (all in the top 10) in the category were *International terrorism* (41 percent up from 27 percent), *Regional instability* (37 percent up from 29 percent) and *Failed and failing states* (28 percent down from 29 percent). Risks with new highs across the survey history were *Interstate and civil wars* (19 percent) and *Cybersecurity/interconnectedness of infrastructure* (58 percent, overall leader). New lows were recorded by risks *Currency trend* (7 percent), *Chinese economic hard landing* (27 percent), *Financial volatility* (44 percent), *Retrenchment from globalization* (8 percent), and *Demographic shift* (23 percent).



Cybersecurity has completed its move to the top of the list of emerging risks, trending up from 21 percent in 2009 to this year's survey where 58 percent listed it among their top five emerging risks. Even five years ago the risk was receiving attention, and every year it has reached a new high point.



In most years the survey has found evidence of anchoring, where responses gravitate toward recent events. This year's results are consistent with these tendencies, driven by cyberthreats and regional tensions.

The evolution of the top four risks chosen provides evidence that trends can be relied on in this survey. The general continuity between survey iterations is very reassuring. The emergence of risks like *Cybersecurity/interconnectedness of infrastructure* (3, 3, 2 and 1 in the past four years) shows how concerns are evolving away from the Economic category. In the most recent survey, in the Economic category only *Financial volatility* made the top four after having two risks in the top five in each of the previous three surveys.

| Year | 2011 | 2012 | 2013 | 2014 |
|------|--|--|--|--|
| 1 | Financial volatility | Financial volatility | Financial volatility | Cybersecurity / interconnectedness of infrastructure |
| 2 | Failed and failing states | Regional instability | Cybersecurity / interconnectedness of infrastructure | Financial volatility |
| 3 | Cybersecurity / interconnectedness of infrastructure | Cybersecurity / interconnectedness of infrastructure | Blow up in asset prices | International terrorism |
| 4 | Chinese economic hard landing | Failed and failing states | Demographic shift | Regional instability |

Six risks increased by 5 percent or more. Among those that do not appear in the preceding chart are *Energy price shock* (7 percent to 13 percent, reversing a downward trend), *Interstate and civil wars* (13 percent to 19 percent, with issues in Ukraine and Africa, among others), and *Pandemics/infectious diseases* (19 percent to 30 percent following an Ebola outbreak). Those risks decreasing by at least 5 percent and not listed among the top four include *Currency trend* (27 percent to 7 percent), *Retrenchment from globalization* (13 percent to 8 percent), and *Demographic shift* (30 percent to 23 percent).

Respondents select from 23 risks in five categories as shown below. When a chart shows 24 risks the last one is “Other.”

Economic

1. Energy price shock
2. Currency trend
3. Chinese economic hard landing
4. Asset price collapse
5. Financial volatility

Environmental

6. Climate change
7. Loss of freshwater services
8. Natural catastrophe: tropical storms
9. Natural catastrophe: earthquakes
10. Natural catastrophe: severe weather

Geopolitical

11. International terrorism
12. Proliferation of weapons of mass destruction (WMD)
13. Interstate and civil wars
14. Failed and failing states
15. Transnational crime and corruption
16. Retrenchment from globalization
17. Regional instability

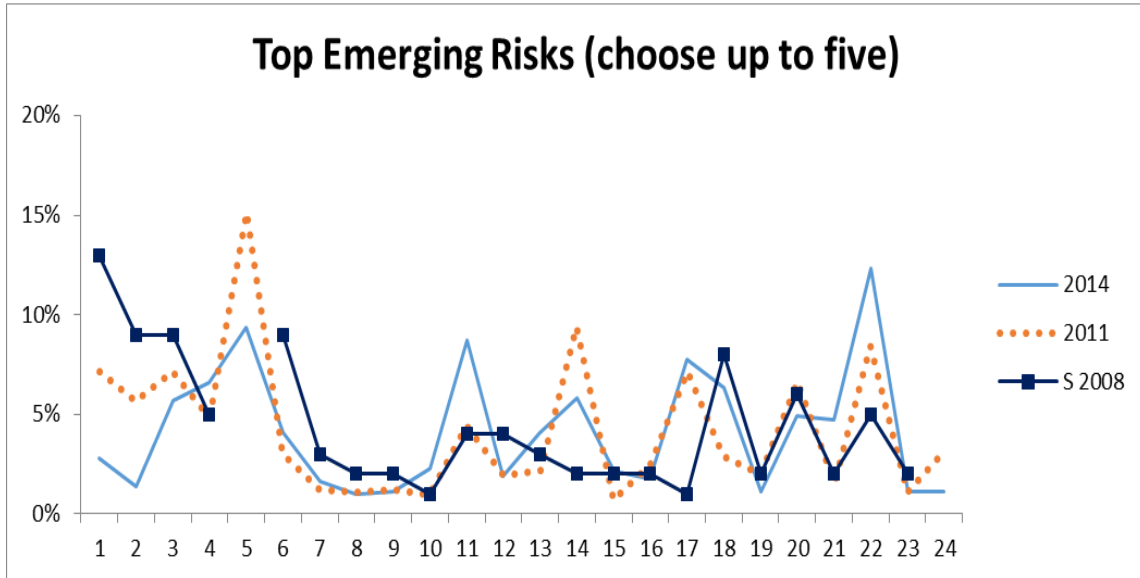
Societal

18. Pandemics/infectious diseases
19. Chronic diseases
20. Demographic shift
21. Liability regimes/regulatory framework

Technological

22. Cybersecurity/interconnectedness of infrastructure
23. Technology/space weather

These results have evolved over time by risk, with some increasing consistently (*International terrorism—risk No. 11, Cybersecurity/interconnectedness of infrastructure—risk No. 22*) and others consistently dropping (*Energy price shock—risk No. 1, Currency trend—risk No. 2*). The following chart shows an example of how the responses have changed over time, displaying results from spring 2008, 2011 and 2014.



Top Emerging Risk

When asked for a single emerging risk, the results are similar.

Top emerging risk in October 2014 (top five named by 54 percent of respondents, down from the previous survey's result in 2013 of 62 percent)

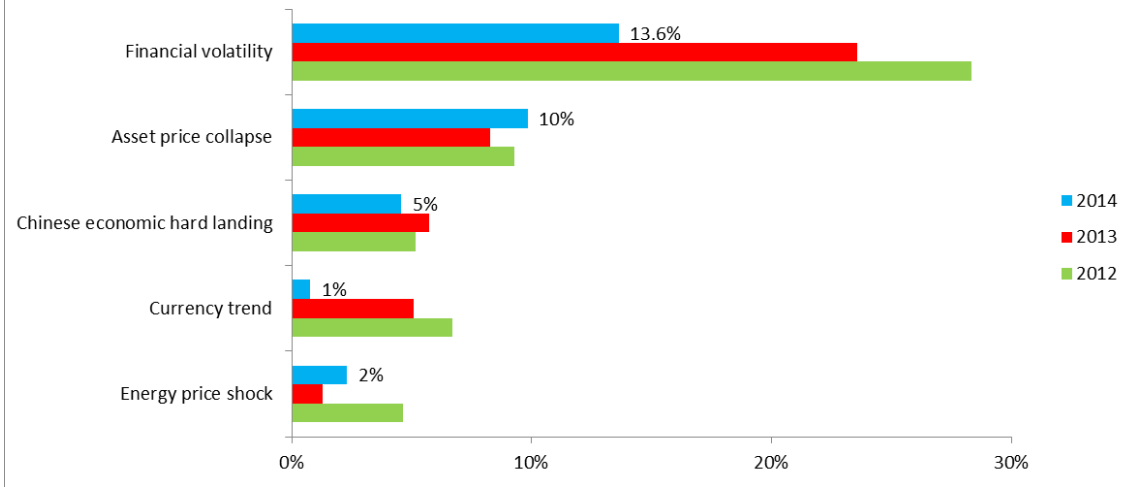
1. *Cybersecurity/interconnectedness of infrastructure* (14 percent)
2. *Financial volatility* (14 percent)
3. *Asset price collapse* (10 percent)
4. *Liability regimes/regulatory framework* (9 percent)
5. *International terrorism* (8 percent)
5. *Failed and failing states* (8 percent)

Almost all of the risks (19 out of 23) received at least one vote in this year's survey.

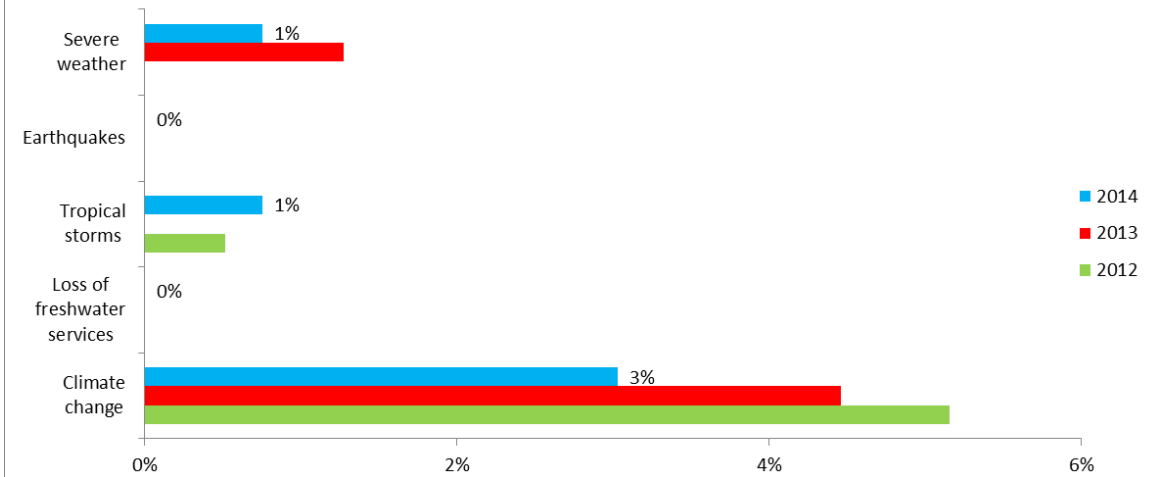
Trending

The following set of charts show results for the most recent three years by category and risk for the top emerging risk.

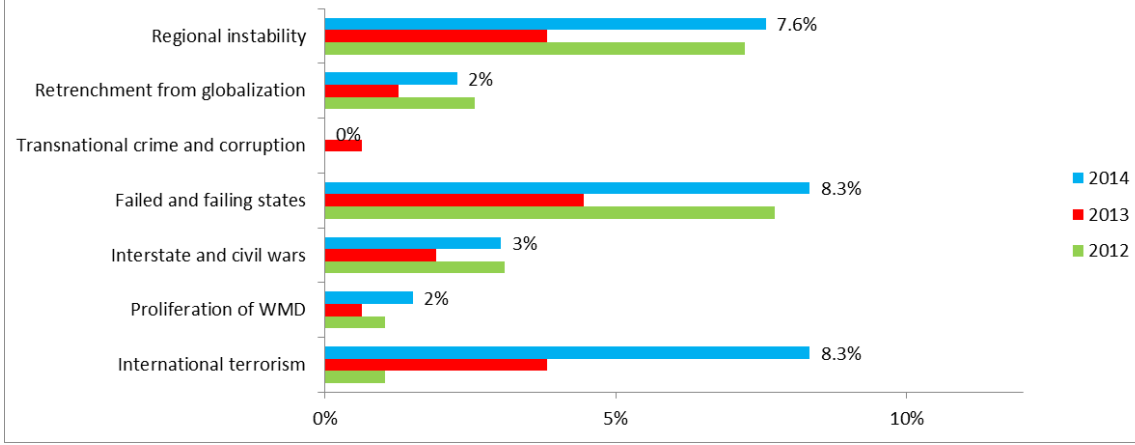
Top Emerging Risk Trends—Percent of Total Responses (Economic category)



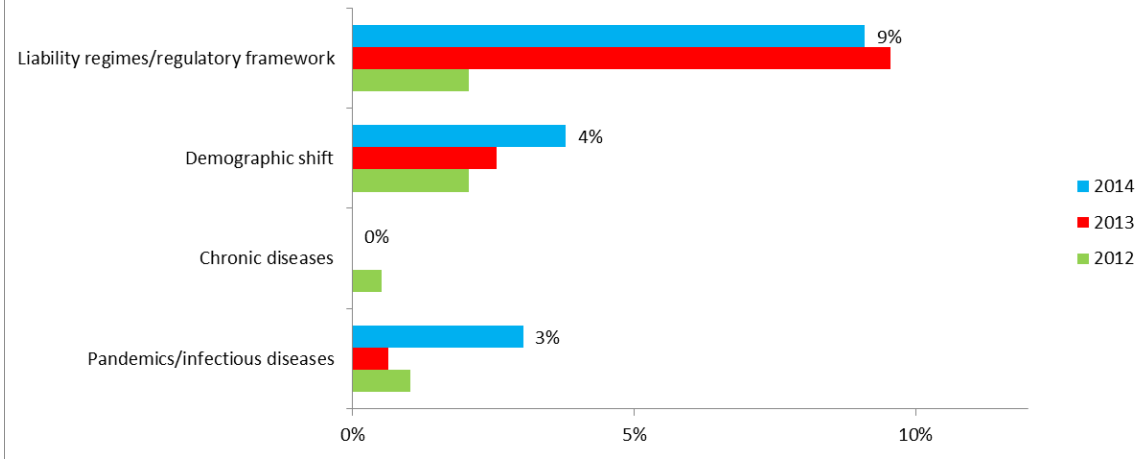
Top Emerging Risk Trends—Percent of Total Responses (Environmental category)

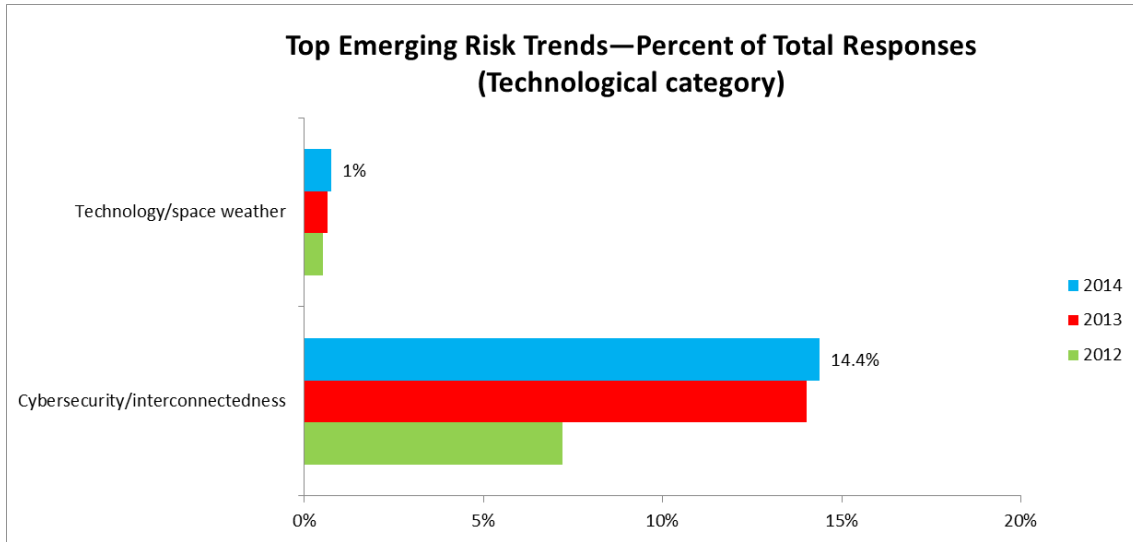


Top Emerging Risk Trends—Percent of Total Responses (Geopolitical category)



Top Emerging Risk Trends—Percent of Total Responses (Societal category)





Each survey has been conducted in periods with unique characteristics that drove results. The perceived risks of Geopolitical, Environmental, Societal and Technological risks rose in 2014, while risk managers were moving away from a focus on Economic risks as conditions stabilize (at least for now). The real scenario, of course, remains to play out.

Risk Combinations

The survey again asked about concerns due to combinations of emerging risks. While in the past survey four of the top five combinations included *Financial volatility*, this survey is noteworthy for the greater diversity of combinations. While *Asset price collapse and Financial volatility* remain the top choice, one combination ranked in the top five was unranked in the previous survey. In fifth position was *Climate change and Loss of freshwater services* (3 percent, up from 1 percent). The top five individual emerging risks mentioned were *Financial volatility* (13 percent), *Asset price collapse* (10 percent), *International terrorism* (9 percent), *Cybersecurity/interconnectedness of infrastructure* (7 percent) and *Failed and failing states* (7 percent). Overall, Economic risks were down in favor of Societal and Geopolitical risks.

Top five combinations selected:

Asset price collapse / Financial volatility—8 percent

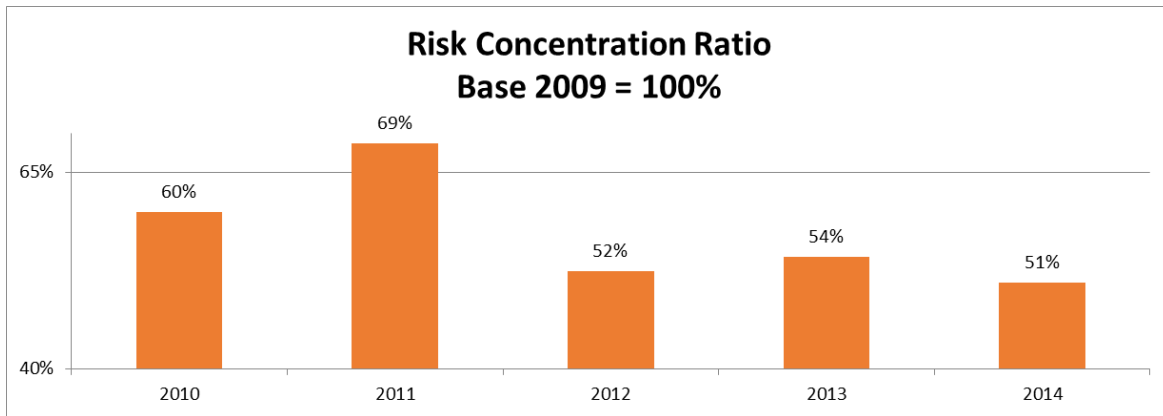
International terrorism / Cybersecurity/interconnectedness of infrastructure—4 percent

Chinese economic hard landing / Asset price collapse—3 percent

International terrorism / Proliferation of weapons of mass destruction—3 percent

Climate change / Loss of freshwater services—3 percent

There are 253 possible two-risk combinations of the 23 risks. The distribution of results was among the least concentrated so far, especially for results in the second quartile as can be seen in the accompanying chart. Hopefully the period immediately following the financial crisis will be the extreme case, so 2009 is used as the base year of 100 percent for the Risk Concentration Ratio. Comparisons are made by ranking the risks and summing them, looking at the 25th percentile, median (50th percentile), 75th percentile and total. A higher percentage reflects greater concerns.



As a relative measure, the Risk Concentration Ratio represents the current feeling among the risk management community. They seem to be less focused on a potential crisis over the past three years. Even during the most concentrated year shown, 2011, the result is 31 percent lower than the base year of 2009, showing how unusual results in that year were.

Population Growth

Each year one question asks about a combination of risks tied to a specific topic. It changes each year. This year the annual rotating question addressed risk interactions with population growth. Societal (40 percent), Geopolitical (31 percent) and Environmental (18 percent) risks captured the vast majority of responses. The top five choices were:

1. *Demographic shift* (18 percent)
2. *Pandemics/infectious diseases* (14 percent)
3. *Loss of freshwater services* (11 percent)
4. *Regional instability* (10 percent)
5. *Chronic diseases* (8 percent)

These responses are reasonable, tied to Societal and Geopolitical categories rather than Economic and Technological. An interesting follow-up would be for the reader to apply these risks against the products and services offered by a firm to brainstorm the who, what, when, where and why of risk to identify those products and services at risk and the potential implications.

Emerging Opportunities

Some think of opportunities as the opposite of risk, while others view them as the other side of the same coin. Emerging risks can present opportunities to the observant. In addition to reporting that low-priced assets were monitored for opportunistic trading, other respondents looked at demographic trends for product opportunities, changing customer behavior, and specific opportunities due to climate changes. The fast pace of regulatory changes was also noted, primarily due to unanticipated secondary effects.

The role of the risk manager when strategic opportunities arise continues to evolve, with the vast majority (85 percent) having input. Fewer (24 percent) are able to stop an opportunity, and a higher percentage than previous surveys (13 percent) have no input at all. What is appropriate for each company will vary, and each risk manager should encourage risk, in addition to potential returns, to be considered during capital allocation decisions.

Risks vs. Returns

Most respondents (57 percent) said that implementing ERM has improved returns relative to risk. Some who agree stated a better understanding of the relationship between risk and return, and others noted that risks had become more transparent and so a greater part of the decision process. Those who disagreed (16 percent) found processes impeded decision-making through bureaucratic functions and regulatory processes that are not relied on by management. It appears that some view ERM as a cost, so those who alternatively consider it as part of the strategic planning process may be able to gain a competitive advantage.

Respondents provided numerous examples where qualitative and quantitative assessments, both individually and combined, enabled better decision-making. Here are some specific responses.

A poor quantification trumps a strong qualitative discussion.

Made decision-making more fact-based; enabled better goal-setting

Qualitative analysis provides the backbone of management decision-making.

In almost all cases there is some measure of both. Quantification requires an initial qualitative assessment of how the risk will manifest and the associated impact; otherwise, there is nothing to quantify.

Leading Indicators

As industry practices evolve, more firms are formally recognizing emerging risks. This is due in part to regulatory pressure, such as the Own Risk and Solvency Assessment (ORSA) regulation, that lists emerging risks as something companies should do as part of their risk framework. Over half (58 percent) now have a process to formally identify emerging risks. One risk manager noted the four pillars of the emerging risk framework

they use: *environmental scan, risk owner survey, workshops with groups outside the company, and stress testing*. Most respondents who identify emerging risks also have criteria for action based on leading indicators (77 percent). One respondent described a process that, when a risk becomes material, it is added to a risk register and assessed likelihood and impact scores, and risk tolerance. When triggers are breached the risk is escalated to management and the board, with an action plan developed.

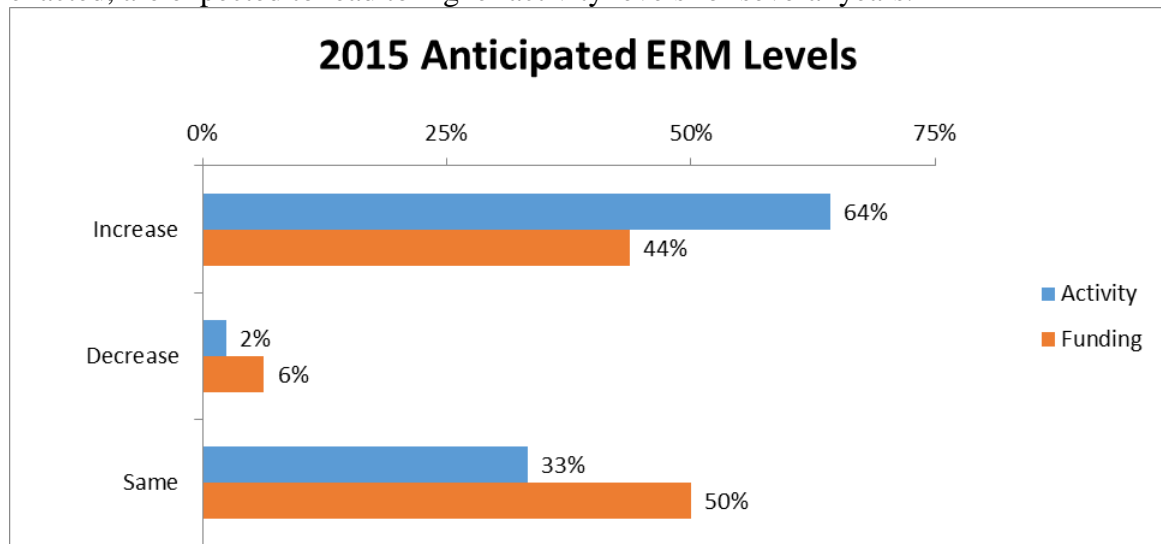
Methodology

While responses for model improvements were comparable to prior surveys, three-year highs were achieved for communication, less detailed models and staffing levels. A new category, more focus on stress testing, was cited by 33 percent of respondents. For modeling emerging risks, methods tended to be qualitative in nature, focusing on expert opinion and exposures. Given the lack of historical data, some encouraged contrarian views in the discussion to avoid an overemphasis on current events.

Trying to manage emerging risks is very challenging. You don't know which, if any, will develop, and the timing is unknown. Yet very few (4 percent) stated the process was not worthwhile. Comments mapped to those results referred to specific situations by risk managers who froze up, unable to make decisions, as they considered a never-ending list of risks. Those saying it had a positive effect noted a greater awareness of risk and the ability to take action earlier. Some referred to process maturity and that it will be difficult to identify when risks move from emerging to existing (or managed) risks.

Risk Activities

Risk managers report that risk tools are being used more frequently to add value and be more resilient. Many activities related to ERM continued to grow in 2014, with 61 percent reporting increases and 64 percent expecting activity growth in 2015. Only 44 percent anticipate an increase in funding for ERM activities in 2015. Increased ERM regulatory requirements, as regulatory requirements related to corporate governance are enacted, are expected to lead to higher activity levels for several years.



Predictions

Some risk managers believe that they can “predict” a coming crisis or bubble, but most are more comfortable generating a potential range of outcomes for management to consider. Here are two comments received on the topic.

The risk manager’s job includes alerting management to possible scenarios and ways to mitigate risk. Decisions, though, belong to senior management/CEO/board.

It is my job to identify potential risks. They don’t need to be likely, merely plausible.

Top Takeaways

While this report provides many nuggets of information to those who read it in its entirety, some will scan the initial pages looking for the primary conclusions. These bullets provide interesting revelations that might trigger you to read further. Another reviewer would come up with a different list based on his background and experience.

- Continued emergence of cyberrisks—sixth consecutive year of increases.
- Strength of Geopolitical category risks—leading category with 32 percent.
- Continued weakness of Economic category risks—26 percent is lowest on record.
- More risk managers are using leading indicators with action triggers.
- Risk managers are settling into a role with the strategic team, but it varies by company and culture.
- The specific comments shared by the respondents are fascinating! Company culture determines where ERM improves future prospects.

Conclusions

The ultimate success of ERM lies in the ability of management teams to utilize long time horizons. This aligns with emerging risks, where ignoring potential scenarios beyond a tactical plan leads to poor incentives and ignores material risks. By thinking further out than your peers, opportunities and risks alike become apparent. This provides a competitive advantage. The importance of combined analysis, using both qualitative and quantitative techniques, allows the risk manager to overcome internal cognitive biases and build a more resilient process.

New risks are gaining a foothold in the consciousness of risk managers. Rapidly changing regulations and cyberrisk are replacing the risk of an oil price shock and other economic risks as risk managers prioritize their efforts. Economic risks decreased in importance this year but still remain among the risks most often considered. As risk managers think about longer time horizons and risk combinations, risks like *Demographic shift* and *Transnational crime and corruption* are increasingly being considered. The Chinese economy remains a concern, but seems to have moved to a back burner for now. Trends across surveys reveal awareness by risk managers of emerging risks prior to their

mainstream acceptance, showing some predictive qualities as risk increase or decrease in ranking.

As this report is being written in the summer of 2015, we continue to get regular reports of extreme climate—strong storms in Australia, drought in California, Arctic and Antarctic ice melts, a slowed jet stream enabling storms to repeatedly follow the same path while consistently bypassing other areas. The financial world is unsure of its next direction, waiting for central banks to lead rates back up while deflationary pressures grow. The U.S. dollar continues to strengthen while oil prices struggle to find a stable level off recent lows. Regional tensions are growing as the spring season starts. Cyberrisk is regularly in the news, with health insurers joining the growing club of those breached. What will come next? What emerging risks will we deal with next year, five years from now, or 20 years from now? How will they interact with other risks and events? How can you prepare? The answers will lead to opportunities for some. Will it be you?

Focus on specific risk cycles, with booms and busts the driver for economic risks and current events influencing the other categories. In late 2014 geopolitical and technological headlines anchored results, with *Cybersecurity/interconnectedness of infrastructure* edging out *Financial volatility* as the top emerging risk. Risk managers were also worried about topics like ISIS, Russia/Ukraine, asset bubbles and regulatory burdens. Risk managers may find it worthwhile to include contrarian viewpoints on their team, especially for risks that seem to cycle in terms of importance such as currency and severe weather. The rotating combination risk question asked in this survey, about population growth and the risks associated with it, can serve to highlight the risks management teams should watch as they develop future strategies. For example, what will become of coastal regions with growing populations as changing climate results in rising sea levels and higher frequency of extreme weather events? The aging demographics of the developed world have major implications for maintenance of infrastructure. How will we react to these types of questions?

Background

This research project was funded by the Joint Risk Management Section (JRMS) of the Canadian Institute of Actuaries, Casualty Actuarial Society, and Society of Actuaries. 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 Listserv and LinkedIn groups related to risk management. The North American based CRO Council was also invited to participate. A total of 178 responses were received. This represents greater than 5 percent of completed surveys relative to the number distributed (over 2,500 to JRMS). This is the eighth survey completed. Many questions are starting to generate sustained trends that suggest conclusions. The previous surveys were distributed in April 2008, November 2008, December 2009, November 2010, October 2011, October 2012 and October 2013. This year's survey was conducted in October 2014. All articles and previous research reports can be found at:

<http://www.soa.org/Research/Research-Projects/Risk-Management/research-emerging-risks-survey-reports.aspx>

April 2008—First survey

- Article: pages 18–21 of *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 *Risk Management* March 2009 issue
<http://soa.org/library/newsletters/risk-management-newsletter/2009/march/jrm-2009-iss15.pdf>

November 2008—Second survey

- Research report <http://www.soa.org/research/research-projects/risk-management/research-2009-emerging-risks-survey.aspx>

December 2009—Third survey

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

November 2010—Fourth survey

- Research report <http://www.soa.org/research/research-projects/risk-management/research-2010-emerging-risks-survey.aspx>
- Article: pages 6–9 of *Risk Management* August 2011 issue
<http://www.soa.org/library/newsletters/risk-management-newsletter/2011/august/jrm-2011-iss22-rudolph.pdf>

October 2011—Fifth survey

- Research report <http://www.soa.org/research/research-projects/risk-management/research-2011-emerging-risks-survey.aspx>

October 2012—Sixth survey

- Research report <http://www.soa.org/research/research-projects/risk-management/research-2012-emerging-risks-survey.aspx>
- Article: pages 12–17 of *Risk Management* August 2013 issue
<https://soa.org/Library/Newsletters/Risk-Management-Newsletter/2013/august/jrm-2013-iss27.pdf>

October 2013—Seventh survey

- Research report <https://www.soa.org/Research/Research-Projects/Risk-Management/2013-Emerging-Risks-Survey.aspx>
- Article: pages 34–35 of *Risk Management* August 2014 issue
<https://www.soa.org/library/newsletters/risk-management-newsletter/2014/august/jrm-2014-iss30-rudolph.aspx>

Rather than developing a unique set of emerging risks to consider, one originally developed by the World Economic Forum (WEF) was chosen for the initial survey. The WEF reports, starting in 2007, can be found at www.weforum.org. The 23 risks utilized in this survey are described in detail in Appendix I. They differ slightly from some previous years as *Currency trend* replaced *Fall in value of US \$* and *Asset price collapse* replaced *Blow up in asset prices*. Each risk has been categorized as either Economic (5 risks), Environmental (5), Geopolitical (7), Societal (4) or Technological (2). The current survey continues its evolution, adding and subtracting a few questions while leaving the core of the survey intact. Responses to open-ended questions have minimal editing.

Research reports do not create themselves in isolation, and the researcher thanks Dave Ingram, Steve Hodges, Victor Chen, 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

The researcher for this project is Max J. Rudolph, FSA, CFA, CERA MAAA. Additional related articles and presentations can be found at his website. His contact information is:

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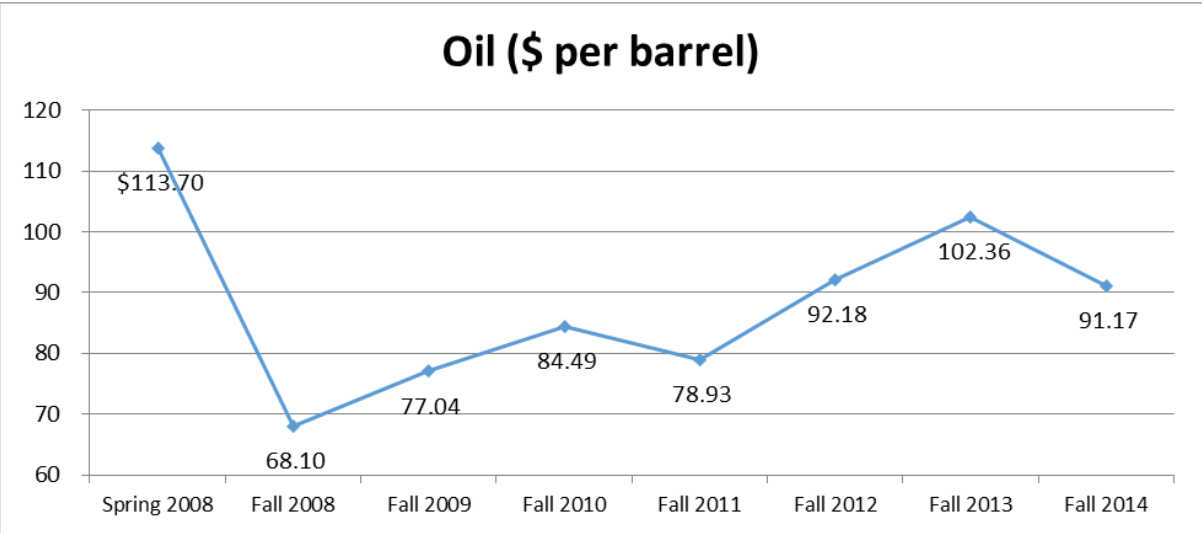
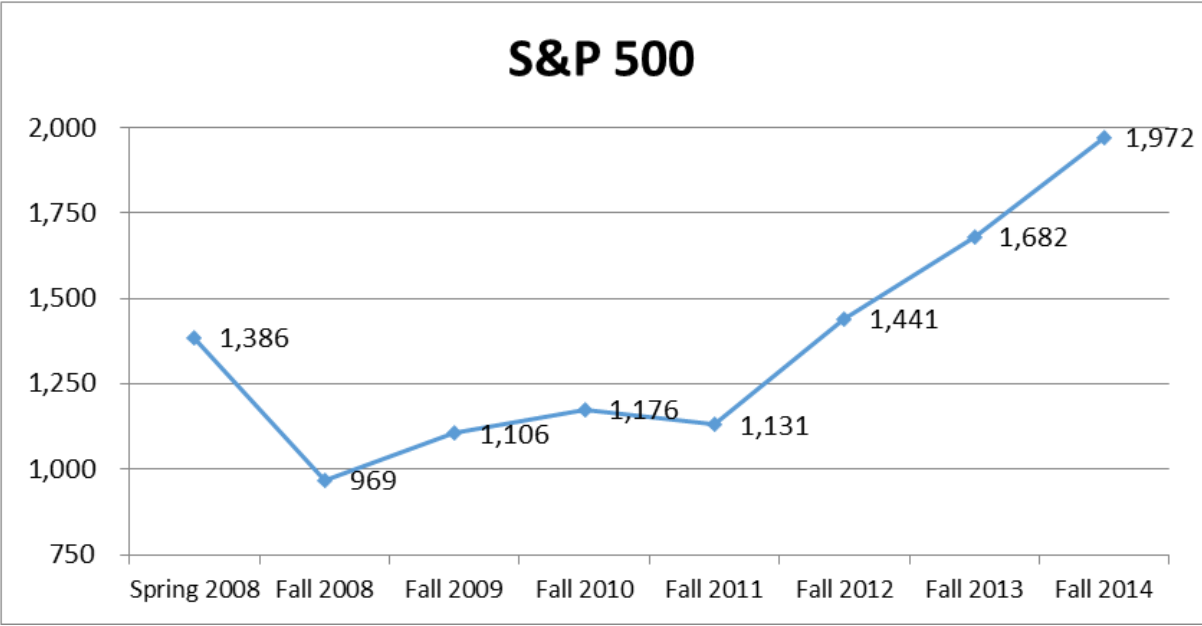
Results

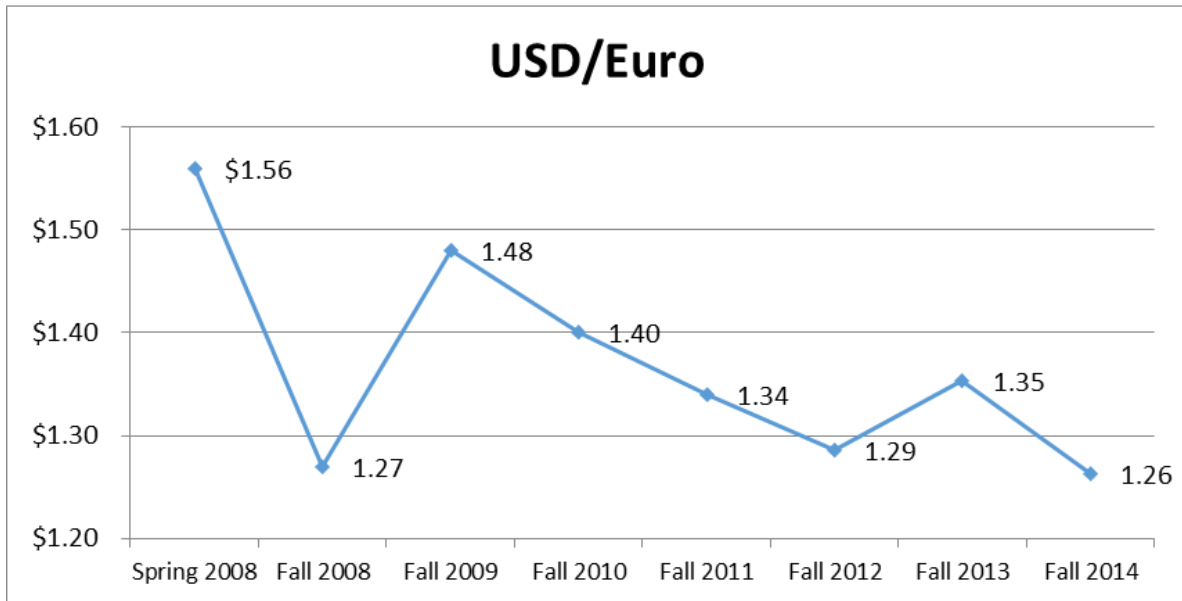
The Eighth Survey of Emerging Risks, sponsored by the Joint Risk Management Section, covers Current Risks, Emerging Risks, Leading Indicators, Methodology, Predictions and Current Topics. Highlights of each section are presented here while complete results can be found in Appendix II. A total of 178 surveys were completed (electronically). The survey asks for individual responses, not company responses, so using an anonymous electronic format encourages opinions. Many multiple choice format questions are followed up with “why” or “provide examples,” allowing expansion of the concept and additional learning for the reader. Some respondents did not answer all the questions. Partially completed surveys have been included, with percentages adjusted for the number completing each question. Answers of “not sure” and “not applicable” were generally (but not always) excluded from percentages. Analysis of this year’s trends was very thought-provoking for the researcher, as occurs each year, and hopefully the reader will agree.

History

As in past reports, the survey results show that current values of the Standard & Poor's 500 index (S&P 500), a barrel of oil, and the U.S. dollar relative to the euro seem to anchor perceptions of risk. Results have evolved over time, generally led by current news topics. Only economic factors are shown here, and the researcher would be interested in suggestions of other metrics that might be drivers of emerging 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 |
| Fall 2011 | 1,131.42 | 78.93 | 1.34 |
| Fall 2012 | 1,440.67 | 92.18 | 1.29 |
| Fall 2013 | 1,681.55 | 102.36 | 1.35 |
| Fall 2014 | 1,972.29 | 91.17 | 1.26 |





The initial survey was completed in April 2008, soon after Bear Stearns lost its independence. At that time, 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://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=RWTC&f=D>) 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 (where respondents were asked to choose up to five) were:

Survey 1 (April 2008)

1. *Oil shock* (57 percent of respondents)
- 2T. *Climate change* (40 percent)
- 2T. *Asset price collapse* (40 percent)
4. *Currency trend* (38 percent)

With oil at historic highs, it was the predominant emerging risk chosen. The second survey was completed in early November 2008, shortly after troubles surfaced at Lehman Brothers, AIG, and the mortgage giants Fannie Mae and Freddie Mac. Rates are compared at the end of October. By then the S&P 500 had dropped 30 percent, the price of a barrel of oil had decreased 40 percent, and the U.S. dollar had strengthened 23 percent. The top four emerging risks from this second iteration of the survey were:

Survey 2 (November 2008)

1. *Asset price collapse* (64 percent)
2. *Currency trend* (48 percent)
3. *Oil price shock* (39 percent)
4. *Regional instability* (34 percent)

Systemic risk was perceived to be very high at this time, with asset values in free fall. Oil prices had fallen quite a bit, U.S. currency was considered a safe harbor, and Barack Obama had just been elected to his first term as president. The next survey was in early December 2009, and metrics were collected at November month-end. The S&P 500 had increased 14 percent, the price of a barrel of oil had increased 13 percent, and the U.S. dollar had weakened 17 percent. The economy had begun its slow recovery. The top four emerging risks, including *Chinese economic hard landing* for the first time, from the third iteration of the survey, were:

Survey 3 (December 2009)

1. *Currency trend* (66 percent)
2. *Asset price collapse* (49 percent)
3. *Oil price shock* (45 percent)
4. *Chinese economic hard landing* (33 percent)

In 2010, data was compiled in October and the indicators had not changed materially. The stock market was up 6 percent, the price of oil was up 10 percent, and the dollar had further strengthened by 6 percent. Most of the top five results continue to come from the Economic category, and *International terrorism* and *Failed and failing states* made their first appearance and *Oil price shock* its last (to date).

Survey 4 (October 2010)

1. *Currency trend* (49 percent)
2. *International terrorism* (43 percent)
3. *Chinese economic hard landing* (41 percent)
4. *Oil price shock* (40 percent)
5. *Failed and failing states* (38 percent)

In the 2011 survey, data was compiled at the end of September. The U.S. stock market was down 4 percent overall and very volatile during the year, the price of oil was down 7 percent, and the dollar had further strengthened against the euro by 4 percent.

The original list of risks was developed by the World Economic Forum (WEF) for their annual Global Risks Survey. There is a balance required between keeping the list current and being able to show trends. The WEF has aggressively updated its list of risks, which is somewhat surprising since its stated time horizon is 10 years and you would not expect risks to change on an annual basis. The Emerging Risks Survey series has tried to maintain stability for trending purposes. For the 2011 survey the risks were updated. One risk was moved to a different category, two combined and one added. These changes, along with others since then, are described in Appendix I. Comparisons have been adjusted for trending. Most of the top six results continued to come from the Economic category. The new risk, *Financial volatility*, resonated with risk managers as they made it their top selection. This was the first time that *Cybersecurity/interconnectedness of infrastructure* appeared in the top five.

Survey 5 (October 2011)

1. *Financial volatility* (68 percent)
2. *Failed and failing states* (42 percent)
3. *Cybersecurity/interconnectedness of infrastructure* (38 percent)
4. *Chinese economic hard landing* (32 percent)
5. *Oil price shock* (32 percent)
6. *Regional instability* (32 percent)

In 2012 equity markets surpassed the levels of spring 2008 for the first time (up 27 percent), while oil prices rebounded (17 percent) and the dollar strengthened (4 percent). Results were less concentrated.

Survey 6 (October 2012)

1. *Financial volatility* (62 percent)
2. *Regional instability* (42 percent)
3. *Cybersecurity/interconnectedness of infrastructure* (40 percent)
4. *Failed and failing states* (33 percent)
5. *Chinese economic hard landing* (31 percent)

Equity markets (17 percent) and oil prices (11 percent) continued their trend upward in 2013, while the dollar reversed course and weakened (5 percent) versus the euro.

Survey 7 (October 2013)

1. *Financial volatility* (59 percent)
2. *Cybersecurity/interconnectedness of infrastructure* (47 percent)
3. *Asset price collapse* (30 percent)
4. *Demographic shift* (30 percent)
5. *Failed and failing states* (29 percent)
6. *Regional instability* (29 percent)

By the fall of 2014, the dollar had started to strengthen (7 percent), the stock market was up (17 percent), and oil had started down (12 percent). Much stronger moves in oil and the dollar occurred after the survey closed, leaving the geopolitical crisis in Eurasia as a top concern.

Survey 8 (October 2014)

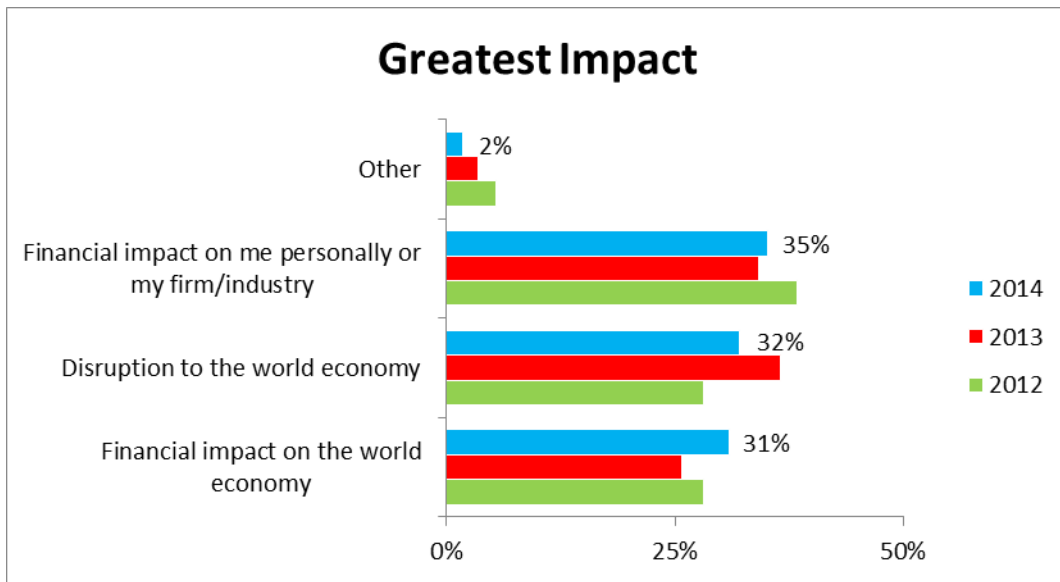
1. *Cybersecurity/interconnectedness of infrastructure* (58 percent)
2. *Financial volatility* (44 percent)
3. *International terrorism* (41 percent)
4. *Regional instability* (37 percent)
5. *Asset price collapse* (31 percent)

Introductory Questions

The fall of 2013 was a relatively stable period, with geopolitical and economic events becoming ever most distant, leaving risks like cybersecurity to take center stage. By late

2014 cyberrisk had continued to gain momentum but events in Ukraine and the Middle East, along with the Ebola outbreak in Africa, had catapulted Geopolitical and Societal risks back to the forefront. Some trends continued and some reversed, while the one constant that the best information lies in the comments. This year was no exception.

Respondents have varying definitions of emerging risk. The answer most commonly reported in the survey this year relates to financial impact on me personally or my firm/industry (35 percent), with disruption to the world economy (32 percent) and financial impact (31 percent) on the world economy also receiving material support. In the “Other” category a respondent pointed out that a specific risk could be bad for some and good to others (e.g., automobile risk differs between insurer and plaintiff law firm). In some cases “Risk Is Opportunity” applies to the same event, depending on the perspective. This seems to be especially true for casualty insurers who provide cover risks using the law of large numbers.



Each year a benchmarking question is asked about the top current risk (not emerging). When the respondents answer this question they are reminded of the anchoring effect identified in prior surveys. In the field of behavioral finance it is thought that recognizing our shortcomings will help us to overcome them.

Complete definitions of the 23 risks are provided in Appendix I, but they are also listed here for convenience.

Economic Risks

- Energy price shock
- Currency trend
- Chinese economic hard landing
- Asset price collapse

- Financial volatility

Environmental Risks

- Climate change
- Loss of freshwater services
- Natural catastrophe: tropical storms
- Natural catastrophe: earthquakes
- Natural catastrophe: severe weather (except tropical storms)

Geopolitical Risks

- 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

Societal Risks

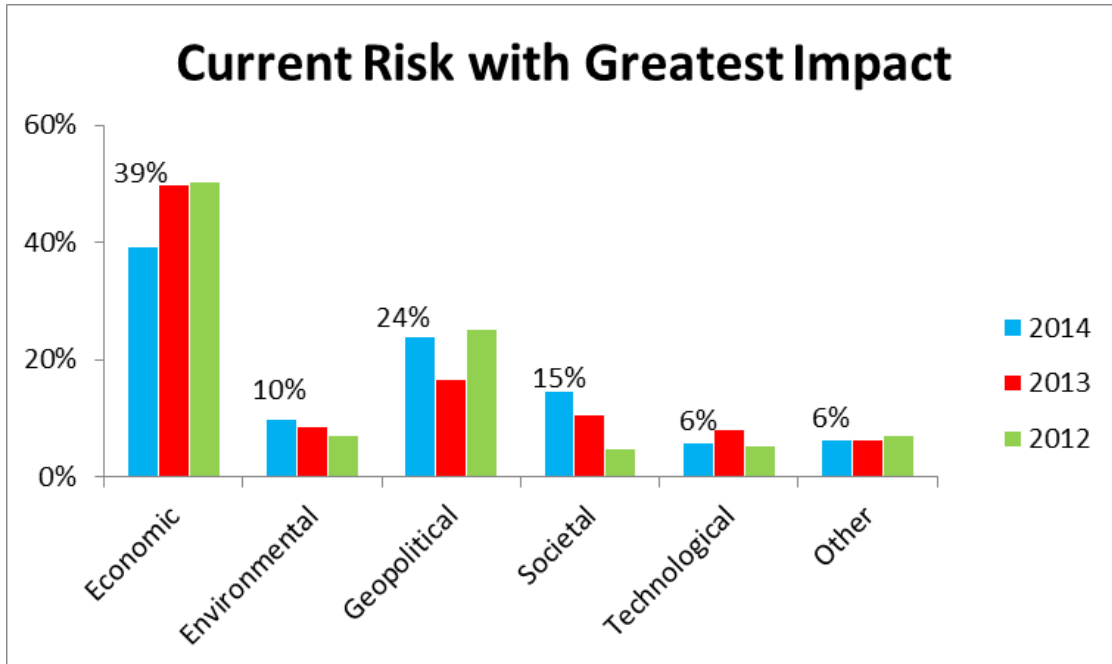
- Pandemics/infectious diseases
- Chronic diseases
- Demographic shift
- Liability regimes/regulatory framework

Technological Risks

- Cybersecurity/interconnectedness of infrastructure
- Technology/space weather

Current Risk

All changes to risk classifications since the original WEF-defined risks have been documented in Appendix I. The 23 emerging risks used in this iteration of the survey were reviewed and two were updated. *Fall in value of US \$* was changed to *Currency trend* to make it more generic as a number of countries have engaged in what has been called a currency war. *Blow up in asset prices* was changed to *Asset price collapse* to make the risk more clear and align with a recent WEF change.



- Economic 39%/50%/50% (2014/2013/2012 surveys)
- Environmental 10%/9%/7%
- Geopolitical 24%/17%/25%
- Societal 15%/11%/5%
- Technological 6%/8%/5%
- Other 6%/6%/7%

The Economic category continued as the top choice as current greatest impact, although it gave up 11 percent to Geopolitical (up 7 percent) and Societal (up 4 percent) as *Asset price collapse* beat out *Financial volatility* risk for the top response. Geopolitical, Societal and Environmental risks saw increases, while Economic and Technological risks dropped off.

Many of the “other” responses could have been mapped to the existing risk options, dealing with volatility, regional instability and climate change. One survey with an interesting response listed financialization as the top current risk. This occurs when leverage allows financial markets to control manufacturing and agriculture.

Three of the risks (*Transnational crime and corruption*, *Chronic diseases and Technology/space weather*) were not chosen by any survey respondent as the top current risk.

The top five current risks chosen were:

1. *Asset price collapse* (17 percent)
2. *Financial volatility* (14 percent)

3. *International terrorism* (8 percent)
4. *Pandemics/infectious diseases* (8 percent)
5. *Regional instability* (7 percent)

Five risks increased materially (over 5 percent or doubled) from the prior survey.

- *Energy price shock* (from 1 percent to 4 percent)
- *Asset price collapse* (from 12 percent to 17 percent)
- *International terrorism* (from 4 percent to 8 percent)
- *Pandemics/infectious diseases* (from 2 percent to 8 percent)
- *Regional instability* (from 3 percent to 7 percent)

The risks that decreased materially (over 5 percent or reduced by half) were:

- *Currency trend* (from 6 percent to 1 percent)
- *Financial volatility* (from 27 percent to 14 percent)

The Economic category results dropped from 50 percent in the previous two surveys to 39 percent this time, mainly driven by a reduction in *Financial volatility*. Given that tactics used by central banks to weaken their home currency have intensified since the survey closed in the fall of 2014, strengthening the dollar and reducing the price of energy, the prioritization of these risks would likely have changed soon after this survey closed. Risk managers need to be very aware of this anchoring phenomenon when thinking about emerging risks.

The Geopolitical category results are very interesting again this year. It continues to be more volatile than the other categories, and this was an “on” year. Two rose materially and returned to the top five current risks. Hopefully, Geopolitical risks will calm moving forward.

The Societal category also saw an overall increase from 11 percent to 15 percent (and from 5 percent in the 2012 survey), led entirely by *Pandemics/infectious diseases* and the Ebola threat. Cybersecurity/interconnectedness of infrastructure actually dropped in this survey as a current risk (from 8 percent to 6 percent), reflecting the perceived strength of the Ebola and Eurasian threats.

Section 1: Emerging Risks

Top Five: Geopolitical Increases to Lead for the First Time

After asking which risk has the current greatest impact, respondents chose up to five emerging risks that “you feel will have the greatest impact over the next few years.” The World Economic Forum (WEF) had a time horizon of 10 years in mind when it developed its 23 risks, but that is not required here. The data is compared across surveys, and considers recent events as part of the analysis. Each survey has come at a unique time in history.

- At the time of the first survey, in May 2008, the market was showing signs of weakness, but the real concern was the high cost of energy.
- By late 2008 the stock markets had fallen precipitously and the price of oil had dropped from record highs. This was the height of the global financial crisis.
- In December 2009 systemic risk was beyond the worst point, but unemployment remained high. The Copenhagen climate conference had just been held, and earlier in the year the world dealt with the mild H1N1 pandemic. The large deficits incurred by fiscal stimulus packages were front and center on risk manager's minds.
- In late 2010 political tensions on the Korean peninsula and the European debt crisis were hot topics.
- 2011 was a busy year, with events including the Japanese tsunami and nuclear disaster, the Arab Spring, and the evolving European debt crisis.
- The 2012 survey continued to move further away from the financial crisis, but tensions in the Middle East (Syria, Iran) were front and center.
- By fall 2013, Hurricane Sandy and Typhoon Haiyan led a torrent of natural disasters around the world. Economies were moving forward even while many leading indicators regarding debt levels remained elevated.
- For 2014 instability in Ukraine and the Middle East, along with continuing economic uncertainty in Europe and the Ebola outbreak, created great uncertainty.

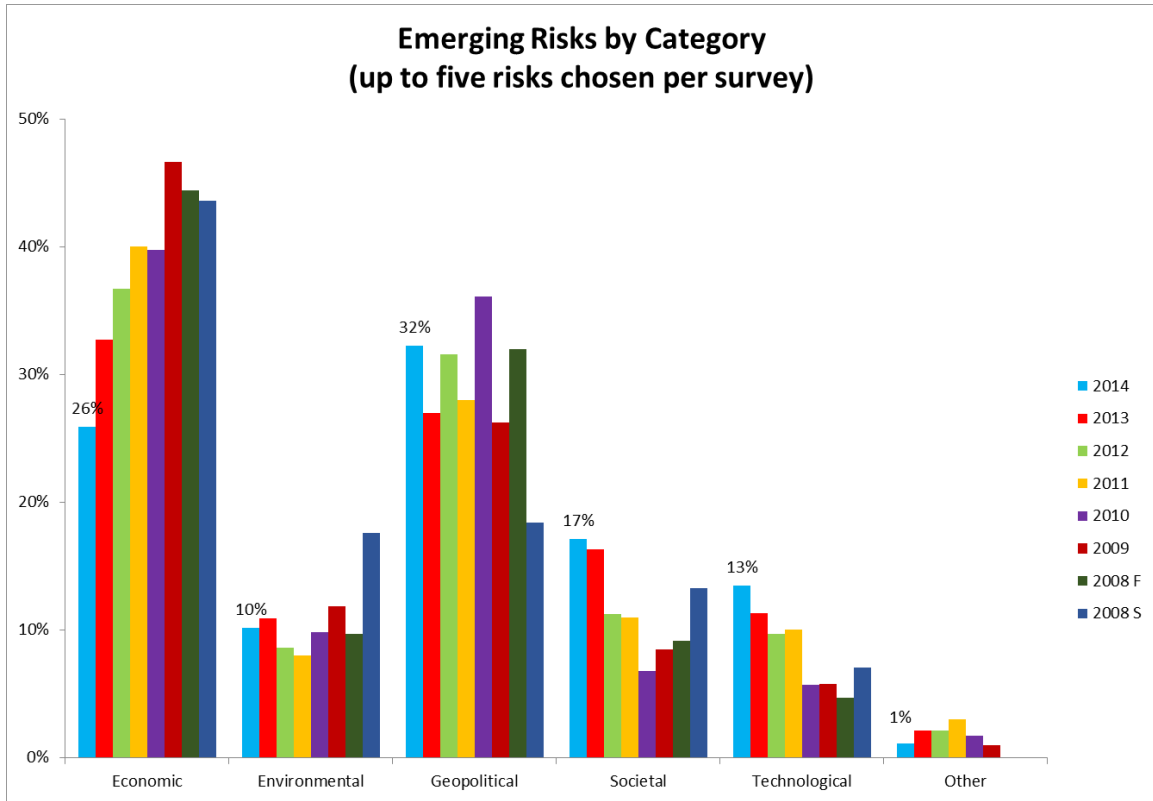
Risks including natural disasters and geopolitical hot spots occur repeatedly over time. Occasionally there are quiet periods, but risk managers should be wary of assuming that historical patterns have changed. Many authors have described a variation of the calm before the storm.

While 77 percent shared five risks, the average was 4.72, up from 4.60 in the prior year. 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.

Given current stresses worldwide, the Geopolitical category surpassed Economic for the first time. The results distributed by category (using percentages of total responses) are:

| | |
|------------------|---|
| 1. Geopolitical | 33%/27%/32% in the 2014/2013/2012 surveys |
| 2. Economic | 26%/33%/37% |
| 3. Societal | 17%/16%/11% |
| 4. Technological | 14%/11%/10% |
| 5. Environmental | 10%/11%/9% |

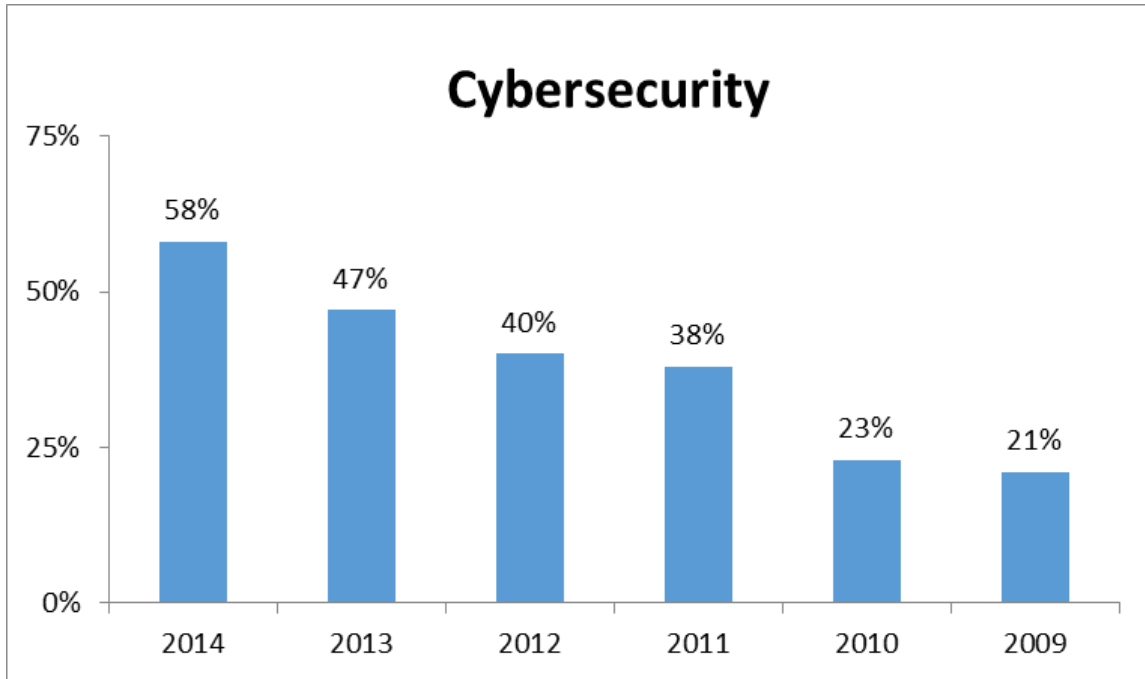
As we move further away from the financial crisis the Economic category continues to trend down from its highs in 2009 (down 7 percent). The Societal (up 1 percent) and Technological (up 3 percent) categories again recorded new highs. Geopolitical saw a 6 percent increase and Environmental dropped 1 percent.



There were material increases in nearly all of the major categories. In the Economic group, *Energy price shock* increased from 7 percent to 13 percent (prior to the most recent two surveys this risk was over 30 percent). In the Environmental category, *Climate change* rose moderately (3 percent) and *Natural catastrophe: Severe weather* matched its highest result with 11 percent. Both *International terrorism* (from 27 percent to 41 percent) and *Interstate and civil wars* (from 13 percent to a high of 19 percent) contributed to the overall Geopolitical increase. The Societal category had one risk that increased materially, with *Pandemics/infectious diseases* advancing from 19 percent to 30 percent, matching its highest for the past six years as Ebola has taken center stage. In the Technological category, *Cybersecurity/interconnectedness of infrastructure* increased from 47 percent to a record 58 percent, the highest recorded in this survey.

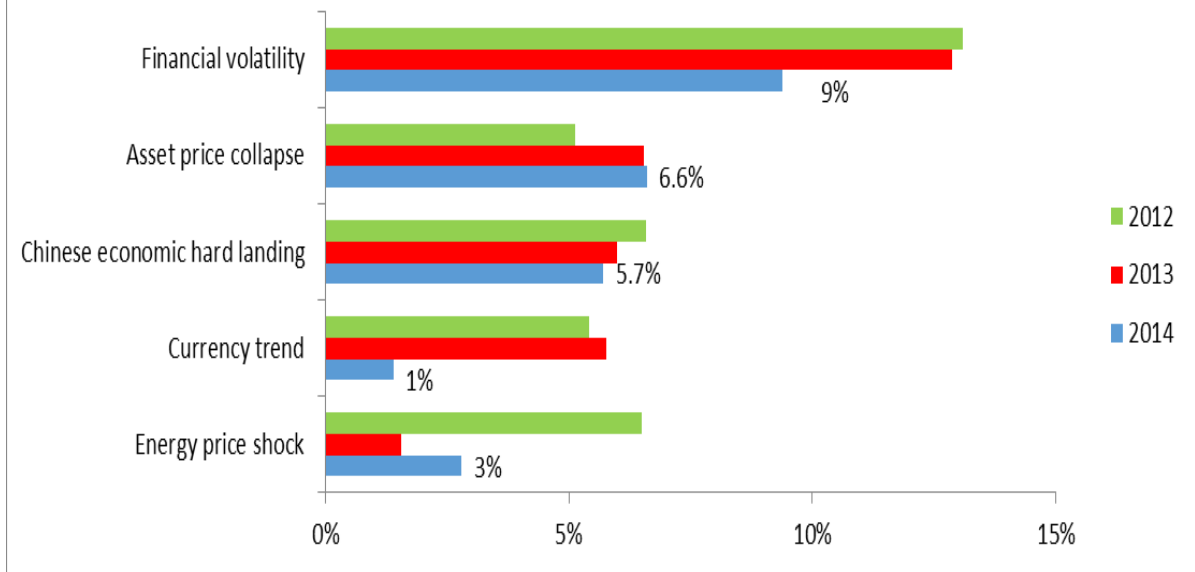
Four risks materially decreased from the prior survey, with large drops reported by *Currency trend* (27 percent to 7 percent), *Financial volatility* (from 59 percent to a record low 44 percent, although still retaining second place overall), *Retrenchment from globalization* (down from 13 percent last year to 8 percent), and *Demographic shift* (down from 30 percent last year to 23 percent).

The top five risks, measured as a percentage of survey respondents, differed from prior surveys. The overall leader was *Cybersecurity/interconnectedness of infrastructure*, continuing its persistent increases.

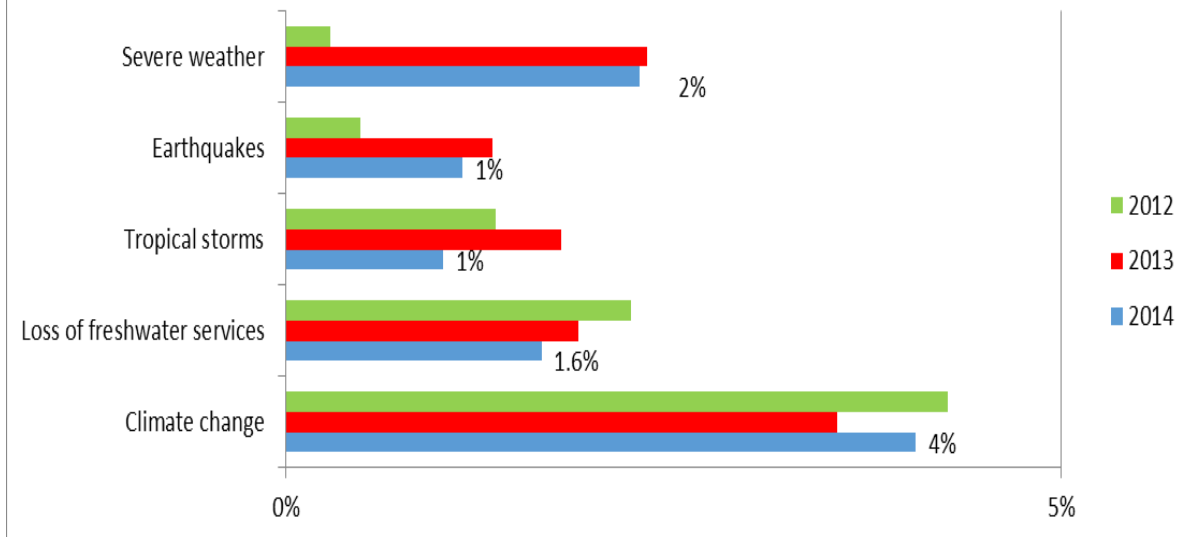


Financial volatility risk fell to second and *International terrorism* was third. The Economic and Geopolitical categories each had two in the top five, with *Regional instability* fourth and *Asset price collapse* fifth. The Geopolitical, Societal and Technological categories all increased their totals. Trends of at least two consecutive years may act as a leading indicator. Increasing trends include *Asset price collapse* (three years), *Transnational crime and corruption* (three years) and *Cybersecurity/interconnectedness of infrastructure* (five years). Decreasing trends include *Chinese economic hard landing* (four years), *Financial volatility* (three years), *Loss of freshwater services*, and *Failed and failing states* (three years). Some categories rebounded materially after falling in the previous survey. These included *Energy price shock*, *Proliferation of weapons of mass destruction (WMD)*, and *Regional instability*. The repercussions of high debt loads, political instability in various regions, and cyberbreaches in 2014 may have impacted the results.

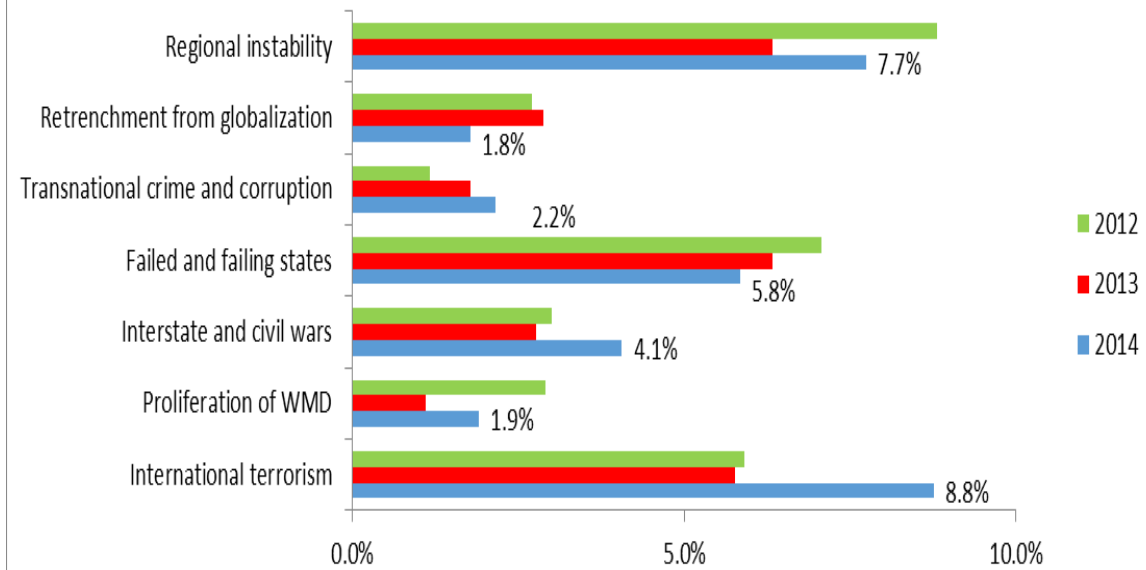
Emerging Risk Trends—Economic (% of total)



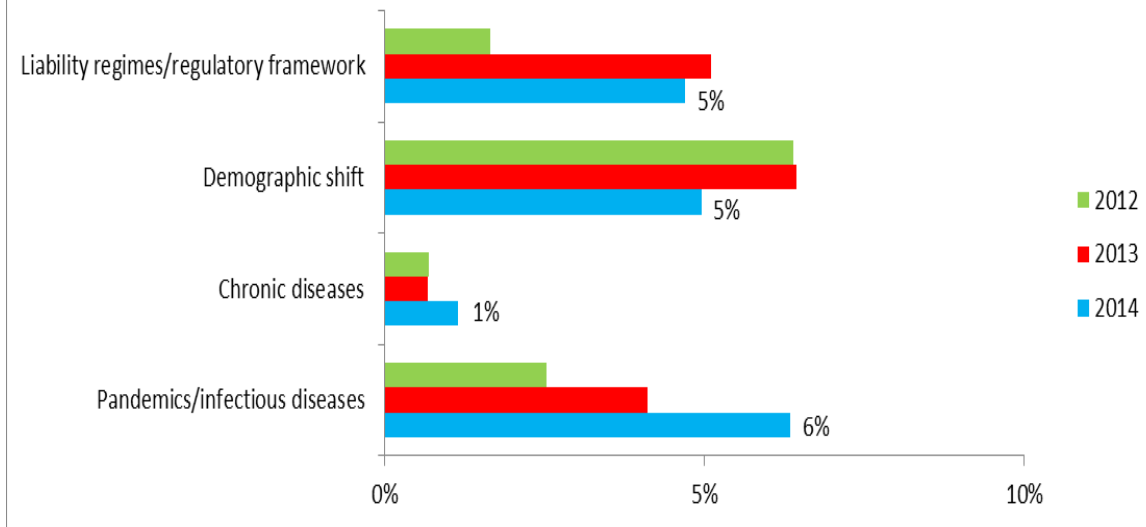
Emerging Risk Trends—Environmental (% of total)

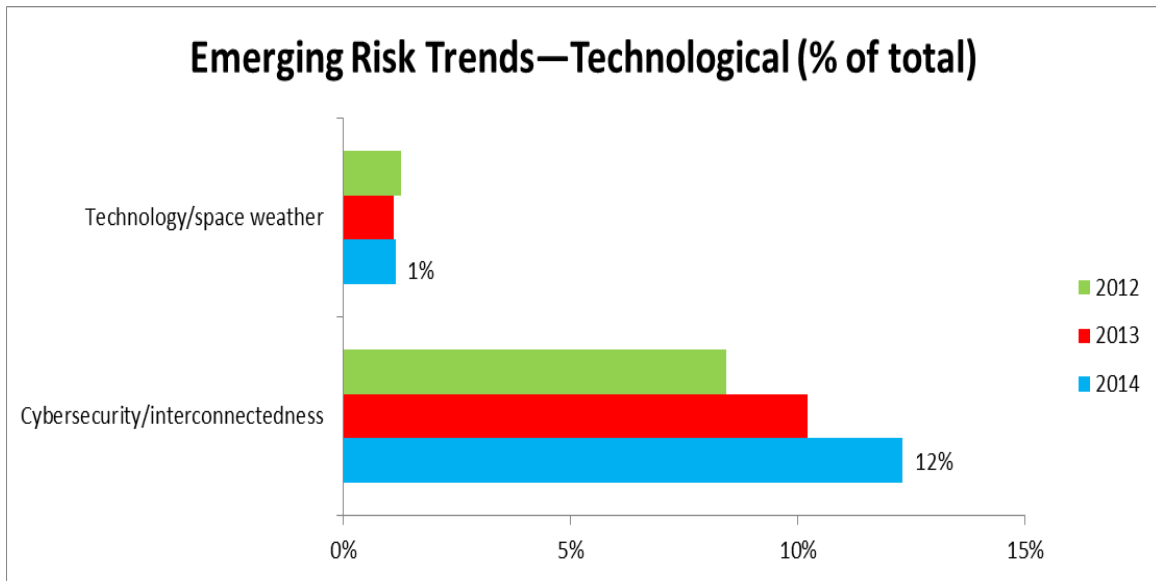


Emerging Risk Trends—Geopolitical (% of total)



Emerging Risk Trends—Societal (% of total)





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, Geopolitical, Societal and Technological categories. Multiple responses, up to five, were encouraged. The percentages shown here use the number of respondents in the divisor, so totals will be much greater than 100 percent.

1. 58%/47% in 2013 *Cybersecurity/interconnectedness of infrastructure*
2. 44%/59% *Financial volatility*
3. 41%/27% *International terrorism*
4. 37%/29% *Regional instability*
5. 31%/30% *Asset price collapse*

What follows are the overall results, noting the top 10 responses in the current survey. For example, *Chinese economic hard landing* is the eighth most common response to this question.

Economic—26% (previous survey 33%)

- 13%/7% Energy price shock
- 7%/27% Currency trend
- 27%/28% 8 Chinese economic hard landing
- 31%/30% 5 Asset price collapse
- 44%/59% 2 Financial volatility

Environmental—10%/11%

- 19%/16% Climate change
- 8%/9% Loss of freshwater services
- 5%/8% Natural catastrophe: tropical storms
- 5%/6% Natural catastrophe: earthquakes

- 11%/11% Natural catastrophe: severe weather

Geopolitical—32%/27%

- 41%/27% 3 International terrorism
- 9%/5% Proliferation of weapons of mass destruction (WMD)
- 19%/13% Interstate and civil wars
- 28%/29% 7 Failed and failing states
- 10%/8% Transnational crime and corruption
- 8%/13% Retrenchment from globalization
- 37%/29% 4 Regional instability

Societal—17%/16%

- 30%/19% 6 Pandemics/infectious diseases
- 5%/3% Chronic diseases
- 23%/30% 9 Demographic shift
- 22%/23% 10 Liability regimes/regulatory framework

Technological—14%/11%

- 58%/47% 1 Cybersecurity/interconnectedness of infrastructure
- 5%/5% Technology/space weather

Other—1%/2%

One of the most interesting survey trends was the lack of focus by respondents on the changes in climate. *Climate change* rebounded this year (up 3 percent), but *Loss of freshwater services* was down for the second consecutive year. Other associated risks, such as *Natural catastrophe: Tropical storms* (down 3 percent) and *Natural catastrophe: Severe weather* (stable) provided conflicting views.

One method to analyze this data over time is to highlight those risks reported in the current survey above long-term averages. For this purpose the data were analyzed as a percentage of all responses. Of the five primary categories, three were higher than their average over the eight survey cycles. Geopolitical (32 percent vs. 29 percent average), Societal (17 percent vs. 15 percent average) and Technological (13 percent vs. 8 percent average) each satisfied this criterion, while Economic at 26 percent was below its 42 percent average and Environmental was slightly lower (10 percent vs. 11 percent average). Among individual risks, five of the 23 had results above average. The greatest positive differential was 5 percent for *Cybersecurity/interconnectedness of infrastructure*. Eight trended below average, led by 7 percent for *Currency trend*. For the third consecutive year, four of the five risks are below their long-term average for the Economic category, while the Societal category has two out of four and the Geopolitical category four out of seven above their longer-term average.

Top Emerging Risk: *Cybersecurity/interconnectedness of infrastructure*

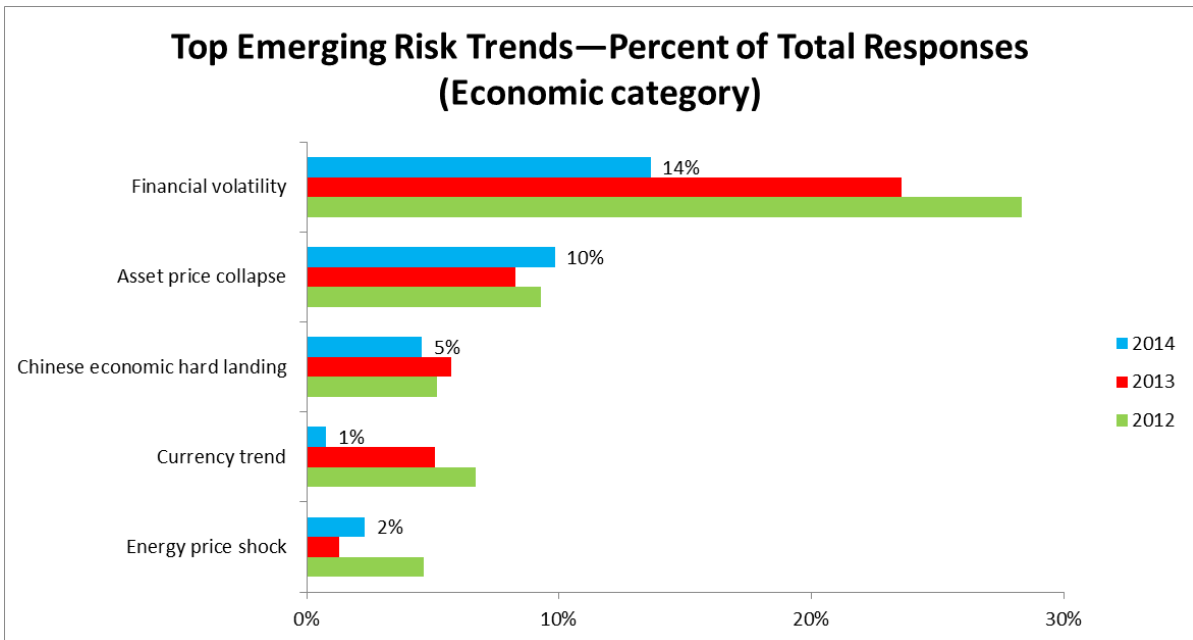
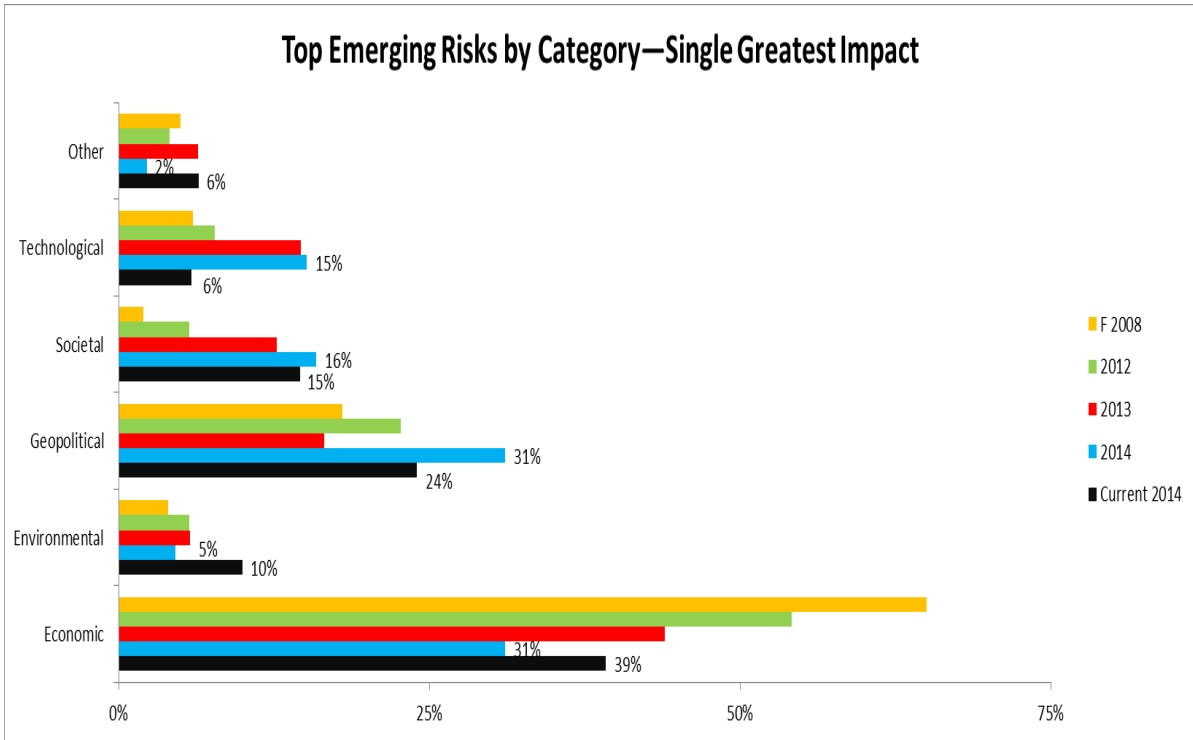
In Question 2, respondents were asked to state the single emerging risk they expected to have the greatest impact. For the first time, the Economic category did not dominate. It tied for the lead with the Geopolitical category. Societal edged out Technological in a

close race, and Environmental risks lagged behind. Last year the differential between first and second place was 27 percent, so a tie is a major change.

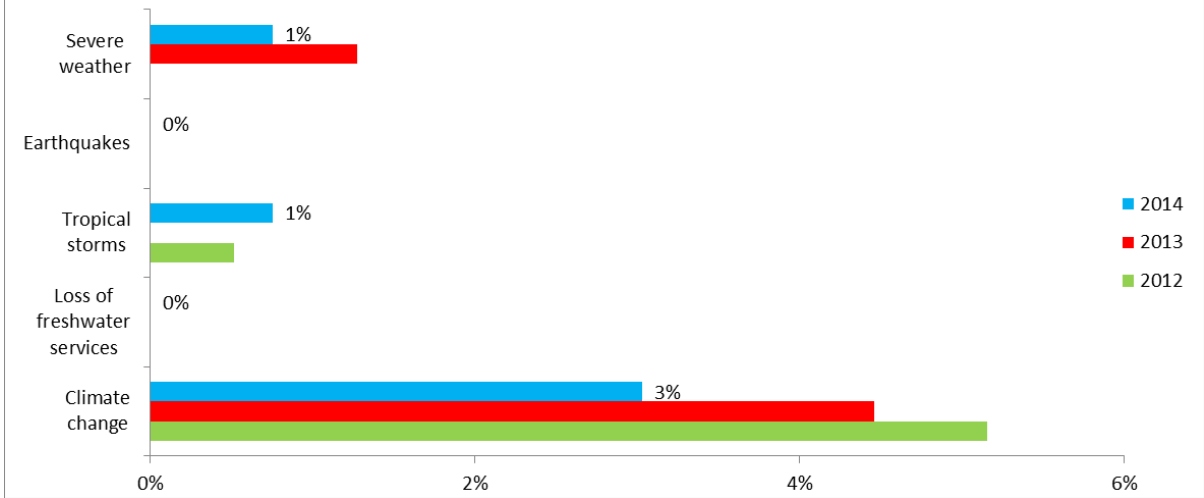
- 1T. 31%/44% Economic
- 1T. 31%/17% Geopolitical
- 3. 16%/13% Societal
- 4. 15%/15% Technological
- 5. 5%/6% Environmental

Interestingly, some risks poll quite a bit higher as the top emerging risk than in the current risk category. These include *Failed and failing states* (+3 percent), *Demographic shift* (+2 percent), *Liability regimes/regulatory framework* (+4 percent) and *Cybersecurity/interconnectedness of infrastructure* (+8 percent). These risks are likely to be leading indicators and merit follow-up analysis. Those risks polling down as emerging risks include *Energy price shock* (-2 percent), *Asset price collapse* (-7 percent), *Climate change* (-3 percent), and *Pandemics/infectious diseases* (-5 percent). These risks are more challenging to analyze as it may mean that risk managers feel they are managing them and they are no longer emerging. Each of these four risks may have a unique story for this particular survey. Right after the survey ended the dollar spiked and oil prices dropped materially. Ebola made infectious diseases a hot current topic, followed after the survey closed by a measles outbreak. The U.S. stock market (S&P 500) ended up for the sixth consecutive year, tying the longest recorded streak. Mixed signals come from the surge in *Climate change* as a current risk (up from 4 percent to 6 percent) versus an emerging risk (down from 4 percent to 3 percent).

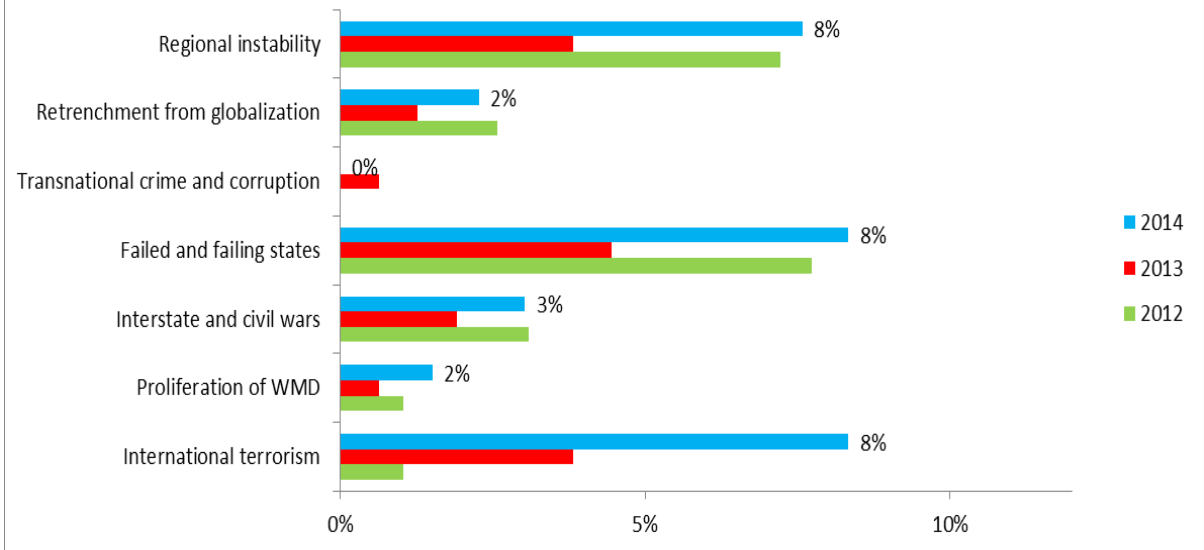
In the accompanying charts, the current risk with greatest impact has been included with the emerging risk choices from the past three years and fall 2008 for comparison with results during the financial crisis. Current 2014 reflects results from the current risks chosen by respondents. The first chart shows all categories in selected years, and includes the current survey's results. The other charts show each individual emerging risk within a category for the most recent three surveys. The results do not follow past patterns of the current risk preferences pulling up/down the emerging risk results.

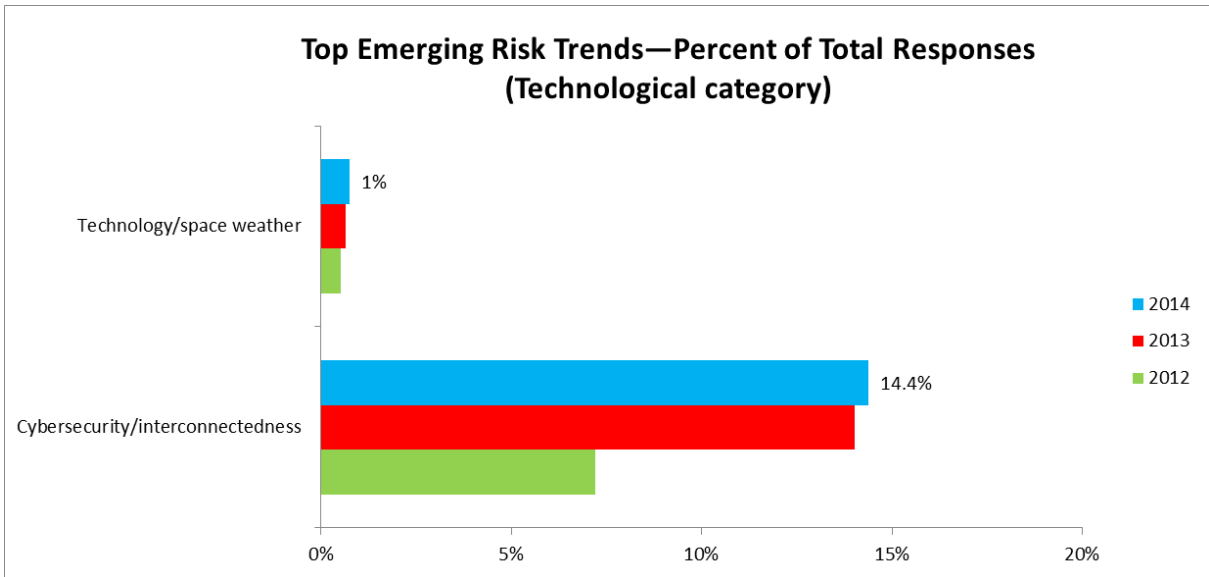
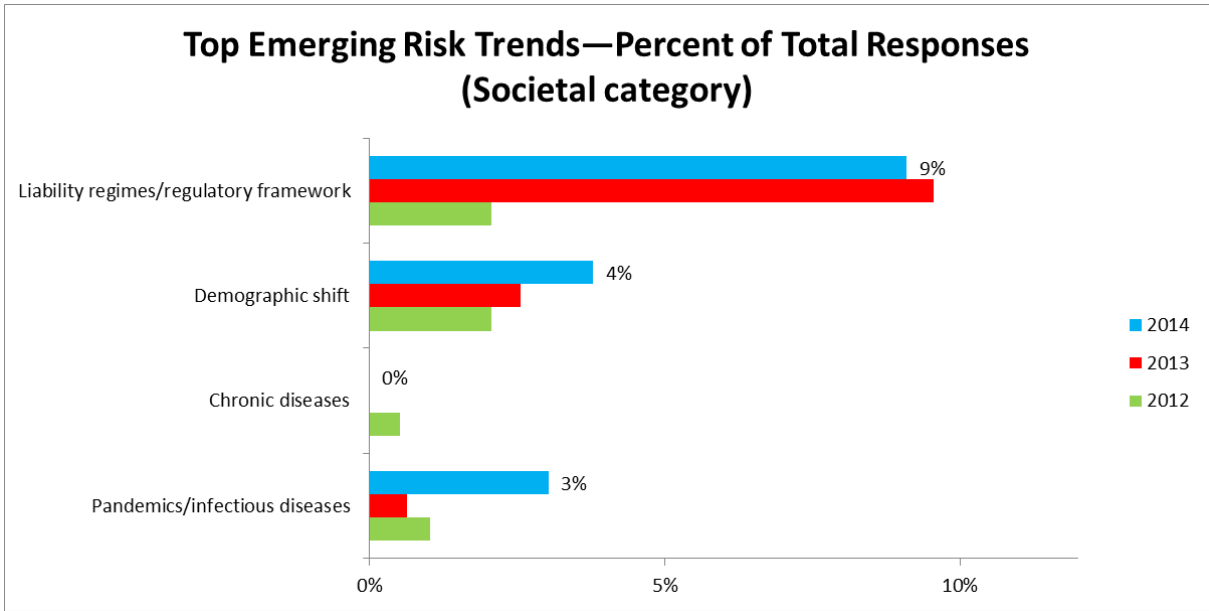


Top Emerging Risk Trends—Percent of Total Responses (Environmental category)



Top Emerging Risk Trends - Percent of Total Responses (Geopolitical category)





For the top emerging risk, the top five listed (six due to a tie) were more broadly distributed in this survey. *Cybersecurity/interconnectedness of infrastructure* advanced to the top spot while staying at 14 percent. The Economic category had the next two, with *Financial volatility* giving up the top spot in a narrow race and *Asset price collapse* in third. *Liability regimes/regulatory framework* took fourth position and two Geopolitical risks tied for fifth—*International terrorism* and *Failed and failing states*. Results were less concentrated than the previous survey, with 28 percent (versus 38 percent in the previous survey) explained by the top two responses and 56 percent (62 percent) by the top five. Respondents continue to diversify away from financially oriented risks. The

major risk increases fell to three Geopolitical risks: *International terrorism* (4 percent to 8 percent, and from 1 percent the previous year), *Failed and failing states* (4 percent to 8 percent) and *Regional instability* (4 percent to 8 percent and finishing just out of the top five). The only material drops were Economic risks: *Currency trend* (5 percent to 1 percent) and *Financial volatility* (24 percent to 14 percent).

- | | |
|------------|---|
| 1. 14%/14% | <i>Cybersecurity/interconnectedness of infrastructure</i> |
| 2. 14%/24% | <i>Financial volatility</i> |
| 3. 10%/8% | <i>Asset price collapse</i> |
| 4. 9%/10% | <i>Liability regimes/regulatory framework</i> |
| 5T. 8%/4% | <i>International terrorism</i> |
| 5T. 8%/4% | <i>Failed and failing states</i> |

Dropping out of the top five was *Chinese economic hard landing*.

Risk Combinations

Risks do not occur in a vacuum. For example, when financial markets implode this does not stop political and military instability. Some risks are, at times, drivers of other risks. The recent drop in oil prices has resulted in increased uncertainty in countries such as Russia and Venezuela. Other risks interact in less obvious ways that are not always apparent in advance, often with unintended consequences. As central banks influence financial markets, impacts on economic risks may seem obvious, but indirect impacts will be felt by societal and geopolitical risks. As we saw with Hurricane Sandy in the United States, the economy is impacted directly by severe weather and other environmental and societal risks.

Combinations of emerging risks interact in ways that are often not fully understood. Risk combinations can happen simultaneously or sequentially. For example, sequentially the Geopolitical risk *Loss of freshwater services* could drive *Interstate and civil wars*. Concurrent emerging risks could exacerbate a scenario. In 2011 the Japanese earthquake and tsunami led to supply chain stress scenarios that had not previously been considered.

Each respondent could choose up to three combinations of two risks and was asked to list their top combination first for a follow-up question. Appendix II includes a grid showing all combinations chosen.

Even though the question is about combinations of risks, it is helpful to look first at the risks in isolation. Consistent with earlier questions, Economic and Geopolitical (tied with 35 percent) are the most frequent response categories when identified in isolation. There was movement toward the Societal category due to *Pandemics/infectious diseases*.

- | | |
|------------|---------------|
| 1. 35%/40% | Economic |
| 2. 35%/32% | Geopolitical |
| 3. 10%/11% | Environmental |
| 4. 12%/9% | Societal |

5. 8%/9% Technological

Individual risks were led by risks from the same major categories. *Financial volatility* as the top response was included 13 percent of the time. *Failed and failing states* replaced *Currency trend* as the only top five change. No risks had material increases and only *Currency trend* had a material drop (from 8 percent to 2 percent).

1. 13%/16% *Financial volatility*
2. 10%/7% *Asset price collapse*
3. 9%/6% *International terrorism*
4. 7%/7% *Cybersecurity/interconnectedness of infrastructure*
5. 7%/6% *Failed and failing states*

The top risk combinations chosen continue to show a broad dispersion. *Financial volatility* again combined with *Asset price collapse* for the top spot. Surprisingly, since it faded in individual risk compilations, *Chinese economic hard landing* combined with *Asset price collapse* to move up from No. 9 to No. 3. *Climate change* and *Loss of freshwater services* were previously not rated in the top 10 but ended up No. 5 this year. Reduced supplies of drinking water, as glaciers melt and coastal populations grow, have been highlighted recently in news reports. These will be interesting risks to follow in the future.

Leading combinations among the 474 responses were (top five are listed—T reflects a tie and NR reflects combinations that were not ranked in the prior survey):

1. 8%/7%, ranked No. 1 in prior survey
Asset price collapse
Financial volatility
2. 4%/4%, No. 2T
International terrorism
Cybersecurity/interconnectedness of infrastructure
3. 3%/3%, No. 8T
Chinese economic hard landing
Asset price collapse
4. 3%/3%, No. 5T
International terrorism
Proliferation of weapons of mass destruction (WMD)
5. 3%/1%, NR
Climate change
Loss of freshwater services

The major category combinations were:

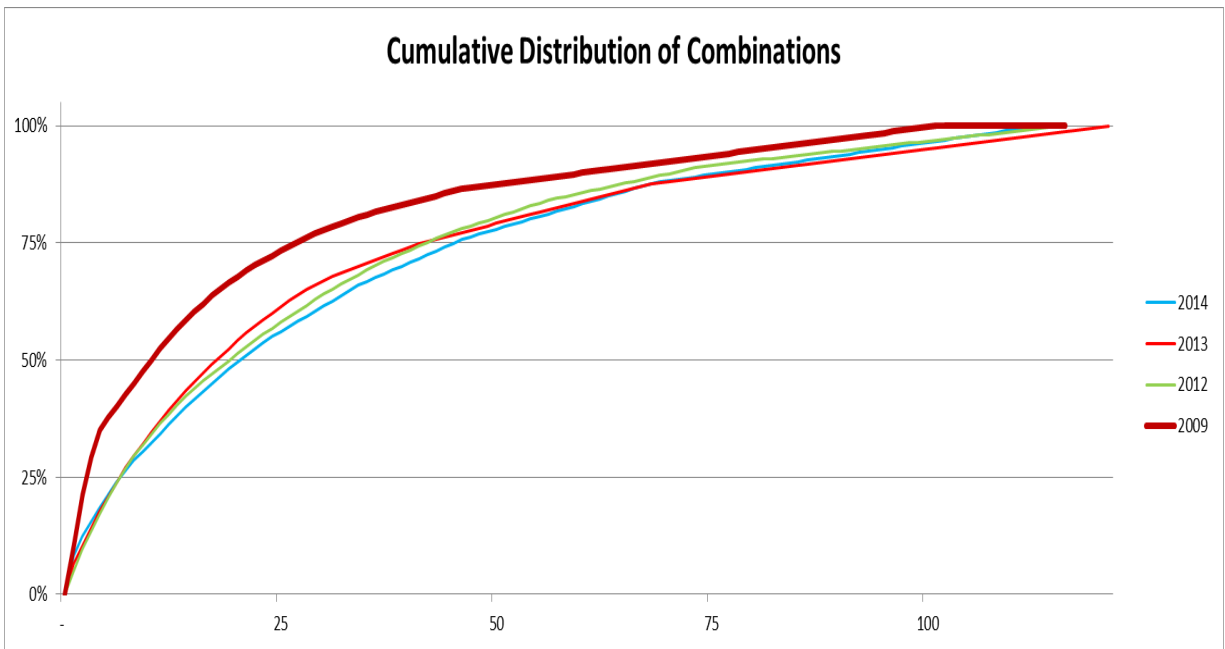
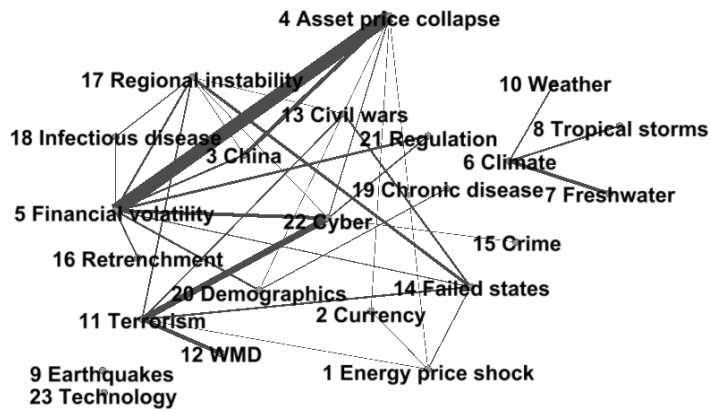
- 19%/24% Economic–Economic
- 19%/15% Geopolitical–Geopolitical

- 15%/18% Economic–Geopolitical
- 9%/7% Economic–Societal
- 8%/9% Geopolitical–Technological
- 7%/7% Environmental–Environmental
- 7%/4% Geopolitical–Societal
- 4%/4% Economic–Technological
- 2%/4% Environmental–Geopolitical
- 2%/2% Economic–Environmental
- 2%/2% Societal–Societal
- 2%/1% Societal–Technological
- 1%/2% Environmental–Societal
- 1%/2% Technological–Technological
- 1%/0% Environmental–Technological

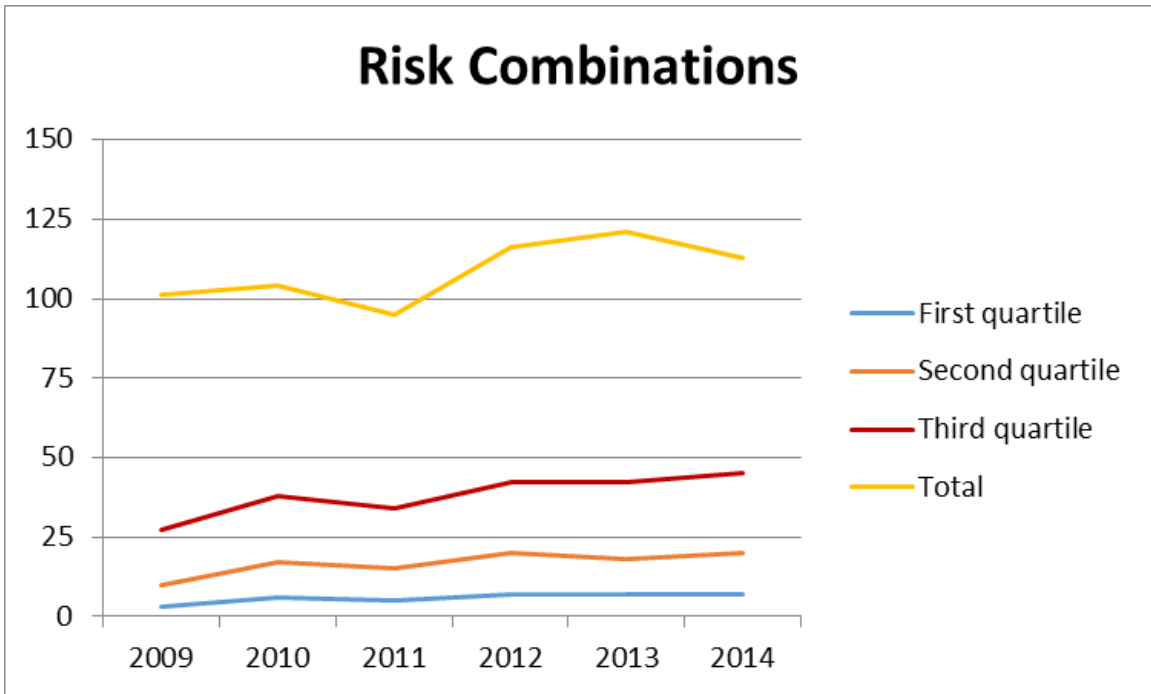
The combinations of the Economic and Geopolitical categories retained the top three positions. Most category combinations were stable, with most movement in the top three combinations.

Risk combinations can be viewed graphically using the open source Gephi software 0.8.2 package. This shows the strength between risks (edge). Combinations of three and fewer are ignored in this graph for clarity. For those who think visually this can be an easier analytical process than reviewing the data itself.

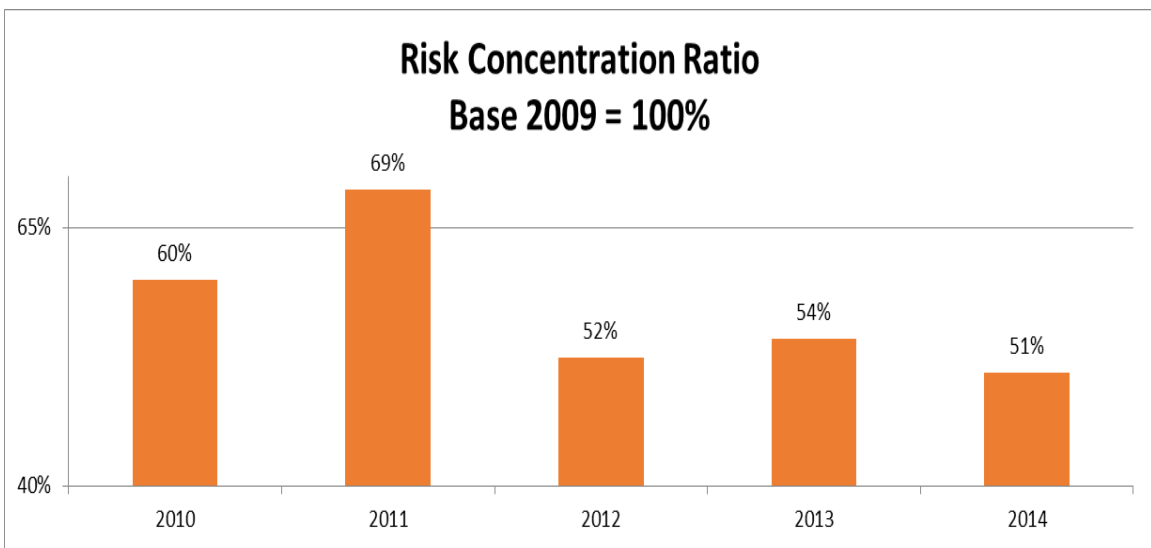
Interestingly, all of the risks (nodes) except *Natural catastrophe: earthquakes* and *Technology/space weather* had a risk combination of at least four. *Climate change* was the only combination chosen (by at least four respondents) for three risks: *Natural catastrophe: severe weather*, *Natural catastrophe: tropical storms* and *Loss of freshwater services*.



There are 253 possible risk combinations. Except for a blip in 2011, the trend has been toward reduced concentration. The outlier in 2011 seems to be a result of the major events that occurred in that year. By quartile, with data listed cumulatively and first quartile representing the most frequent responses, results were presented in the following graph. A trend is presented, especially in the third quartile results, which will continue to be monitored and analyzed. The results this year show lower concentration in the most common 100 combinations.



The broad representation may be an indicator of the current risk environment, with each quartile being considered against the extreme example of 2009. This year's Risk Concentration Ratio of 51 percent is comparable to the previous two years.

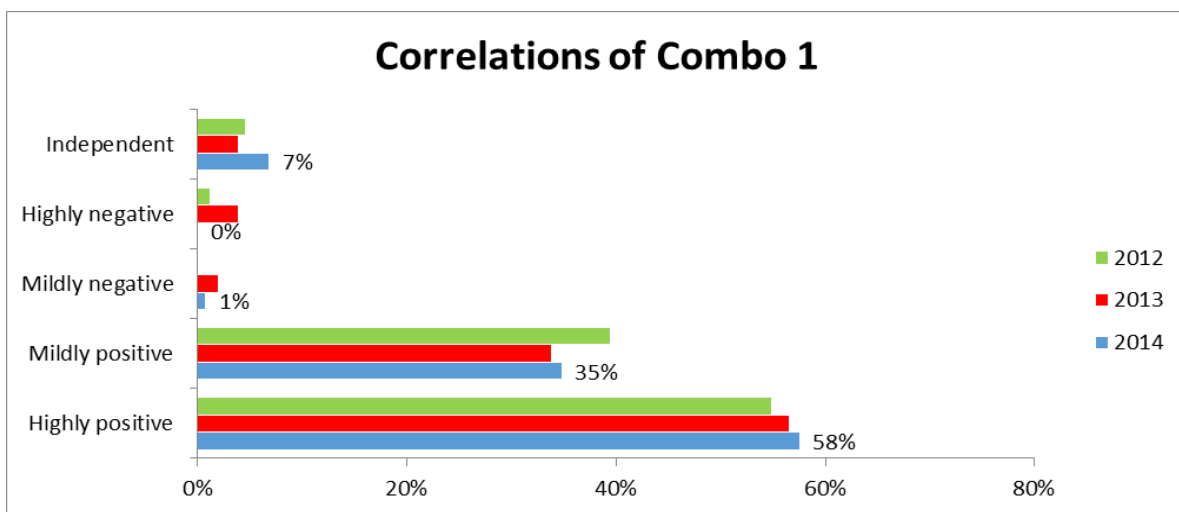


The next chart shows the responses in the order they were chosen. A follow-up question referred to Combo 1 so it is reasonable to assume that it is the risk manager's first choice. The Economic category is more commonly included in the first option while the other categories, especially Geopolitical (except when teamed with Technological), become more prevalent in later choices. It may be that risk managers are anchored in current

events or responsibilities for the first choice. Combos 2 and 3 might provide more forecasting credibility.

| | | Combo 1 | Combo 2/3 |
|---------------|---------------|---------|-----------|
| Economic | Economic | 27% | 15% |
| Economic | Environmental | 5% | 1% |
| Economic | Geopolitical | 12% | 17% |
| Economic | Societal | 11% | 8% |
| Economic | Technological | 4% | 5% |
| Environmental | Environmental | 6% | 8% |
| Environmental | Geopolitical | 1% | 3% |
| Environmental | Societal | 1% | 1% |
| Environmental | Technological | 1% | 0% |
| Geopolitical | Geopolitical | 15% | 21% |
| Geopolitical | Societal | 4% | 9% |
| Geopolitical | Technological | 9% | 7% |
| Societal | Societal | 2% | 2% |
| Societal | Technological | 3% | 2% |
| Technological | Technological | 1% | 0% |

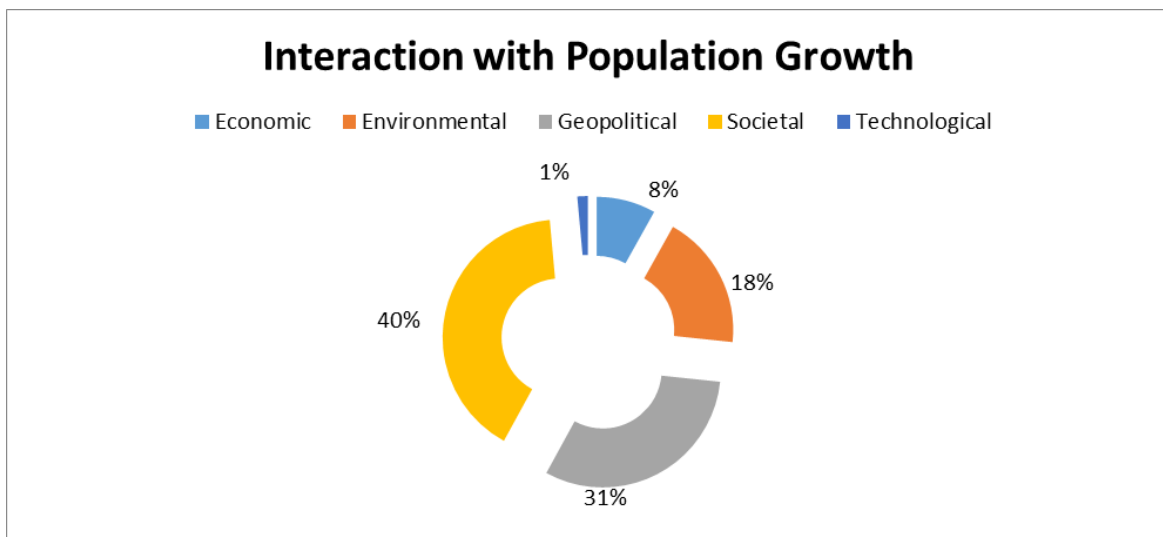
Respondents were asked the type and level of correlation for the two risks in Combo 1. While 93 percent of responses reported either highly or mildly positively correlated (up from 90 percent in 2013), negative correlation responses (highly 0 percent, mildly 1 percent) decreased so the total correlated responses are 93 percent. Those listing the risk combinations as independent rose to 7 percent. These results continue to be intriguing as the risk community evolves its thinking about this issue. A highly positive correlation does not infer causality, but the risk manager might consider correlated risks that are sequential a leading indicator.



It is very hard to anticipate unintended consequences when multiple risks are stressed concurrently or in rapid succession. This survey historically includes a question allowing up to three risks to be chosen that fit the criteria. Respondents were asked, *What risks do you expect to have the greatest interaction with population growth?* Not surprisingly, many of the top results came from the Societal category. This included the top response, *Demographic shift* (18 percent), second—*Pandemics/infectious diseases* (14 percent), and fifth—*Chronic diseases* (8 percent). In third overall, from the Environmental category, was *Loss of freshwater services* (11 percent) and fourth was the Geopolitical category’s *Regional instability* (10 percent). These five leading responses comprise 61 percent of the total.

Respondents included up to three risks, and included an average of 2.6 responses. Results focused on the Societal and Geopolitical categories.

1. 40% Societal
2. 31% Geopolitical
3. 18% Environmental
4. 8% Economic
4. 1% Technological



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. In general, responses indicate that opportunities are sought out by searching for volatility and assuming reversion to the mean, along with trends in demographics and climate. Some specific examples include:

- *Demographic shifts—can result in new product opportunities*
- *Financial volatility—opportunity to secure long-term assets at low price*
- *Changing customer preferences and behaviors*

- *Mortality improvement because it has been underestimated*
- *Climate change, while slow moving, seems likely to have different impact on different industries, some of which (for example, home building, engineering) will see opportunity as weather patterns change.*

This last bullet, detailing the two-sided nature of climate change, is an excellent example of how anyone allocating capital should look at change. Addressing how it impacts current practice is important, but anticipating potential investments is important too.

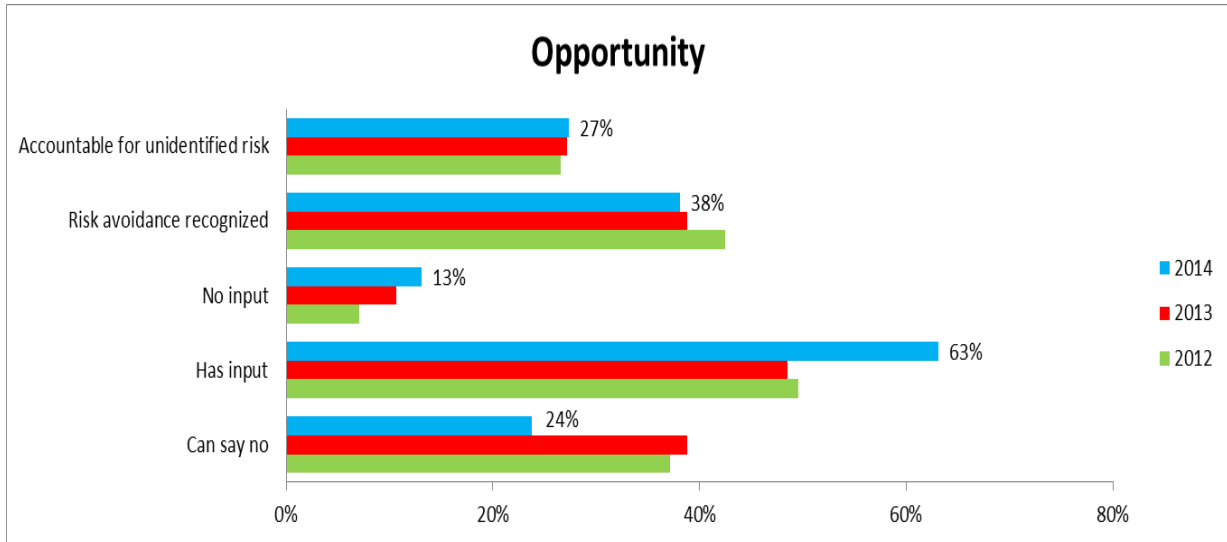
This survey saw expanded views of opportunistic behavior. Some responses are the opposite of what others said, while others seem to worry about uninformed new investors in their industry. Cyberrisk is viewed as a positive by some for the insurance industry, and an actuary shared ideas similar to other professions that are looking to expand their domain.

- *Climate change turns out to be a mirage (not the change per se, but the effect of it).*
- *Private equity entry into insurance industry; regulatory arbitrage especially with respect to capital regimes*
- *Closely monitor chronic diseases in an attempt to find better ways to more effectively manage medical/Rx costs.*
- *Growth of actuarial profession in nontraditional areas (the number and types of emerging risks are increasing) (more scope for actuaries to add value).*
- *Cyberrisk—need for protection, in infancy with definitions of exposure, the risk itself, etc.*
- *Regulatory change—thinking about secondary effects that were unanticipated.*

In contrast to previous years, no one challenged the use of risk management to go beyond risk mitigation techniques. This may be an indicator that enterprise risk management (ERM) as a core part of strategic planning is becoming more common. Identifying trends and leading indicators before your competitors can provide an advantage.

The survey asked how the ERM team is utilized when a strategic opportunity is presented to a firm. While 85 percent (there was some overlap) can either say “no” to a strategic opportunity (24 percent) and/or have input but no vote (63 percent), 13 percent still have no input. Companies are still trying to figure out the proper role of the risk manager, and it will vary based on their skill set and management expectations. Similar to prior years, 38 percent expect to be recognized for avoiding a risk and almost a third (27 percent) say they would be held accountable if they failed to identify a risk that materialized.

Asked to expand, comments from respondents focused on the structure and level of an ERM unit or committee indicating the influence company culture has on the role of the ERM team.



A final question for this section asked for suggestions of risks that are not included in the current 23, described in detail in Appendix I. Each respondent could suggest up to three additional risks. Here are some of the suggestions (unedited).

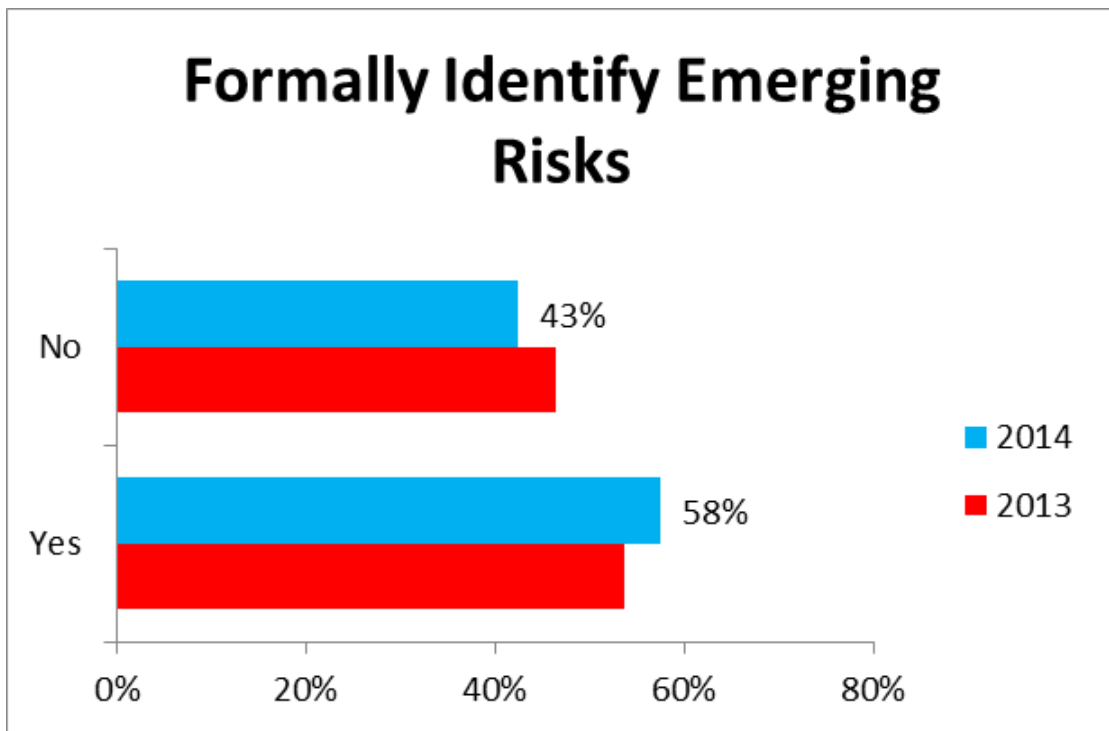
- *Breakdown of government in supposedly stable nations (such as U.S.) due to citizen discontent*
- *Income disparity*
- *Pension funding crisis*
- *Food supply inequity*
- *Massive replacement of workers by technology (e.g., self-driving trucks)*
- *Government non-functionality*
- *Volcanic eruptions*
- *Big data and loss of privacy (aggravating factor for failing states, terrorism ...)*
- *The degree of interconnectedness of the major risks—reinforcement and amplification*
- *Rapidly changing consumer technology*
- *Unrecognized impacts of new technology*
- *Medical advancements*
- *Expansion of America's military and police class threatens liberty*
- *Sharing economy (Uber, Airbnb, etc.)*
- *Health care affordability and access*

Section 2: Leading Indicators

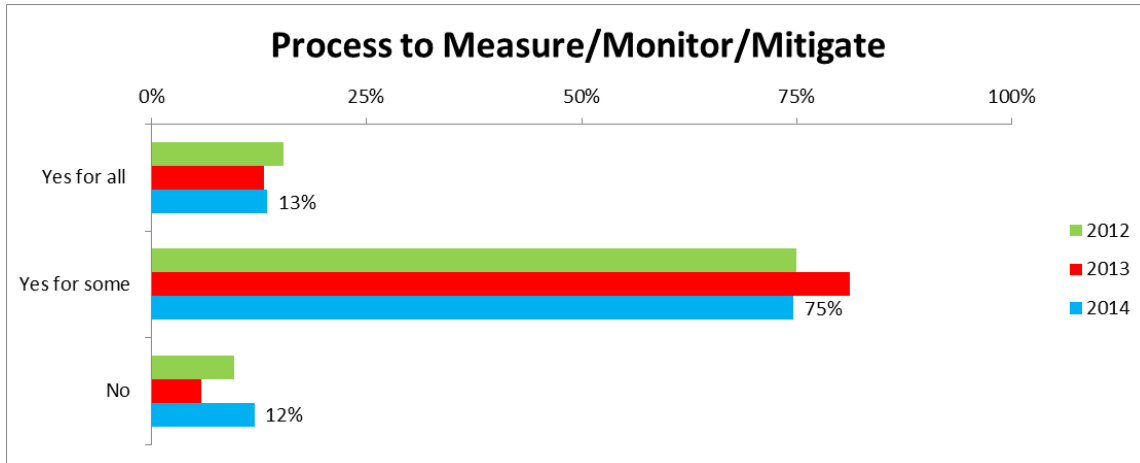
Leading indicators of emerging risks are metrics, or events, indicating a higher likelihood that an emerging risk may be materializing. This information is used to make decisions earlier than might be the case otherwise. Key risk indicators (KRIs) provide information about a specific risk. They do not replace metrics that measure value in hindsight, but attempt to identify drivers of future performance. Trending lagging indicators like gross

domestic product (GDP) or consumer price index (CPI) can provide macroeconomic KRIs, as can revenue and expenses for a firm. These measure historic results. Leading indicators, by contrast, provide information earlier in the process. For example, a lower unemployment rate would drive expectations of higher collected taxes. A leading indicator could be an event that becomes a Boolean indicator, acting as a light switch or on/off indicator. An example might be the signing of a star athlete who would drive higher attendance at games and revenues from jersey sales. The survey asked about the use of leading indicators that would provide a firm with actionable information about a risk.

Respondents formally identify emerging risks 58 percent of the time, 4 percent higher than in the previous survey.



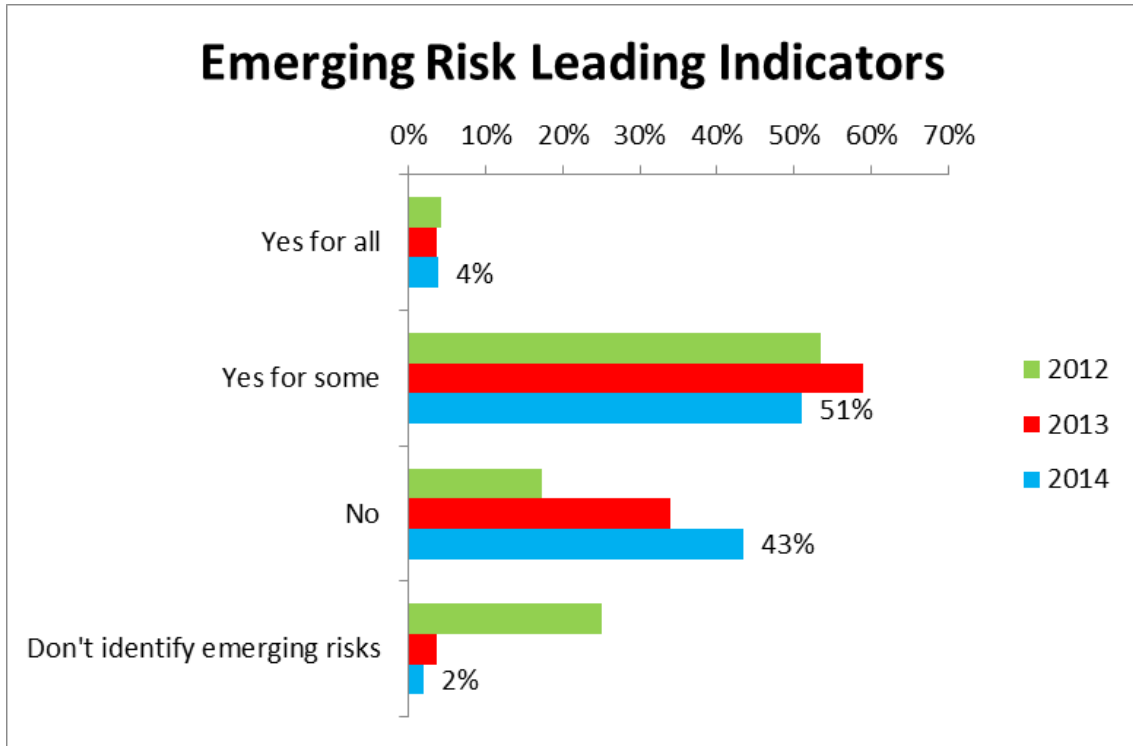
For those with a formal process, the survey asked about measuring, monitoring and mitigating an emerging risk once it has been identified. Eighty-eight percent responded that they did this for some or all of their identified emerging risks (down from 94 percent in 2013). Twelve percent reported having no process in place, compared to 6 percent in the prior survey. Developing KRIs is challenging and expected to be a source of improvement as risk management evolves.



Several surveys noted that leading indicators had been added to quarterly dashboards. Risks included cyberrisk, TRIPRA (federal terrorism insurance), demographics, climate change and diseases such as Ebola and silicosis. There were a couple of comments that were forward-thinking and are worth sharing verbatim.

- *Monitoring of social media against reputation risk*
- *Risk that rates in U.S. stay down much longer than expected due to global recession and flight to quality as Europe drops and China slows more dramatically. How low can yields go and stay for long periods of time compared to our floor of credited rates, thus squeezing margins?*
- *Four pillars in ER program: environmental scan, risk owner survey, workshops with groups outside the company (e.g., academics, community leaders, etc.), stress testing*

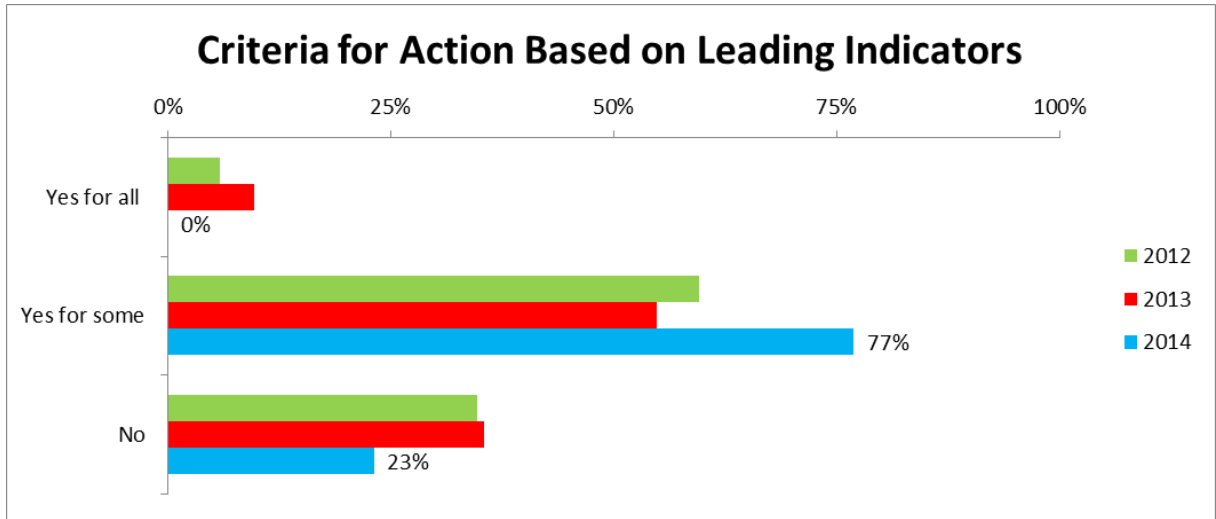
In a follow-up question, *Once an emerging risk is identified, do you select leading indicators to measure changing likelihoods?* 4 percent of the respondents noted that they had leading indicators for all identified emerging risks and 51 percent had them for some. An increasing rate, to 43 percent, stated no emerging risk leading indicators.



The examples shared about specific leading indicators collected and monitored (found in their entirety in Appendix II) are interesting. Standard byproducts of the financial reporting process or economic metrics tend to be lagging indicators so are not included here. Some that were listed are specific to an industry, like monitoring severe weather or make-up of regulatory bodies. Some risk managers are monitoring greenhouse gas emissions, Federal Reserve Bank actions, fund flows between countries/regions, cyberattacks, and the number of processes migrated in an outsourcing project.

Qualitative tools such as brainstorming between diverse teams are added to quantitative techniques like predictive modeling. One survey noted that *it's often more important to implement risk mitigation than to attempt accurate risk measurement!*

The survey asked whether these leading indicators included criteria that would lead to an action to mitigate or accept the risk. Over three-quarters (77 percent) stated that criteria exist for some of their emerging risks. No one said they had criteria for all identified emerging risks, which is not a surprising response as it is an extremely challenging topic.

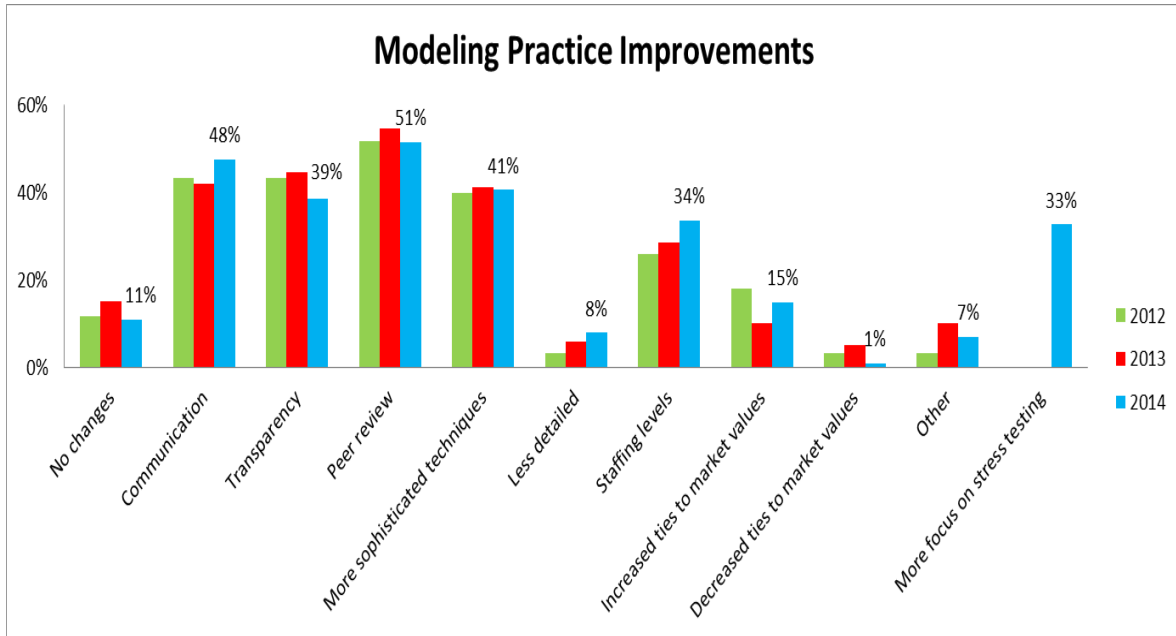


When asked for examples, respondents are starting to share a more formalized process, with specific actions and triggers than in previous surveys. A good example is:

- *When an emerging risk becomes material, it is added to our Risk Register and assessed a likelihood and impact score, as well as a risk tolerance. If the assessed risk scores are beyond the risk tolerance, the risk is escalated. Management and board would be notified and an action plan would be developed.*

Section 3: Methodology

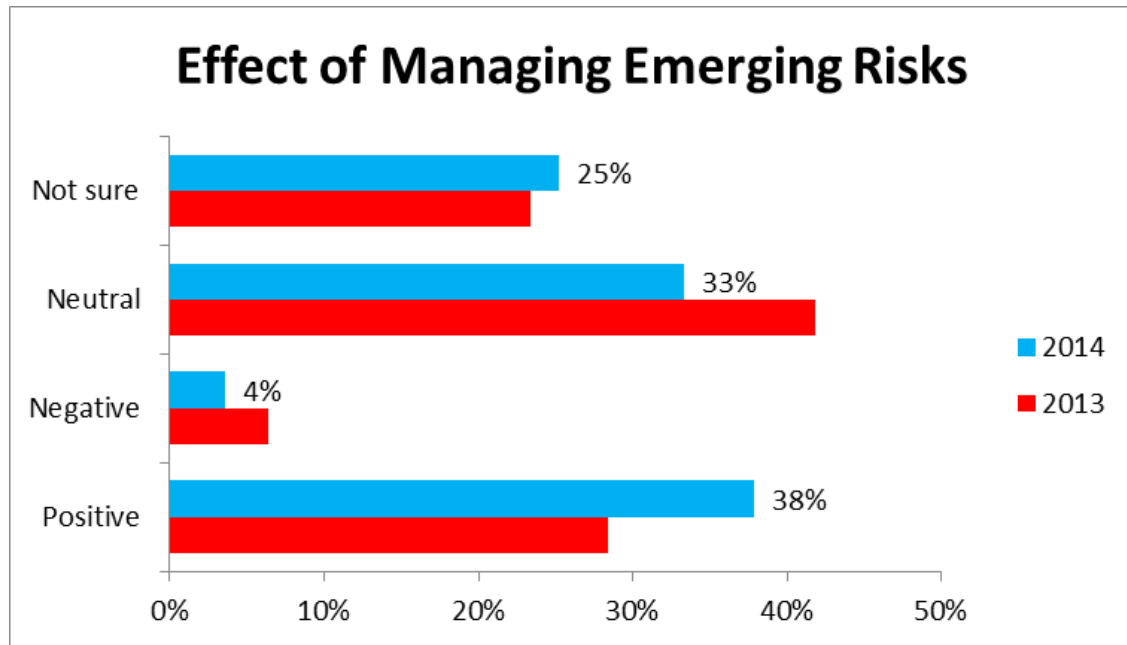
Models continue to be heavily scrutinized as various regulatory developments move forward. How are risk managers adapting? Staffing is visited later in the survey, but peer review, communication, increasingly sophisticated techniques and transparency all continue to evolve. Trends are noticeable among some of the other options as well, with more reporting *Increased ties to market value* (15 percent) and fewer (1 percent versus 5 percent) citing *Decreased ties to market values*. While not one of the top responses, *Less detailed* increased its response rate from 6 percent to 8 percent. A new option, *More focus on stress testing rather than stochastic analysis*, garnered a 33 percent response. Formal model validation and documentation are other model improvements noted.



When asked to share methods for developing assumptions applicable to emerging risks, the focus was on expert opinions, performing sensitivities (especially events leading to insolvency), and focusing on exposures and risk concentrations. Any modeling performed reflects the level and credibility of available data.

With 65 comments, it's clear that this is a topic being discussed by risk managers and evolving over time. Comments like *judgment*, *Delphi method* and *qualitative assessment* seem to sum up the current state of affairs. While most seem to be trying to get their hands around the issues, the process is starting to take shape at many companies. Some comments expressed the importance of having contrary views, with some companies rotating a designated contrarian at planning meetings whose role is to be a skeptic.

The survey asked respondents if managing emerging risks was worthwhile. Very few say it has a negative view, but positive (38 percent), neutral and not sure each received comparable support.



When asked to expand their answer, responses were tagged to how the question was answered. Those who reported a positive effect of managing emerging risks used comments like “better awareness,” “better prepared,” “what could happen,” “earlier response,” “plan.” These are all terms that allow a firm to be more resilient. No process is perfect at every company, and while there were not nearly as many comments, those who answered that there was a negative effect of managing emerging risks made several good points. One comment noted a fear that someone would be consumed by a search for risk and make poor strategic decisions. Another noted that some competitors using models with very aggressive assumptions that may not play out well in the long run were causing reduced sales for more diligent firms. Those who were neutral, or not sure, expressed concern about maturity of the process and of the reality that no emerging risk has become a dominant current risk to this point.

In possibly the most interesting part of the survey to analyze, respondents were asked to share instances where quantitative, qualitative and combination efforts have enabled better decision-making.

The quantitative responses included some common themes. Many reflected modeling improvements to incorporate correlations and provide a prioritization plan so that all risks were included. Some reflected tactical plans that had been implemented, and some that were now better understood. Others stated they had changed products and enacted mitigation plans by identifying worst-case scenarios.

Qualitative analysis reflected the importance of brainstorming with more collaboration across business units. Some risks are Boolean, such as if a particular regulation has been passed. It is yes or no, and may be very important, but attaching a probability is not useful. It is agreed by many that qualitative works well but should be replaced when

quantitative tools become available. One response stated that *Qualitative analysis provides the backbone of management decision-making.*

Respondents also shared instances where a combination of qualitative and quantitative analysis has enabled better decision-making. The responses talk about “providing a complete picture of the risk,” “response agility,” “better focused,” “react sooner,” “more predictive” and “prioritization.”

The section can be summarized with this comment. *In almost all cases there is some measure of both. Quantification requires an initial qualitative assessment of how the risk will manifest and the associated impact; otherwise, there is nothing to quantify.*

Section 4: Predictions

The capabilities of the risk manager, at least as the respondents characterize them, focus on identifying risk exposures and ranges of scenarios. While no one can predict every crisis, at least some bubbles driven by human biases may be identified in advance. When asked if it is possible to anticipate/predict a crisis, most (74 percent) stated that it was possible sometimes. Comments reflected recognition of mean reverting data, and the difficulty of identifying the timing and severity. Thinkers mentioned include Guntram Werther, Bruce Bueno de Mesquita and Joseph Tainter. *Many if not all crises, in hindsight, seem predictable. The 2008 housing crisis, in retrospect, signaled its arrival years in advance with the Case-Schiller price index, and rents relative to income. How did we NOT see it coming!? In many cases, crises give advance warning and typically society ignores the warning. A good risk manager is alert to those signs.*

Not all agree that a crisis is possible to predict, although many of the comments refer to timing and complexity rather than identifying a future crisis. *You can monitor some risk factors, but it is not easy to predict the tipping point when the crisis is more than likely to occur. By the time you predict it, the crisis may be unfolding already.*

This question, like others in this survey, is designed to make the respondent think and tends to elicit well-thought-out comments. Even “not sure” produced *Wrong to focus too much on combatting crises just like those of the past; the next one will be different.*

About two-thirds (67 percent) felt it was part of their job to predict a range of outcomes, with 8 percent (up from 3 percent last year) saying they were asked to predict specific outcomes. Comments from those answering “yes—range of outcomes” included:

- *Providing a range of outcomes, determining which ones are acceptable and which ones need action, is one of the highest functions of ERM.*
- *Range of outcomes—prediction is not a science—range is what works best—with some attachment of likelihood.*
- *Risk manager’s job includes alerting management to possible scenarios and ways to mitigate risk. Decisions, though, belong to senior management/CEO/board.*

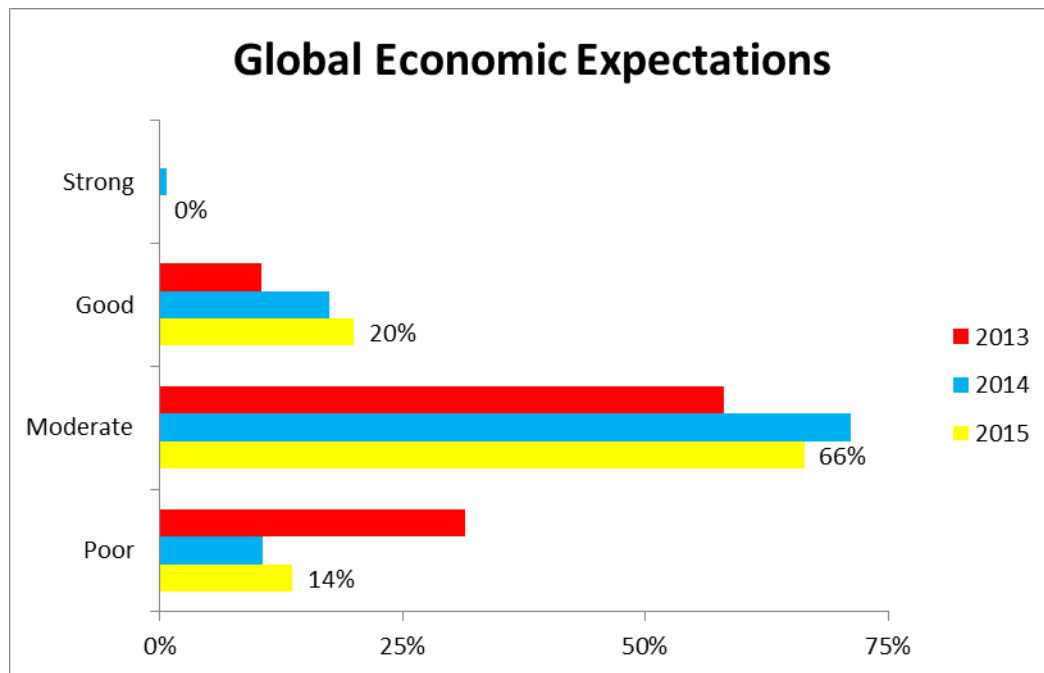
Each person has a unique read of questions. Comments from those who answered “no” to this question are no different. The comments show the deep thinking that occurs on both sides of this topic.

- *Awareness of future possibilities is my risk management job; awareness and prediction are two very different things.*
- *It is my job to identify potential risks. They don't need to be likely, merely plausible.*
- *My job is to create a framework that allows our organization to make decisions that are robust across a range of outcomes.*

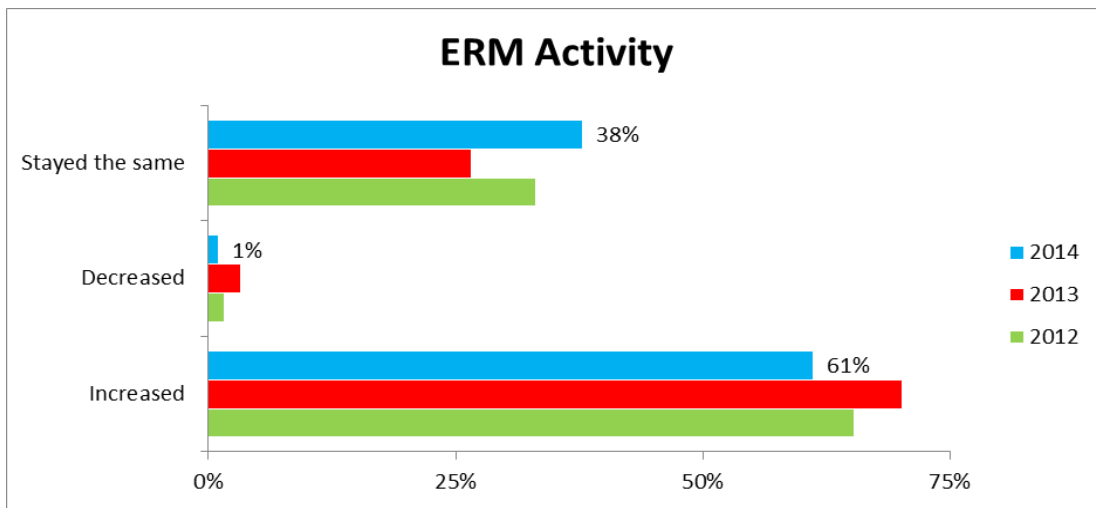
Section 5: Current Topics

Since the first iteration of this survey in April 2008 much has transpired. 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 be predictive.

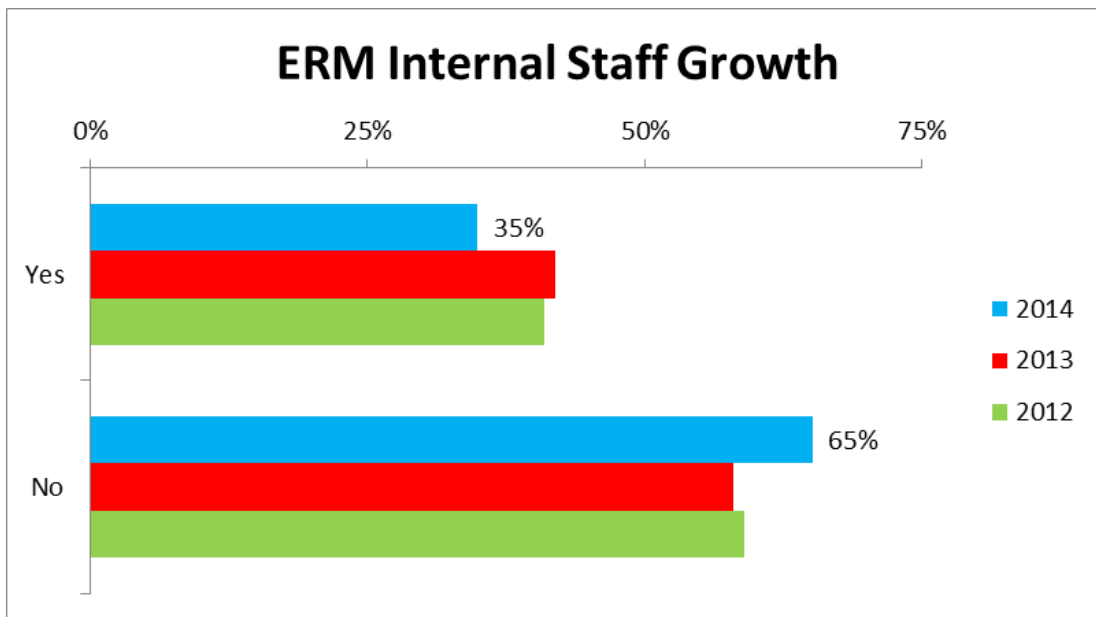
Global economic expectations have been volatile during past surveys, and this year is no different. Respondents have a bifurcated outlook for 2015, with 66 percent having a moderate outlook and 20 percent (a new high) a good outlook. Only 14 percent have poor expectations.



Risk managers continued to see increased ERM activity (61 percent) in 2014, and only 1 percent decreased activity.

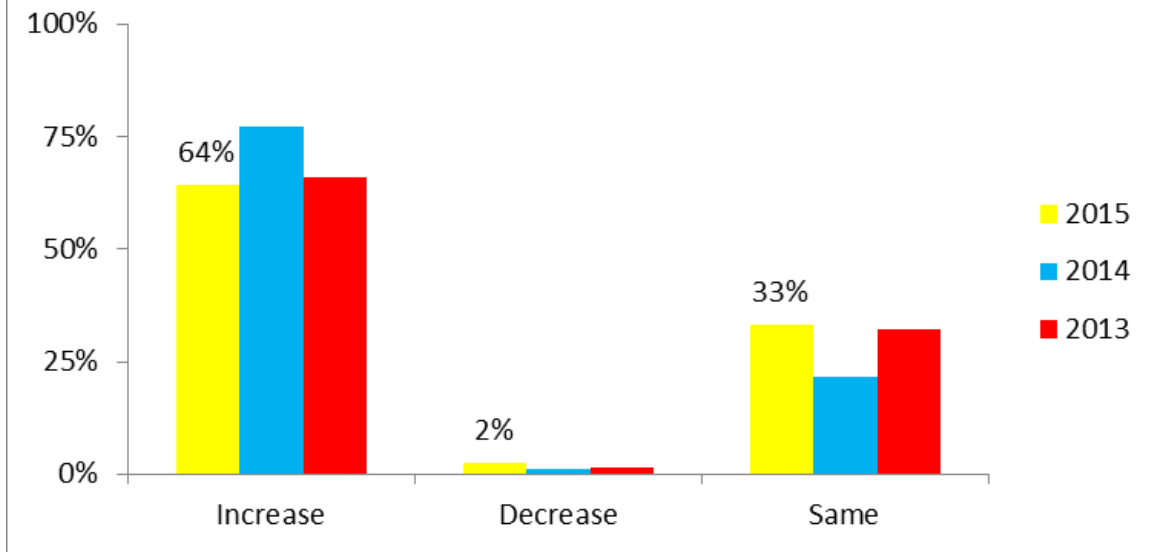


Despite the higher ERM activity, 65 percent of respondents' internal staff did not grow in 2014.

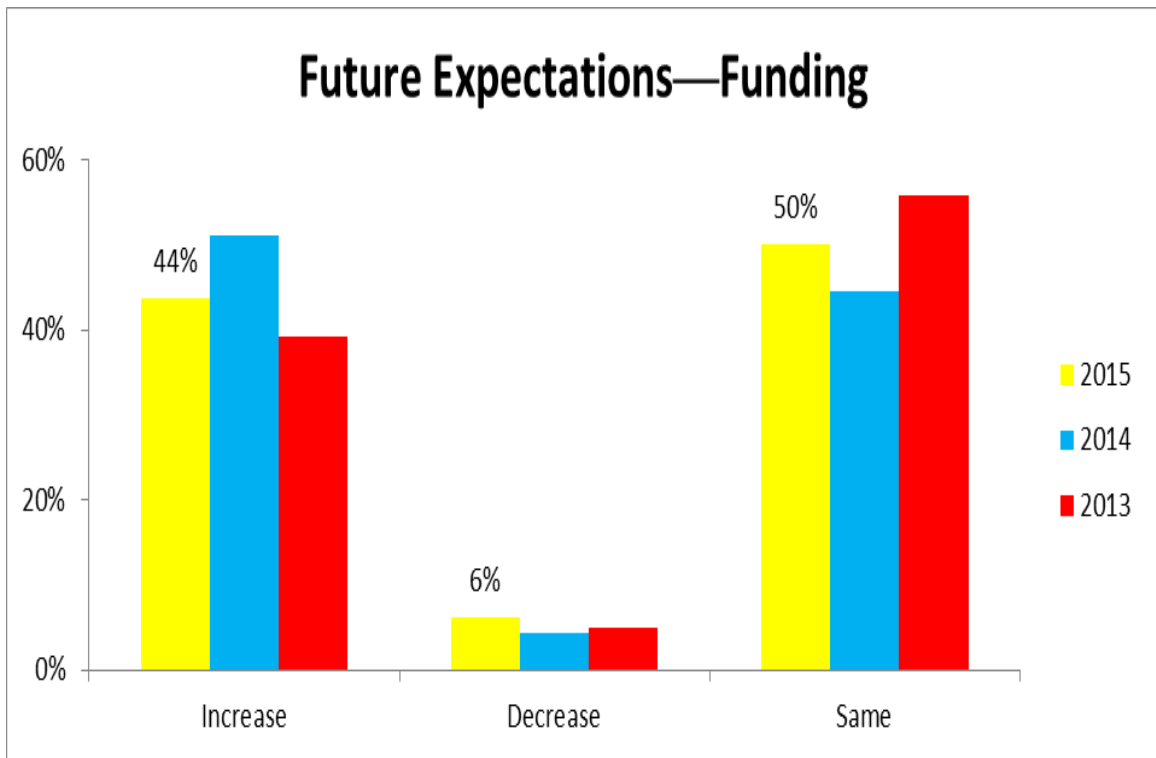


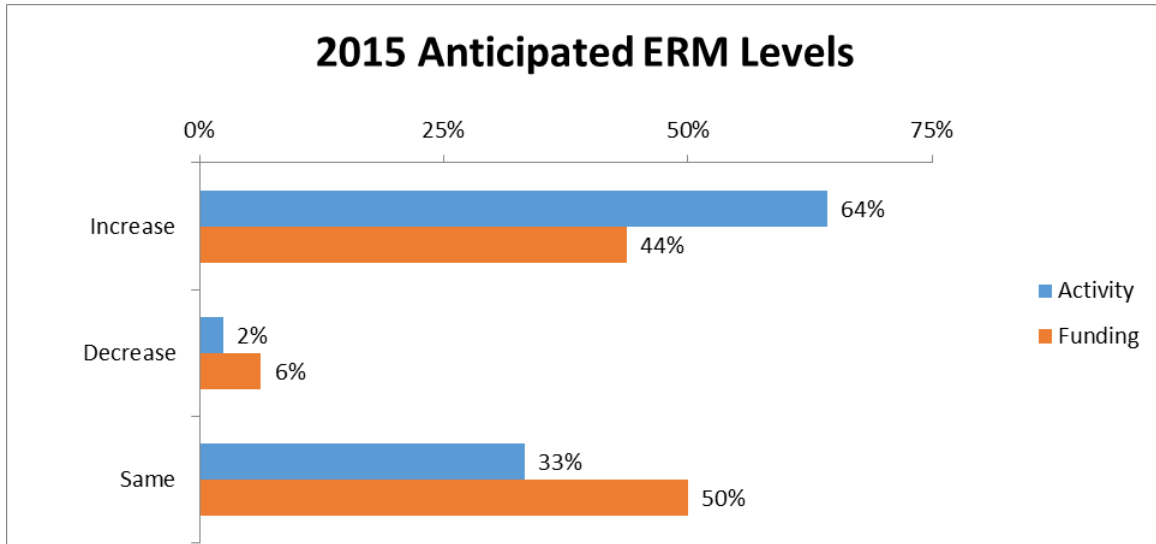
For 2015, survey respondents anticipate continued growth in their activities (64 percent), but less than half (44 percent) expect to see increased funding to accomplish these heightened expectations. Risk managers are being asked to do more, often with existing or smaller staffs. A challenge, especially when there is not an ongoing crisis, is to have management teams perceive ERM as adding value rather than a cost center.

Future Expectations—Activity

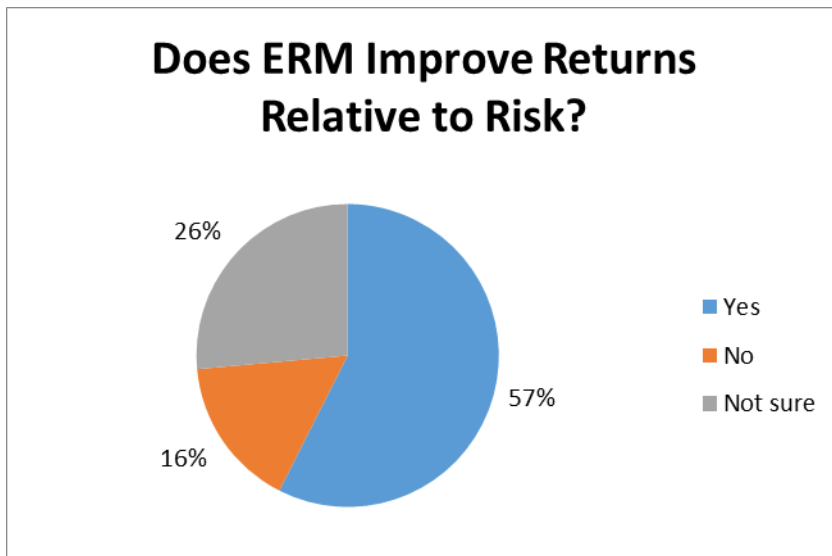


Future Expectations—Funding





A firm’s risk profile evolves over time, as does its understanding of those risks. In an attempt to ascertain the level of ERM maturity, respondents were asked, *Does ERM improve returns relative to risk?* More than half (57 percent) responded “yes,” while the comments were interesting for those who said “no” or were “not sure” (percentages do not add to 100 percent due to rounding).



Comments have been segmented based on how they answered the lead-in question. Some responses from those saying “yes” used words like “awareness,” “transparency,” “discussions,” “balance,” “decreasing volatility” and “better decisions.” Specifically:

- *Reduce likelihood of major losses*
- *Better able to chop off the tails of returns primarily through risk avoidance in product design*

- *Helps identify and mitigate some tail risk that might have otherwise been passively accepted*
- *ERM creates the framework, tools and metrics to evaluate return against risk.*
- *One business area is not working against another business unit on the same risk*
- *We have caught issues earlier because of ERM.*
- *Better understanding of marginal impacts of business decisions*

Again, nuance is important with an experienced group of risk managers. Here are some comments from those saying ERM has not improved returns relative to risk. Except for those fighting with a bureaucratic risk culture they don't sound much different than those saying "yes."

- *Helps to understand the risks being taken. It would stabilize returns, so reduce volatility and not necessarily the absolute level.*
- *The purpose of ERM is to avoid the impact of the risks at a minor cost. There is a positive return relative to what would happen otherwise.*
- *Most activities have so far been regulatory measures.*
- *It is more a matter of focusing on the risk-return trade-off than it is about ERM.*
- *ERM is largely involved with quantifying risks; however, senior management doesn't understand and doesn't use any information.*
- *Creation of a top-heavy bureaucracy with too many unaccountable reviewers*

The comments from those answering "not sure" are even more interesting.

- *Like buying insurance, poor deal in good times*
- *Ultimately it becomes part of how you do business and it is hard to identify the specific impact.*
- *You can't measure what didn't happen.*

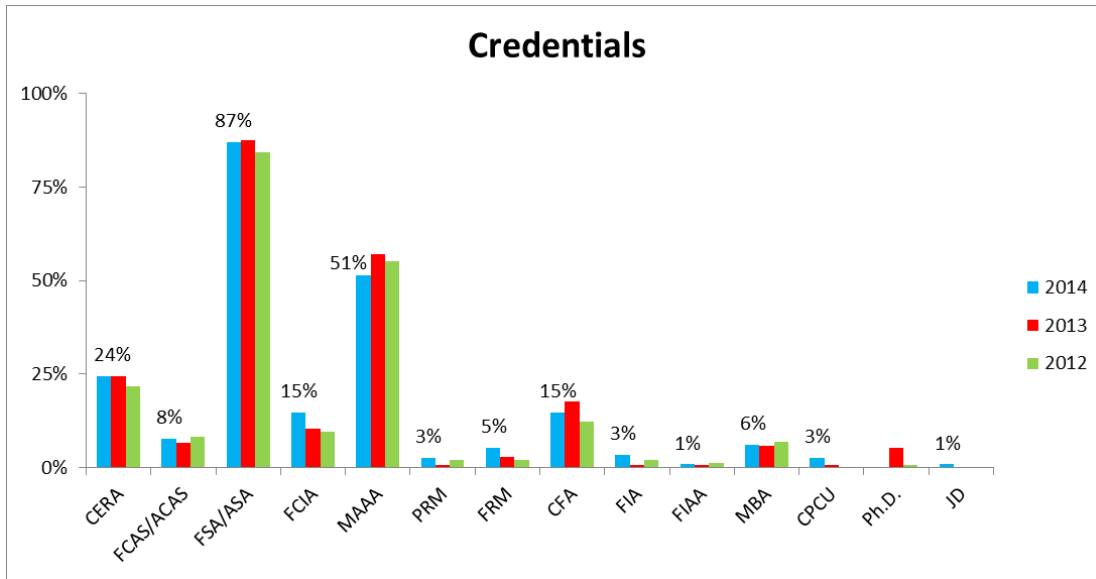
Not everyone agrees on what the risk team should accomplish. Some look at risk in all forms as bad, and try to set up controls to eliminate any possibility of a risk. Others focus on risk in only certain sections of a distribution, either trying to optimize the common results around the mean or looking strictly in the tail. Both of these interpretations are important but a focus on one ignores the other.

Regulatory efforts like Own Risk and Solvency Assessment (ORSA) in the insurance industry can highlight practices an individual company may not have thought of, as regulators provide feedback regarding pilot studies, as well as providing budget dollars to improve the ERM process overall. Rightly or wrongly, budget is easier to allocate when there is a compliance aspect to it.

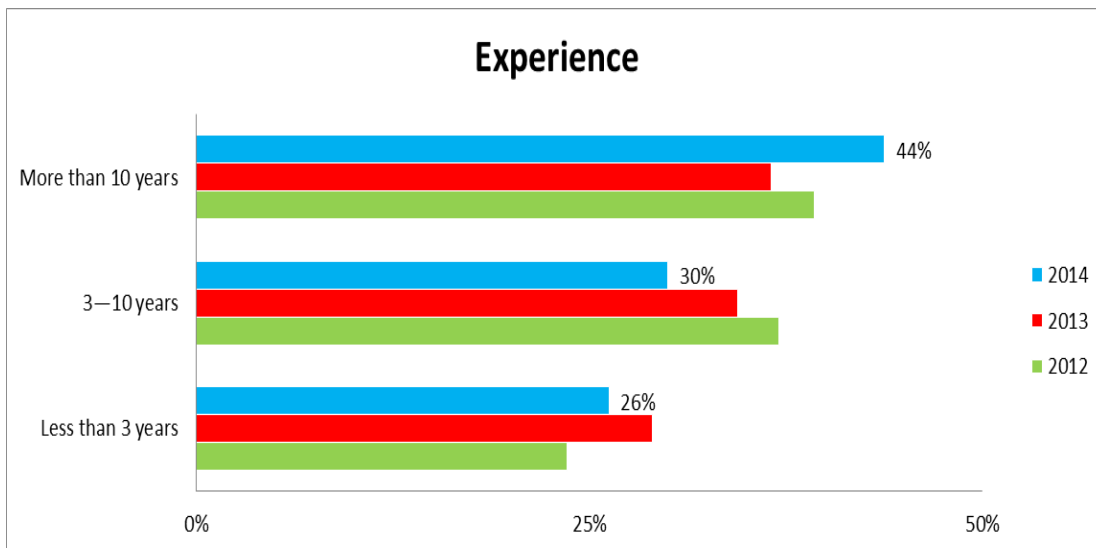
Section 6: Demographics

Each year the Emerging Risks survey is distributed using targeted emails and social media. For this survey 45 percent reported filling out the survey in the past. In another

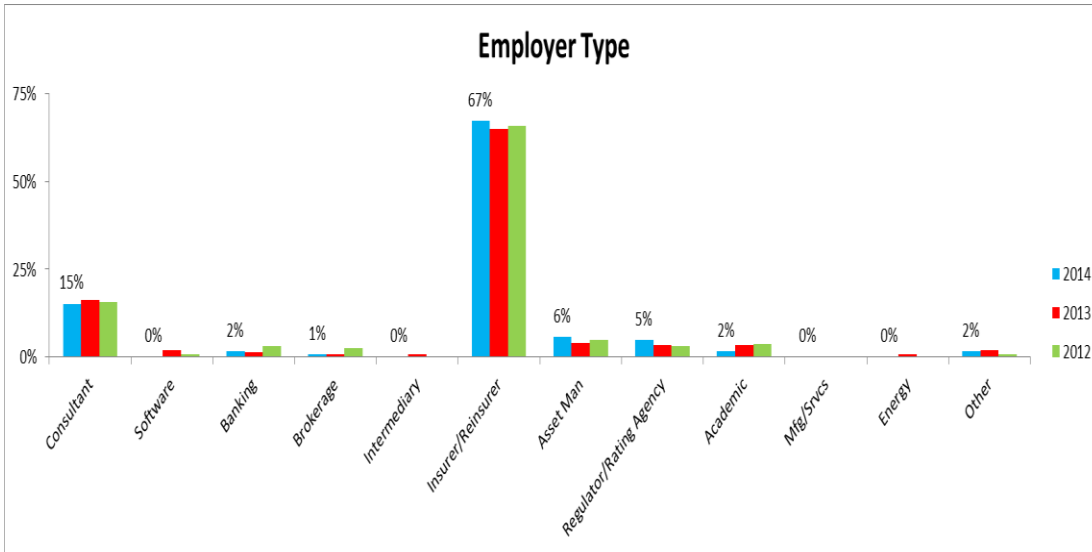
question, 87 percent of the survey respondents held a credential from the Society of Actuaries (ASA/FSA). Other groups representing the research sponsor, the Joint Risk Management Section, were also represented with 15 percent FCIA's (Canadian Institute of Actuaries) and 8 percent ACAS/FCAS (Casualty Actuarial Society). Another group strongly represented is CFA charterholders with 15 percent of the respondents.



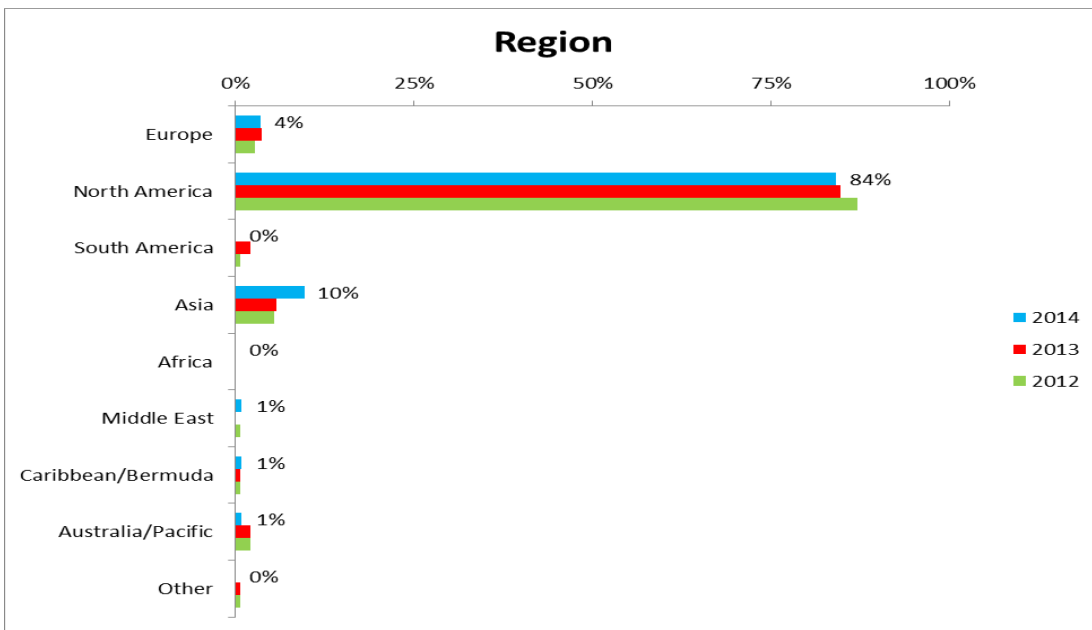
The survey respondents are becoming more experienced over time, with 44 percent saying they have been a risk manager for at least 10 years. The respondents overall have shown themselves able and willing to share many of their current practices.



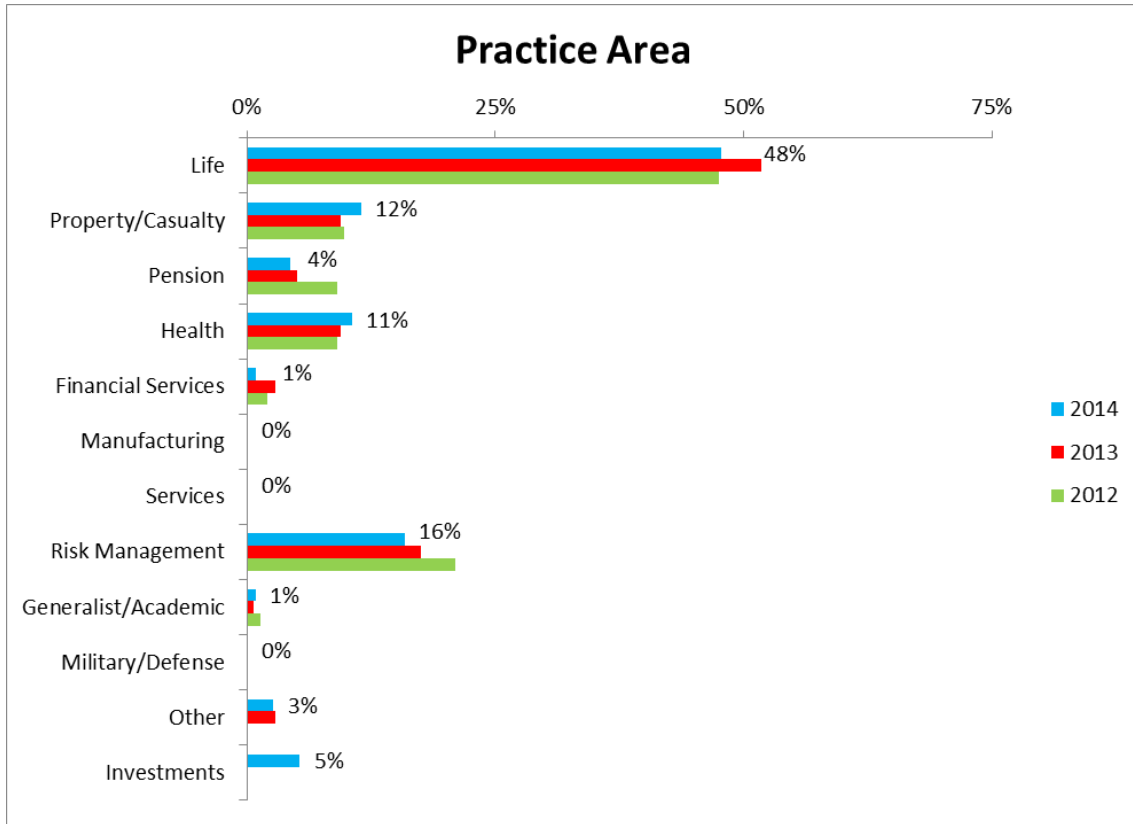
Most survey respondents are employed by either an insurance company/reinsurer (67 percent) or as a consultant (15 percent).



The survey continues to be dominated by North Americans (84 percent), with significant minorities coming from Asia and Europe. This year surveys were also completed by risk managers in the Middle East, Caribbean/Bermuda and Australia/Pacific regions.



The primary areas of practice continue to be life insurance (48 percent) and risk management (16 percent). Property/casualty insurance (12 percent), health (11 percent), investments (5 percent) and pension (4 percent) practitioners reveal a broader distribution than past surveys.



The survey found that 55 percent of the respondents belonged to the Joint Risk Management Section (JRMS, sponsored by the Canadian Institute of Actuaries, Casualty Actuarial Society and Society of Actuaries). The survey was sent directly to all JRMS and International Network of Actuarial Risk Managers (INARM) members, along with some targeted social media groups on LinkedIn and Twitter.

WEF Global Risks 2015

There are numerous emerging risk surveys being published. Many are sponsored by consulting firms and academic institutions, and seem to focus on a relatively short time horizon. The World Economic Forum (WEF) survey states a 10-year time horizon, focuses on the negative impact of risks, and provides no review of current risk sentiment. It is a thought-provoking survey but changes risks so it is hard to use for trending purposes.

The Global Risks 2015 Interconnections Map shows how combinations of risks might interact with each other. For each category the “hub” risk is:

- Economic risks—Unemployment or underemployment
- Environmental risks—Failure of climate-change adaptation
- Geopolitical risks—Interstate conflict
- Societal risks—Profound social instability
- Technological risks—Cyberattacks

There are several topics the WEF paper introduces that are useful for risk managers to think about and perhaps elaborate on. Here are a few:

- Impact of urbanization on risks in developing countries—what can we learn from a century ago when developed countries were moving from farms to cities?
- Most risk management practices assume a mean reversion process where “normal” is stable—this may not be true in a complex adaptive system like the earth.

The report is broken into three major sections: survey results, risks in focus, and risk resilience. It is an excellent companion piece to this report as it dives into some of the risks in detail.

Future Recommendations

Future surveys in this series should be more specific when asking about emerging risks versus ERM and be clearer about the desired time horizon. The survey should continue to use open-ended questions to learn from leading practitioners. Utilizing the experience of the Project Oversight Group (POG) has worked very well to develop 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. Recent efforts have focused on the defense industry. Partnerships with U.K. and Australian actuarial risk managers, along with the CRO Forum, should be sought out. Additional groups should be encouraged to complete the survey to reduce the reliance on actuarial risk managers. Here is a specific suggestion to follow up.

- *I think it would be instructive to include a section related to “lessons learned” from those who currently participate in or are in the process of developing ERM processes. It would help promote the value of ERM and provide concrete examples (if not proprietary information) to those that may be starting to formalize their processes and would appreciate some guidance to the benefits of ERM.*

Suggestions from the Researcher

Add questions probing

- Does an emerging risk leading indicator ever get dropped? Why?
- What blogs and other sources do you follow?
- Velocity—which risks can move quickly?

Following the Introductory Section question about top current risk, ask which regions they are concerned with (looking for regional instability and also if eurozone problems are being picked up here).

Investigate ways that rating agencies and the Securities and Exchange Commission (SEC) are incorporating emerging risks in their analysis.

Where does stochastic analysis add value and where does it not?

Change *Currency trend* to *Currency shock*

Move Space weather to *Climate change*

Add ACIA to credential list

In each survey the current 23 risks should be reviewed. The WEF list of emerging risks continues to evolve, and those in this survey should as well, even while maintaining consistency for trending.

Appendix I—Glossary of Risks

Initially 23 core risks were defined in *Global Risks 2007: A Global Risk Network Report*. They can be found at www.weforum.org/pdf/CSI/Long_Global_Risk_Report_2007.pdf. What follows is an updated version for the 2014 survey with a description of the 23 risks.

Economic Risks

- Energy price shock—Energy prices rise steeply due to major supply disruption.
- Currency trend—U.S. 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.
- Asset price collapse—The value of personal assets such as housing and equities collapses, fueling a recession.
- Financial volatility—price instability of core products such as commodities, energy or currency.

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 areas, leading to catastrophic economic losses and/or high human death tolls.
- Natural catastrophe: Earthquakes—Strong earthquake(s) occur in heavily populated areas.
- Natural catastrophe: Severe weather (except tropical storms)—Meteorological phenomena with potential to cause significant economic losses, fatalities and disruption. Includes inland flooding from all causes, tornados, thunderstorms, drought, wildfires, high winds, snowstorms and dust storms.

Geopolitical Risks

- International terrorism—Attacks disrupt economic activity, causing major human and economic losses.
- Proliferation of weapons of mass destruction (WMD)—Nuclear Non-Proliferation Treaty no longer effective, leading to spread of nuclear technologies.
- Interstate and civil wars—Major interstate or civil wars erupt.
- Failed and failing states—Trend of widening gap between order and disorder.
- Transnational crime and corruption—Corruption continues to be endemic and organized crime successfully penetrates the global economy.
- Retrenchment from globalization—Rising concerns about cheap imports and immigration sharpen protectionism in developed countries. Emerging economies become more nationalist and state-oriented.

- Regional instability—Certain unstable areas may cause widespread political and other crises. These include, but are not limited to, the Middle East and the Korean peninsula.

Societal Risks

- Pandemics/infectious diseases—A pandemic emerges with high mortality/incidence of diseases such as HIV/AIDS spreads geographically.
- Chronic diseases—Obesity, diabetes and cardiovascular diseases become widespread.
- Demographic shift—Aging populations in developed economies drive economic stagnation by forcing governments to raise taxes or borrow.
- Liability regimes and regulatory framework—Costs rise by multiples of GDP growth, with spread of litigiousness and regulatory revisions.

Technological Risks

- Cybersecurity/interconnectedness of infrastructure—A major disruption of the availability, reliability and resilience of critical information infrastructure caused by cybercrime, terrorist attack or technical failure. Results are felt in major infrastructure: power distribution, water supply, transportation, telecommunication, emergency services and finance.
- Technology/space weather—Health impairment due to exposure to nanoparticles, unintended consequences of technology, or disruptions caused by geomagnetic storms, meteorites and other phenomena originating from beyond the earth.

Evolution of Risks

The survey has attempted to maintain consistent risks as much as possible.

Spring 2008—23 risks generated by World Economic Forum’s Global Risks 2007

Fall 2008—no change to risks, minor changes to definition wording

2009—no changes

2010—some definitional changes

- *Changed Oil price shock/energy supply interruptions to Oil price shock*
- *Changed US current account deficit/fall in US dollar to Fall in value of US \$*
- *Changed Blow up in asset prices/excessive indebtedness to Blow up in asset prices*
- *Changed Middle East instability—The Israel-Palestine conflict and Iraqi civil war continue to Regional instability—A variety of hot spots are prevalent around the world. These include the Middle East and the Korean Peninsula.*
- *Changed Infectious diseases in the developing world to Infectious diseases*
- *Changed Chronic disease in the developed world to Chronic disease*
- *Changed Emergence of risks associated with nanotechnology to Nanotechnology*

2011—more substantive changes but attempt made to maintain trends and simplify

- *Moved Fiscal crises caused by demographic shift from Economic to Societal category and renamed Demographic shift. Updated trend data to make consistent going forward.*
- *Added Financial volatility—price instability of core products such as commodities, energy or currency to Economic category*
- *Combined Pandemic and Infectious diseases to Pandemics/infectious disease—A pandemic emerges with high mortality/Incidence of diseases such as HIV/AIDS spreads geographically.*
- *Changed Breakdown of critical information infrastructure (CII) to Cyber security/Interconnectedness of infrastructure*
- *Changed “Nanotechnology— Studies indicate health impairment due to unregulated 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.” to “Technology/Space weather— health impairment due to exposure to nanoparticles, unintended consequences of technology, or disruptions caused by geomagnetic storms, meteorites and other phenomena originating from beyond the earth.”*
- *Changed definition of International terrorism from “Attacks disrupt economic activity, causing major human and economic losses. Indirectly, attacks aid retrenchment from globalization.” to “Attacks disrupt economic activity, causing major human and economic losses.”*
- *Changed the definition of Regional instability from “A variety of hot spots are prevalent around the world. These include the Middle East and the Korean peninsula.” to “Certain unstable areas may cause widespread political and other crises. These include, but are not limited to, the Middle East and the Korean peninsula.”*
- *Changed definition of Liability regimes from “US liability costs rise by multiples of GDP growth, with litigiousness spreading to Europe and Asia” to “Liability costs rise by multiples of GDP growth, with spread of litigiousness.”*

2012—no changes

2013—changes to two definitions in reaction to

- *Changed Natural Catastrophe: Inland Flooding to Natural Catastrophe: Severe Weather (except Tropical Storms) and the definition to “Meteorological phenomena with potential to cause significant economic losses, fatalities and disruption. Includes inland flooding from all causes, tornados, thunderstorms, drought, wildfires, high winds, snow storms and dust storms.”*
- *Changed Liability Regimes to Liability regime and regulatory framework, and the definition to “Costs rise by multiples of GDP growth, with spread of litigiousness and regulatory revisions.”*

2014—changes to the names of two risks

- *Changed Fall in value of US \$ to Currency trend*
- *Changed Blow up in asset prices to Asset price collapse*

Appendix II—Survey Results 2014

The following includes 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. Note that open ended questions have been edited for AP style, but original intent is unchanged.

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.

Keep in mind that you cannot press the “back” button in your browser to review prior answers. Please use the “Previous” button at the bottom of each page to navigate back to already answered questions. If you want to save your responses for later, it is suggested to print each page before pressing the “Continue” button.

Please respond no later than November 10, 2014.

For a glossary of terms, please click here (see Appendix I) and then click on the link in the Related Links box on the right of the page.

Thanks for participating!

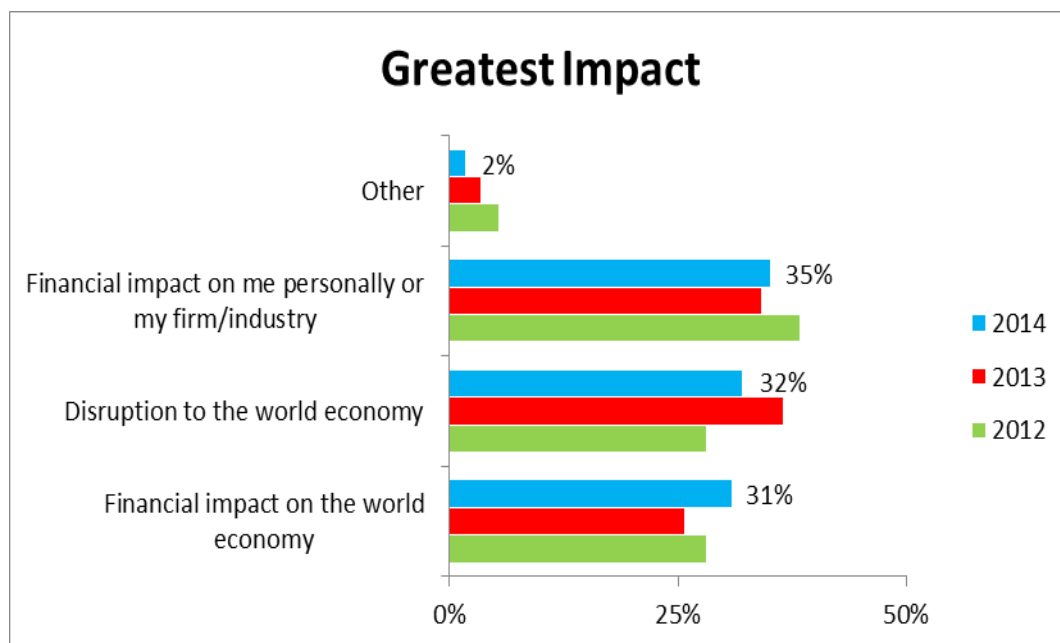
Note: Occasionally a comment is **highlighted** to reflect those the researcher found particularly thought provoking.

Default Question Block

Previous surveys have found that respondents tend to be anchored in the present with their responses, giving more weight to recent events. 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 current and emerging risks that you expect to have the greatest impact currently and also over the next few years.

Question 1. Greatest impact related to risk can have various meanings. How do you define it?

- 51 responses 31% (26%/28%/29% in 2013/2012/2011 survey) Financial impact on the world economy
- 53 responses 32% (37%/28%/28%) Disruption to the world economy
- 58 responses 35% (34%/38%/39%) Financial impact on me personally or my firm/ industry
- 3 responses 2% (3%/5%/4%) Other
 - Loss of lives/quality of lives (world economy)
 - Need to quantify impact, but not only economy—deaths important, too
 - It depends! An automobile risk to an insurer may be a boon to a plaintiff law firm. The “risk client” needs to be defined. Could be global or a specific entity. For this survey I’ll refer to financial impact on world economy.



Question 2. What is the risk that currently has the greatest impact? (Please select one.)
 The 23 risks shown have been adapted from those developed by the World Economic Forum in 2007. (Ed. Note: Detailed definitions of these risks can be found in Appendix I, along with how the definitions have evolved over time.)

171 total responses for individual responses (bold corresponds with a 5 percent increase or doubling, italics a 5 percent decrease or halving)
Economic—67 responses 39% (50%/50%/51%)

- **7 responses 4% (1%/5%/3%)**
- *1 response 1% (6%/4%/2%)*
- 6 responses 4% (4%/4%/7%)
- **29 responses 17% (12%/12%/7%) 1**
- *24 responses 14% (27%/26%/32%) 2*
- Environmental—17 responses 10% (9%/7%/2%)**
- 10 responses 6% (4%/3%/1%)
- 2 responses 1% (2%/3%/1%)
- 1 response 1% (1%/0%/1%)
- 1 response 1% (0%/1%/1%)
- 3 responses 2% (1%/0%/0%)
- Geopolitical—41 responses 24% (17%/25%/23%)**
- **13 responses 8% (4%/3%/2%) T3**
- 2 responses 1% (1%/3%/1%)
- 4 responses 2% (3%/3%/2%)
- 9 responses 5% (4%/8%/11%)
- 0 responses 0% (0%/0%/0%)
- 1 response 1% (1%/1%/2%)
- **12 responses 7% (3%/7%/4%) 5**
- Societal—25 responses 15% (11%/5%/8%)**
- **13 responses 8% (2%/2%/4%) T3**
- 0 responses 0% (0%/0%/1%)
- 3 responses 2% (3%/1%/3%)
- 9 responses 5% (5%/1%/1%)
- Technological—10 responses 6% (8%/5%/5%/8%)**
- 10 responses 6% (8%/5%/4%)
- 0 responses 0% (0%/0%/1%)
- Other—11 responses 6% (6%/7%/11%)**
- Intolerance and inability to work collectively
- Regulation of the industry
- European deflation
- Decreasing long-term growth trend, i.e., secular stagnation
- Low interest rates
- Financialization (Ed. Note: Per Wikipedia financialization is a term sometimes used in discussions of financial capitalism which developed over recent decades, in which financial leverage tended to override capital (equity) and financial markets tended to dominate over the traditional industrial economy and agricultural economics.)
- Decline of the American Empire
- The change of the circumstance of the industry resulted by new regulations
- Low interest rates
- Model risk
- Environmental issues

Energy price shock

Currency trend

Chinese economic hard landing

Asset price collapse

Financial volatility

Climate change

Loss of freshwater services

Natural catastrophe: tropical storms

Natural catastrophe: earthquakes

Natural catastrophe: severe weather

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

Pandemics/infectious diseases

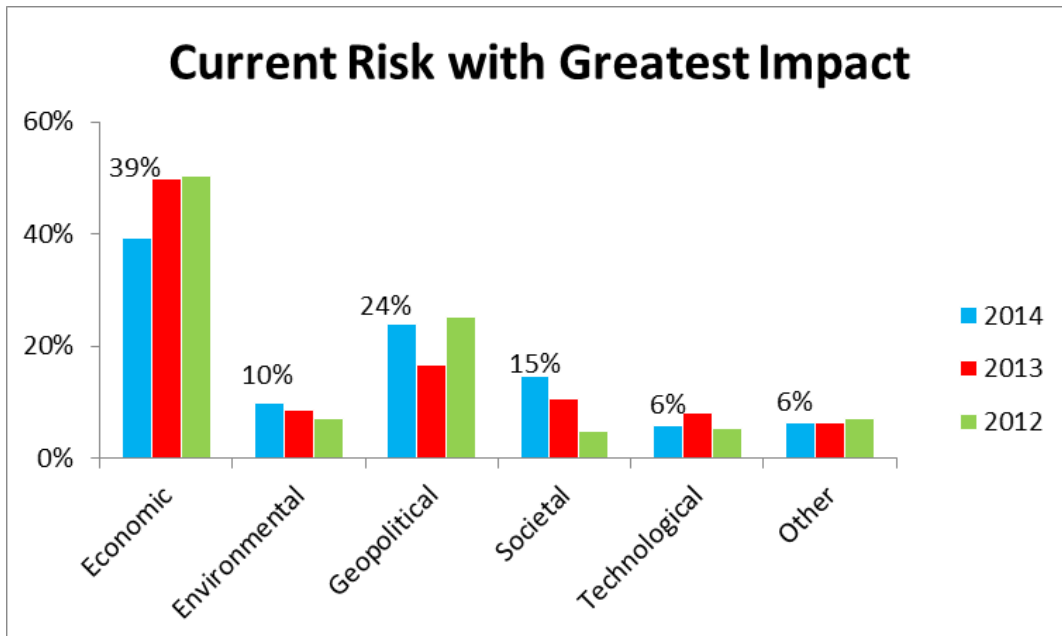
Chronic diseases

Demographic shift

Liability regimes/regulatory framework

Cybersecurity/interconnectedness of infrastructure

Technology/space weather



The categories of risks chosen as those having the current greatest impact were:

- Economic 39%/50%/50% in 2014/2013/2012
- Environmental 10%/9%/7%
- Geopolitical 24%/17%/25%
- Societal 15%/11%/5%
- Technological 6%/8%/5%
- Other 6%/6%/7%

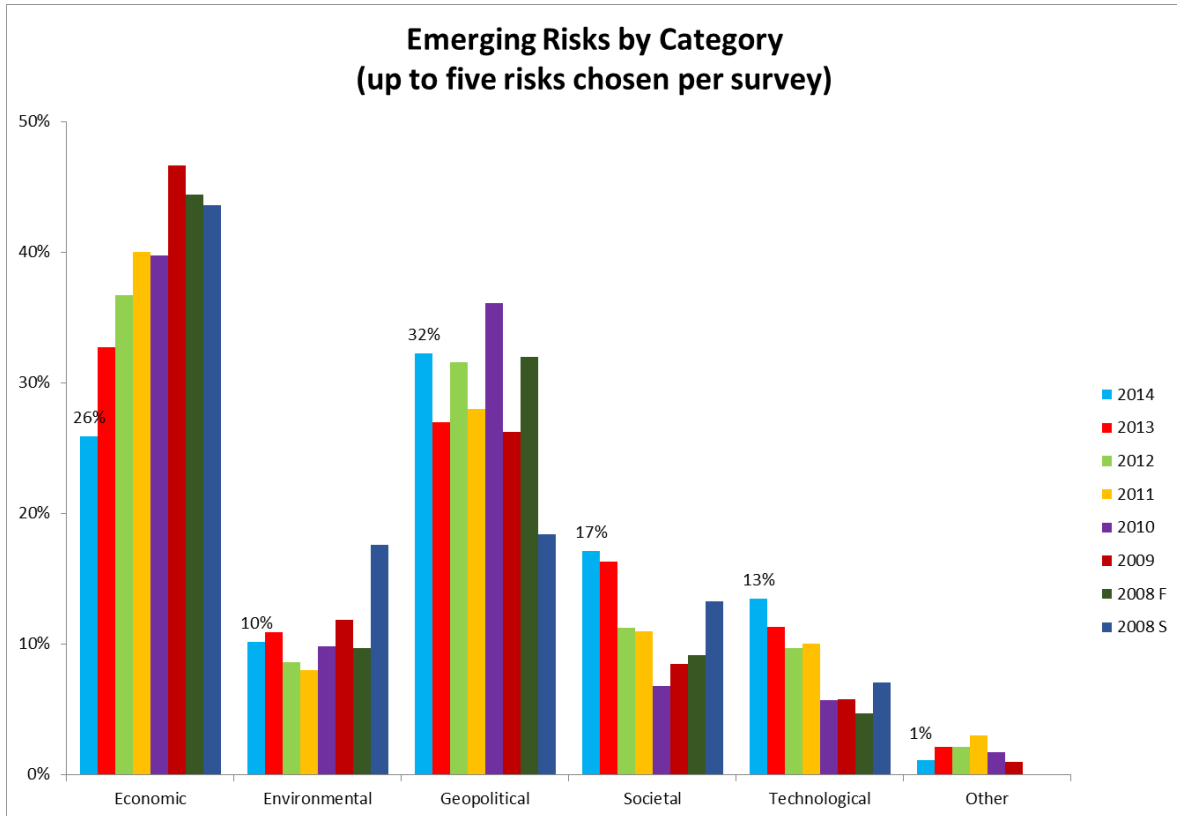
Section 1: Emerging Risks

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

788 total responses from 167 surveys—average 4.72 (4.60 in 2013)

Divisor in percentages for major categories is 788—for individual categories it is 167.

- 1–0 surveys 0%
- 2–0 surveys 0%
- 3–8 surveys 5%
- 4–31 surveys 19%
- 5–128 surveys 77%



Economic—204 responses 26% previous surveys

2013/2012/2011/2010/2009/F2008/S2008 (33%/37%/40%/40%/47%/44%/44%)

• 22 responses 13% (7%/31%/32%/40%/45%)

• 11 responses 7% (27%/26%/25%/49%/66%)

• 45 responses 27% (28%/31%/32%/41%/33%)

landing

• 52 responses 31% (30%/24%/22%/31%/49%)

• 74 responses 44% (59%/62%/68%)

Environmental—80 responses 10% (11%/9%/8%/10%/12%/10%/18%)

• 32 responses 19% (16%/20%/14%/25%/27%)

• 13 responses 8% (9%/11%/6%/9%/10%)

• 8 responses 5% (8%/6%/5%/4%/8%)

storms

• 9 responses 5% (6%/2%/6%/5%/7%)

earthquakes

• 18 responses 11% (11%/1%/4%/2%/5%)

weather

Geopolitical—254 responses 32% (27%/32%/28%/36%/26%/32%/18%)

• 69 responses 41% (27%/28%/20%/43%/30%)

• 15 responses 9% (5%/14%/9%/18%/14%)

mass destruction (WMD)

• 32 responses 19% (13%/14%/10%/10%/9%)

Energy price shock

Currency trend

Chinese economic hard

Asset price collapse

Financial volatility

Climate change

Loss of freshwater services

Natural catastrophe: tropical

Natural catastrophe:

Natural catastrophe: severe

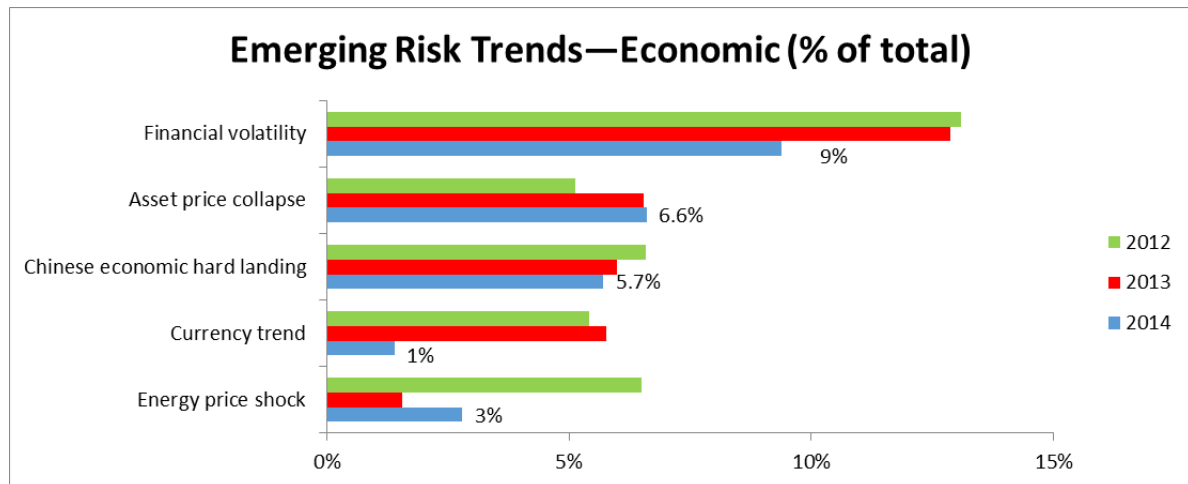
International terrorism

Proliferation of weapons of

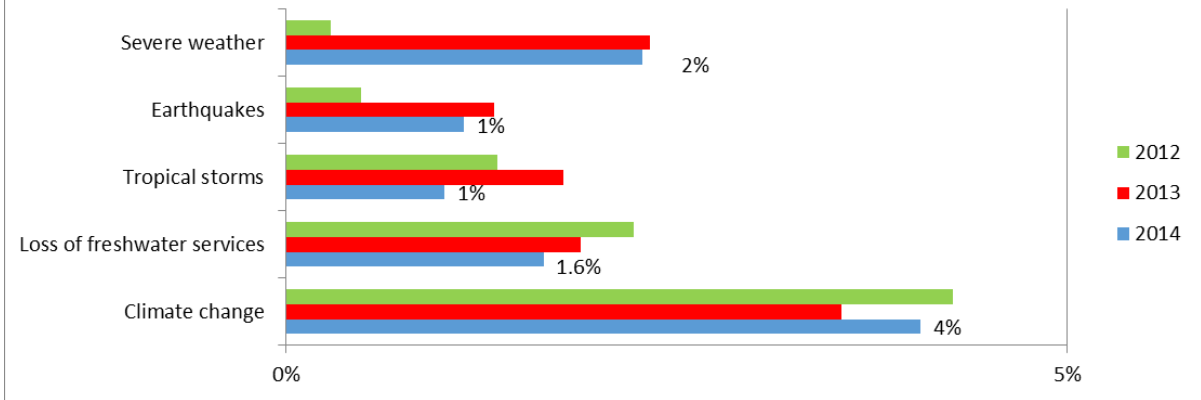
Interstate and civil wars

- 46 responses 28% (29%/33%/42%/38%/18%)
 - 17 responses 10% (8%/5%/3%/12%/7%)
 - 14 responses 8% (13%/13%/11%/25%/18%)
 - 61 responses 37% (29%/42%/32%/25%/28%)
- Societal—135 responses 17% (16%/11%/11%/7%/8%/9%/13%)**
- 50 responses 30% (19%/12%/13%/22%/30%)
 - 9 responses 5% (3%/3%/2%/4%/4%)
 - 39 responses 23% (30%/30%/30%/26%/27%)
 - 37 responses 22% (23%/8%/7%/6%/6%)
- Technological—106 responses 14%/11% (10%/10%/6%/6%/5%/7%)**
- 97 responses 58% (47%/40%/38%/23%/21%)
 - 9 responses 5% (5%/6%/5%/4%/7%)
- Other—9 responses 1% (2%/2%/3%/2%/1%/0%/0%)**
- Financial repression
 - European deflation
 - Ethical behavior of people in doing business or job
 - Price transparency and customer behavior
 - Changing regulations
 - Decline of the American Empire
 - Putin
 - Corporate irresponsibility
 - Gov't sponsored crime

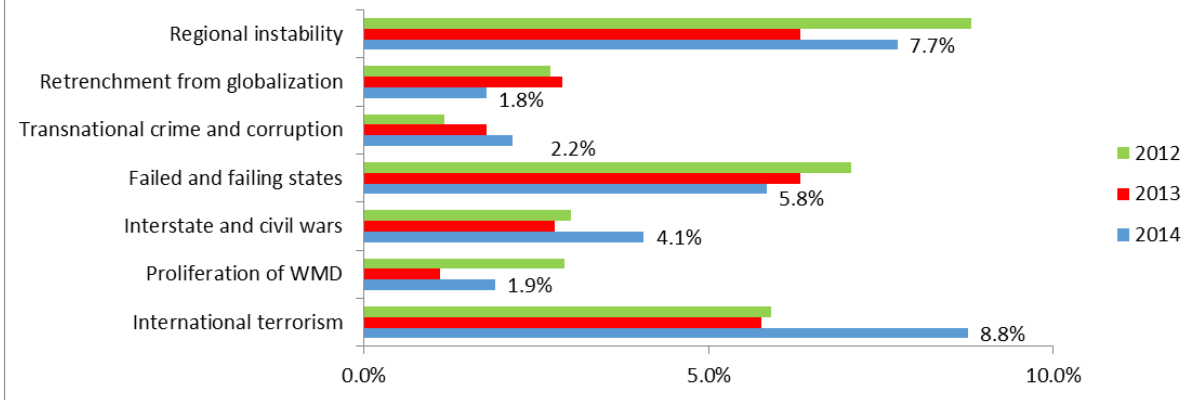
Failed and failing states
 Transnational crime and corruption
 Retrenchment from globalization
 Regional instability
 Pandemics/infectious diseases
 Chronic diseases
 Demographic shift
 Liability regimes/regulatory framework
 Cybersecurity / interconnectedness of infrastructure
 Technology/space weather



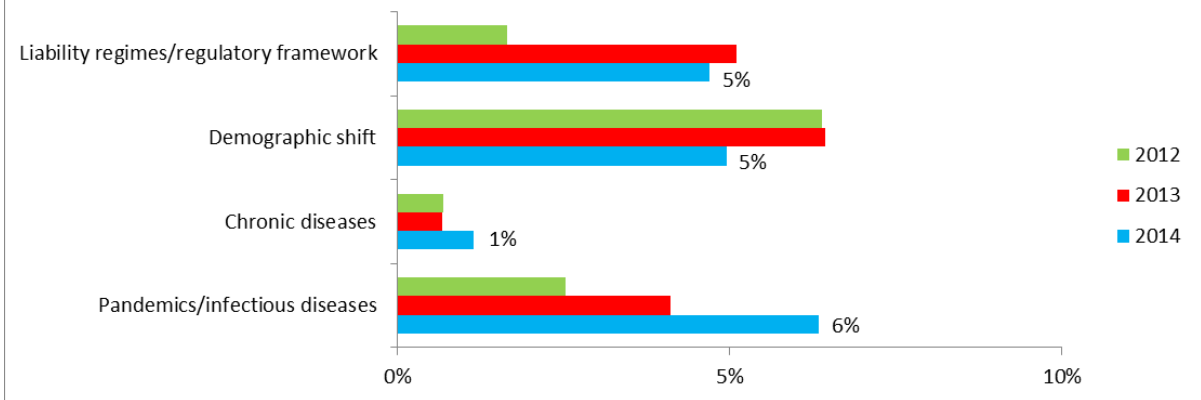
Emerging Risk Trends—Environmental (% of total)

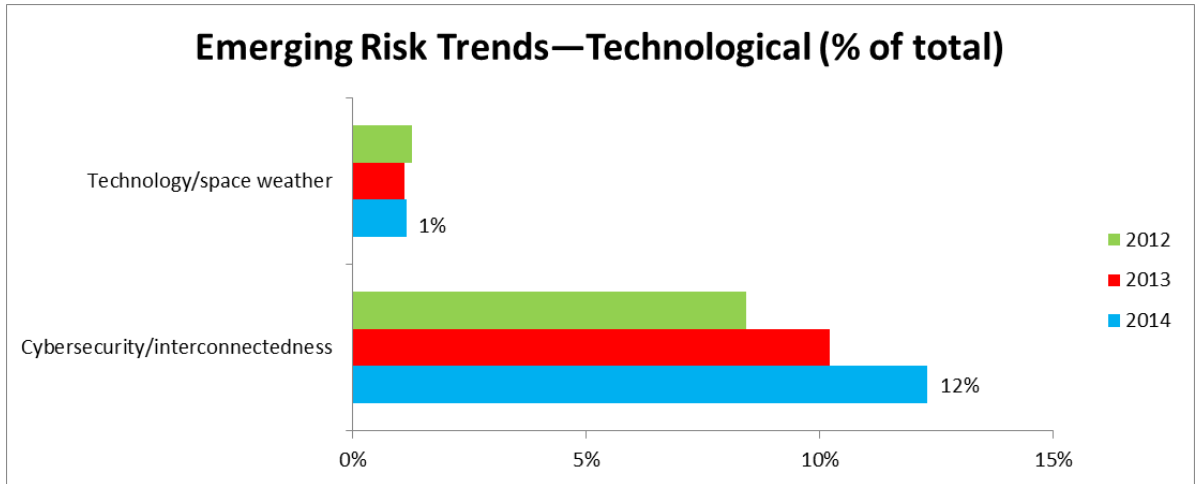


Emerging Risk Trends—Geopolitical (% of total)



Emerging Risk Trends—Societal (% of total)





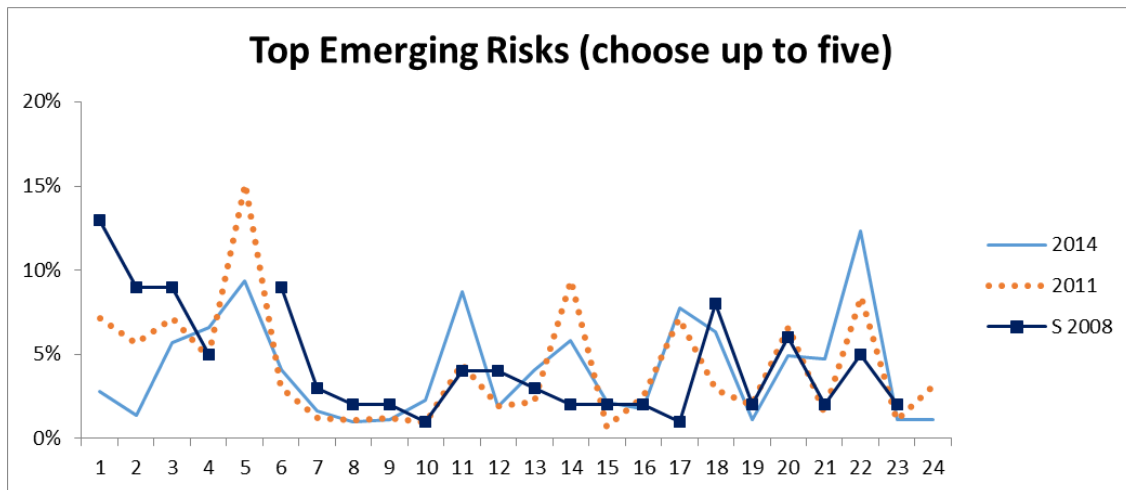
| Five Top Emerging Risks as percentage of total (not by number of surveys) | | | | | | | | | | |
|---|-----------|------------|------------|------------|------|------|--------|--------|------------|--|
| | 2014 | 2013 | 2012 | 2011 | 2010 | 2009 | F 2008 | S 2008 | Average | |
| 1 Energy price shock | 3% | 2% | 6% | 7% | 9% | 10% | 8% | 13% | 7% | |
| 2 Currency trend | 1% | 6% | 5% | 6% | 10% | 14% | 10% | 9% | 8% | |
| 3 Chinese economic hard landing | 6% | 6% | 7% | 7% | 9% | 7% | 6% | 9% | 7% | |
| 4 Asset price collapse | 7% | 7% | 5% | 5% | 6% | 10% | 14% | 5% | 7% | |
| 5 Financial volatility | 9% | 13% | 13% | 15% | | | | | 13% | |
| 6 Climate change | 4% | 4% | 4% | 3% | 5% | 6% | 5% | 9% | 5% | |
| 7 Loss of freshwater services | 2% | 2% | 2% | 1% | 2% | 2% | 2% | 3% | 2% | |
| 8 Tropical storms | 1% | 2% | 1% | 1% | 1% | 2% | 1% | 2% | 1% | |
| 9 Earthquakes | 1% | 1% | 0% | 1% | 1% | 1% | 1% | 2% | 1% | |
| 10 Severe weather | 2% | 2% | 0% | 1% | 0% | 1% | 0% | 1% | 1% | |
| 11 International terrorism | 9% | 6% | 6% | 4% | 9% | 6% | 6% | 4% | 6% | |
| 12 Proliferation of WMD | 2% | 1% | 3% | 2% | 4% | 3% | 3% | 4% | 3% | |
| 13 Interstate and civil wars | 4% | 3% | 3% | 2% | 2% | 2% | 2% | 3% | 3% | |
| 14 Failed and failing states | 6% | 6% | 7% | 9% | 8% | 4% | 6% | 2% | 6% | |
| 15 Transnational crime and corruption | 2% | 2% | 1% | 1% | 3% | 2% | 2% | 2% | 2% | |
| 16 Retrenchment from globalization | 2% | 3% | 3% | 2% | 5% | 4% | 5% | 2% | 3% | |
| 17 Regional instability | 8% | 6% | 9% | 7% | 5% | 6% | 7% | 1% | 6% | |
| 18 Pandemics/infectious diseases | 6% | 4% | 3% | 3% | 5% | 6% | 7% | 8% | 5% | |
| 19 Chronic diseases | 1% | 1% | 1% | 2% | 1% | 1% | 1% | 2% | 1% | |
| 20 Demographic shift | 5% | 6% | 6% | 7% | 6% | 6% | 5% | 6% | 6% | |
| 21 Liability regimes/regulatory framework | 5% | 5% | 2% | 2% | 1% | 1% | 1% | 2% | 2% | |
| 22 Cybersecurity/interconnectedness | 12% | 10% | 8% | 8% | 5% | 4% | 3% | 5% | 7% | |
| 23 Technology/space weather | 1% | 1% | 1% | 1% | 1% | 1% | 1% | 2% | 1% | |
| 24 Other | 1% | 2% | 2% | 3% | 2% | 1% | 4% | 4% | 2% | |

Another way to review this data is as a percent of the total responses. For example, *Climate change* had 32 responses in this survey. In the previous analysis just shared, $32/167 = 19\%$. In this next section we will look at $32/788 = 4\%$ and compare the results with previous surveys. **Bold** signifies higher than the average in the current survey and *italics* signifies lower than the average.

Economic (39% average—26%/33%/37%/40%/40%/47%/43%/42% October 2014, October 2013, October 2012, October 2011, November 2010, December 2009, November 2008, April 2008)

- 7%—3%/2%/6%/7%/9%/10%/8%/13% *Energy price shock*
- 8%—1%/6%/5%/6%/10%/14%/10%/9% *Currency trend*
- 7%—6%/6%/7%/7%/9%/7%/6%/9% *Chinese economic hard landing*

- 7%—7%/7%/5%/5%/6%/10%/14%/5%
 - 13%—9%/13%/13%/15%
- Environmental (11% - 10%/11%/9%/8%/10%/12%/9%/17%)**
- 5%—4%/4%/4%/3%/5%/6%/5%/9%
 - 2%—2%/2%/2%/1%/2%/2%/2%/3%
 - 1%—1%/2%/1%/1%/1%/2%/1%/2%
 - 1%—1%/1%/0%/1%/1%/1%/1%/2%
 - 1%—2%/2%/0%/1%/0%/1%/0%/1%
- Asset price collapse**
Financial volatility
Climate change
Loss of freshwater services
Natural catastrophe: tropical storms
Natural catastrophe: earthquakes
Natural catastrophe: severe weather
- Geopolitical (29% - 32%/27%/32%/28%/36%/26%/31%/18%)**
- 6%—9%/6%/6%/4%/9%/6%/6%/4%
 - 3%—2%/1%/3%/2%/4%/3%/3%/4%
- 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 (12% - 17%/16%/11%/11%/7%/8%/9%/12%)**
- 5%—6%/4%/3%/3%/5%/6%/7%/8%
 - 1%—1%/1%/1%/2%/1%/1%/1%/2%
 - 6%—5%/6%/6%/7%/6%/6%/5%/6%
 - 2%—5%/5%/2%/2%/1%/1%/1%/2%
- Pandemics/infectious diseases**
Chronic diseases
Demographic shift
Liability regimes/regulatory framework
- Technological (8% - 13%/11%/10%/10%/6%/5%/4%/7%)**
- 7%—12%/10%/8%/8%/5%/4%/3%/5%
- Cybersecurity/interconnectedness of infrastructure**
Technology/space weather



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

132 total responses

Economic—41 responses 31% (44%/54%/56%/48%/63%/65%)

- 3 responses 2% (1%/5%) Energy price shock
- 1 response 1% (5%/7%) Currency trend
- 6 responses 5% (6%/5%) Chinese economic hard landing
- 13 responses 10% (8%/9%) 3 Asset price collapse
- 18 responses 14% (24%/28%) 2 Financial volatility

Environmental—6 responses 5% (6%/6%/4%/7%/12%/4%)

- 4 responses 3% (4%/5%) Climate change
- 0 responses 0% (0%/0%) Loss of freshwater services
- 1 response 1% (0%/1%) Natural catastrophe: tropical storms
- 0 responses 0% (0%/0%) Natural catastrophe: earthquakes
- 1 response 1% (1%/0%) Natural catastrophe: severe weather

Geopolitical—41 responses 31% (17%/23%/22%/28%/14%/18%)

- 11 responses 8% (4%/1%) 5T International terrorism
- 2 responses 2% (1%/1%) Proliferation of weapons of mass destruction (WMD)
- 4 responses 3% (2%/3%) Interstate and civil wars
- 11 responses 8% (4%/8%) 5T Failed and failing states
- 0 responses 0% (1%/0%) Transnational crime and corruption
- 3 responses 2% (1%/3%) Retrenchment from globalization
- 10 responses 8% (4%/7%) Regional instability

Societal—21 responses 16% (13%/6%/5%/4%/2%/2%)

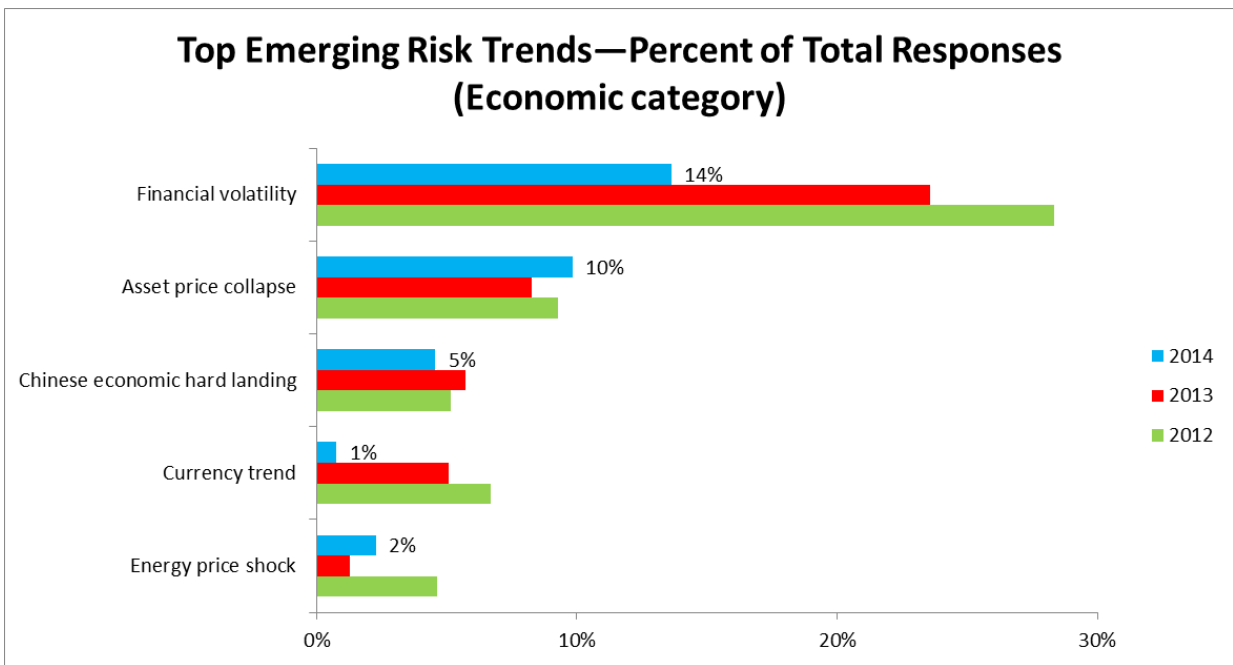
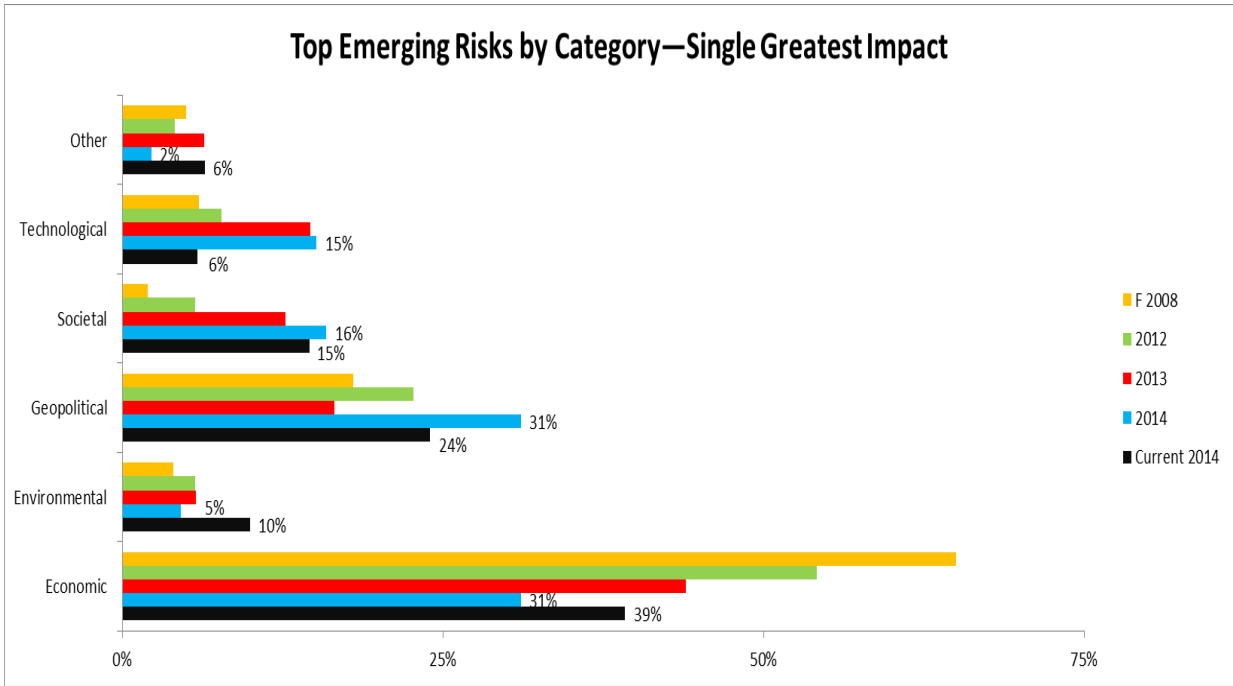
- 4 responses 3% (1%/1%) Pandemics/infectious diseases
- 0 responses 0% (0%/1%) Chronic diseases
- 5 responses 4% (3%/2%) Demographic shift
- 12 responses 9% (10%/2%) 4 Liability regimes/regulatory framework

Technological—20 responses 15% (15%/8%/8%/9%/6%/6%)

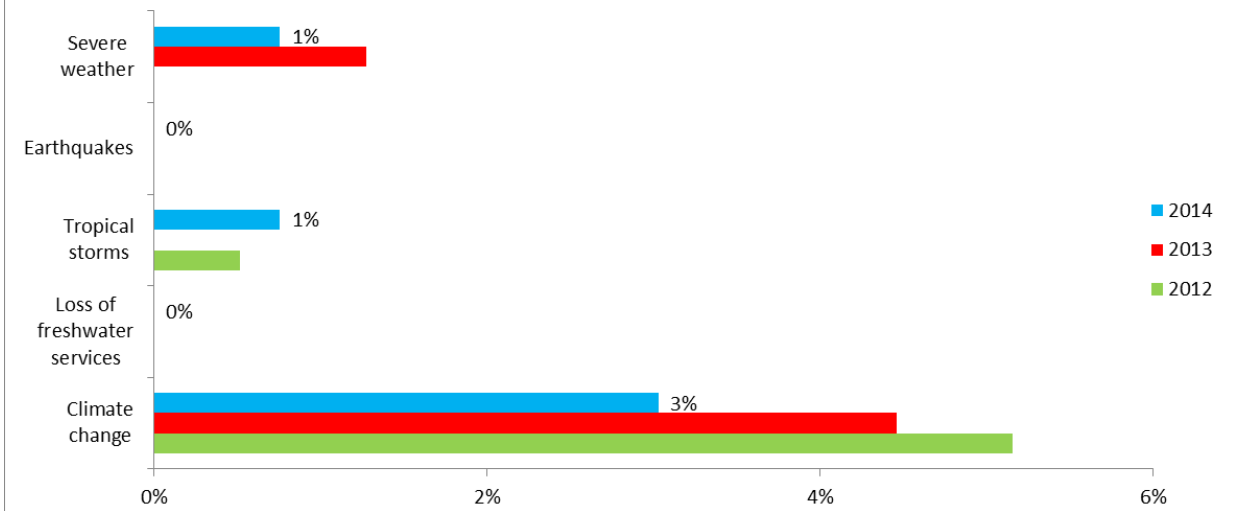
- 19 responses 14% (14%/7%) 1 Cybersecurity/interconnectedness of infrastructure
- 1 response 1% (1%/1%) Technology/space weather

Other—3 responses 2% (6%/4%/5%/3%/3%/3%)

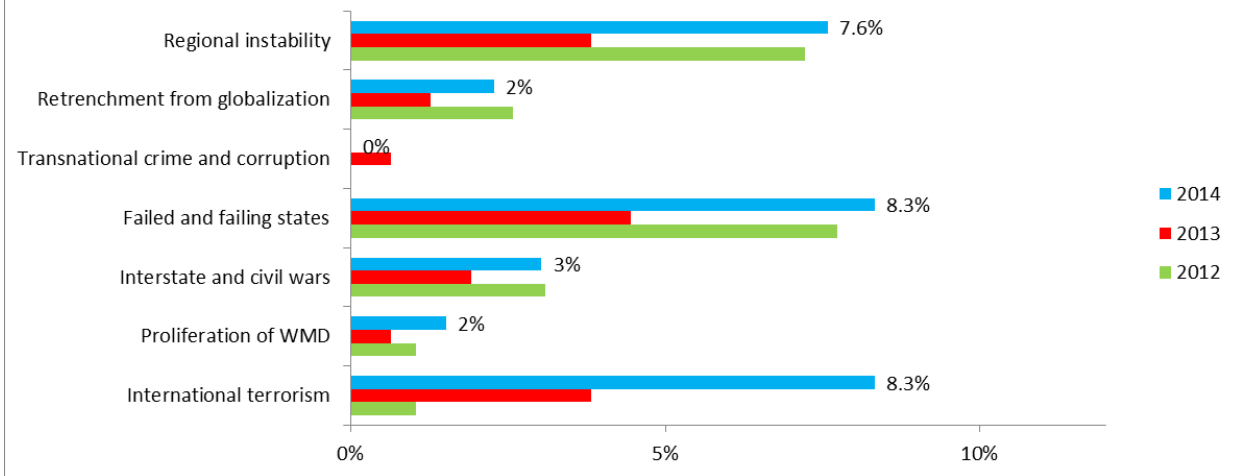
- European deflation
- Changing regulatory environment
- Putin

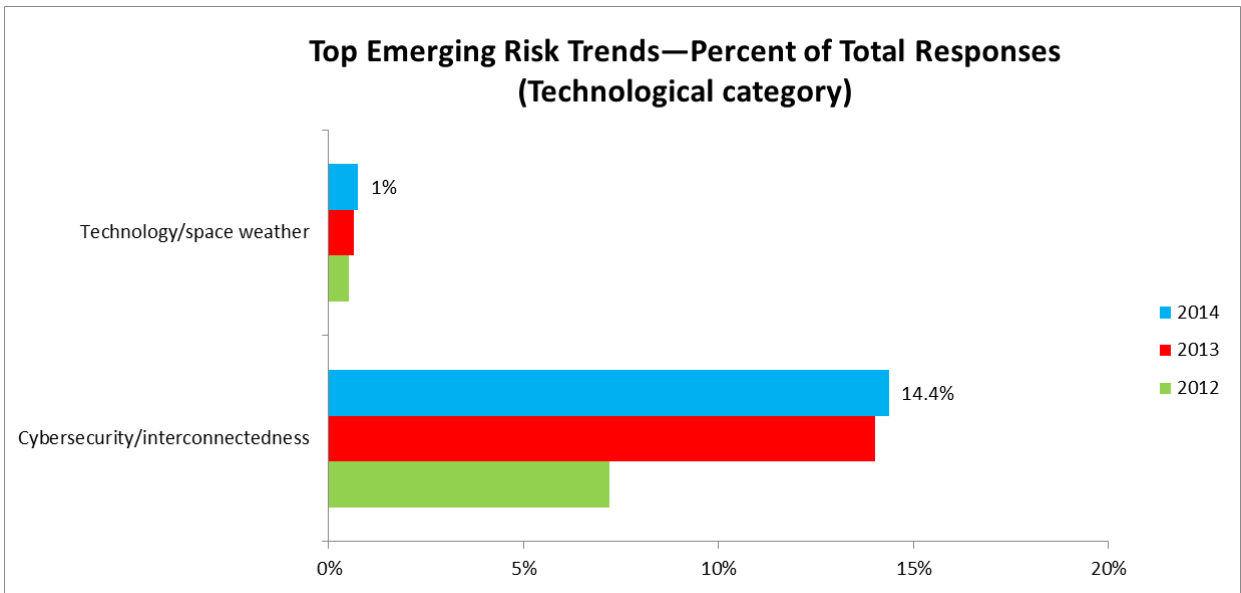
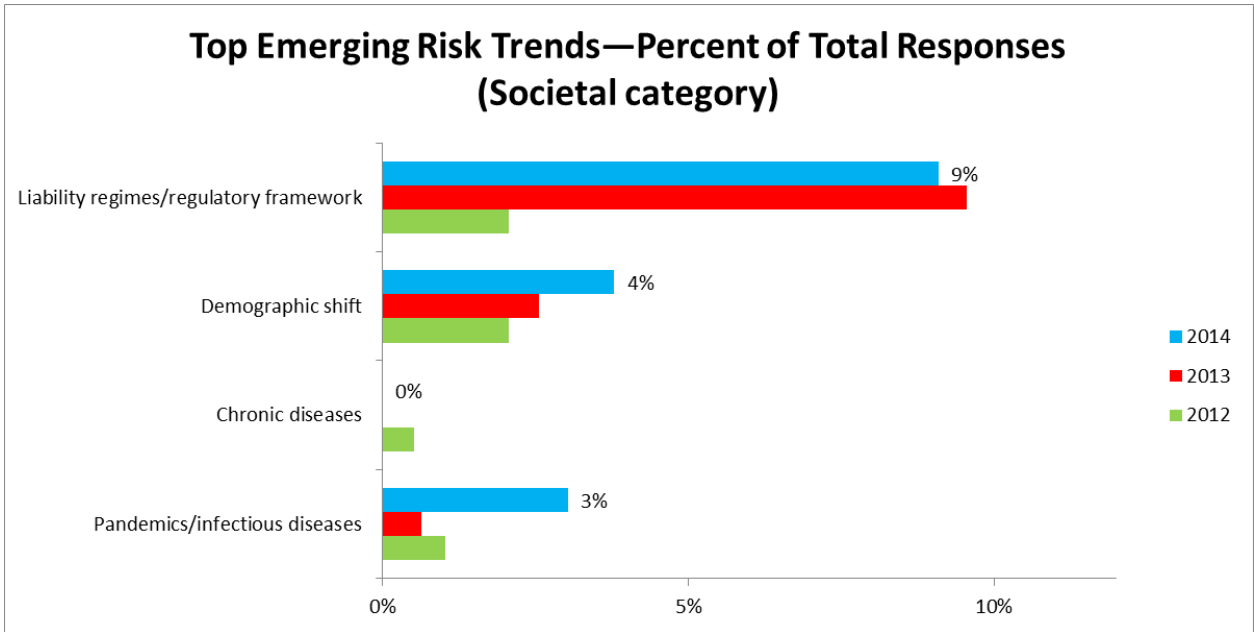


Top Emerging Risk Trends—Percent of Total Responses (Environmental category)



Top Emerging Risk Trends—Percent of Total Responses (Geopolitical category)





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. A follow-up question applies to the first combination listed so make that the one you think will have the largest impact.

Total mentions **367 combinations** (risks are numbered)

Economic—35% (40%/46%/48%/45%/53%/49% in previous surveys)

- 4% (3%/9%) 1 Energy price shock
- 2% (8%/6%) 2 Currency trend

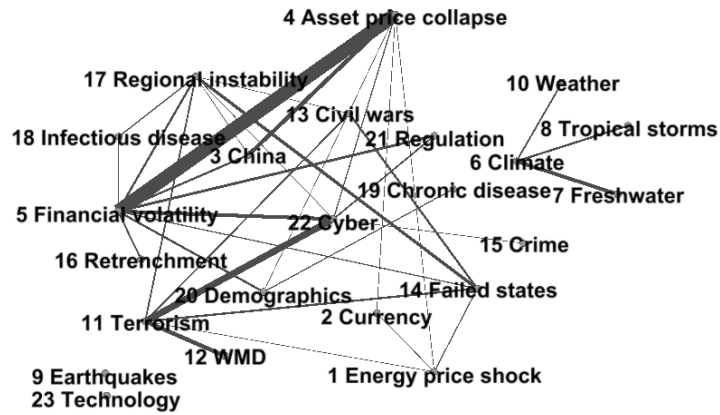
- 5% (6%/7%) 3 Chinese economic hard landing
- 10% (7%/8%) 4 2 Asset price collapse
- 13% (16%/15%) 5 1 Financial volatility
- Environmental—10% (11%/9%/7%/11%/13%/9%)**
- 4% (4%/4%) 6 Climate change
- 2% (2%/2%) 7 Loss of freshwater services
- 1% (2%/1%) 8 Natural catastrophe: tropical storms
- 0.4% (0.2%/1%) 9 Natural catastrophe: earthquakes
- 2% (3%/1%) 10 Natural catastrophe: severe weather
- Geopolitical—35% (32%/32%/32%/35%/25%/32%)**
- 9% (6%/6%) 11 3 International terrorism
- 2% (4%/4%) 12 Proliferation of weapons of mass destruction (WMD)
- 4% (4%/4%) 13 Interstate and civil wars
- 7% (6%/8%) 14 5 Failed and failing states
- 2% (4%/1%) 15 Transnational crime and corruption
- 3% (3%/3%) 16 Retrenchment from globalization
- 7% (6%/7%) 17 Regional instability
- Societal—12% (9%/7%/6%/5%/5%/8%)**
- 4% (2%/2%) 18 Pandemics/infectious diseases
- 1% (0.4%/1%) 19 Chronic disease
- 4% (3%/3%) 20 Demographic shift
- 3% (4%/1%) 21 Liability regimes/regulatory framework
- Technological—8% (9%/5%/7%/4%/3%/2%)**
- 7% (7%/5%) 22 4 Cybersecurity/interconnectedness of infrastructure
- 1% (1%/1%) 23 Technology/space weather

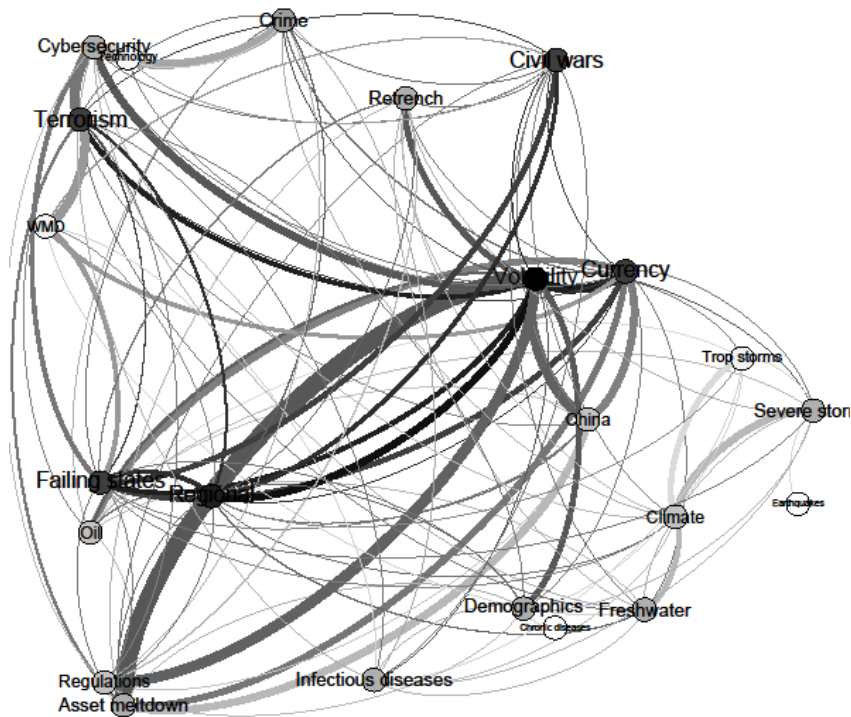
Two risk combinations—474 total responses

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | |
|-----|---|---|---|----|----|---|----|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|
| 1 | 0 | 4 | 3 | 4 | 3 | 2 | 0 | 0 | 0 | 0 | 4 | 0 | 2 | 5 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 31 |
| 2 | 0 | 0 | 2 | 4 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11 |
| 3 | 0 | 0 | 0 | 11 | 7 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 3 | 2 | 1 | 2 | 4 | 3 | 0 | 0 | 0 | 0 | 0 | 34 |
| 4 | 0 | 0 | 0 | 0 | 30 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 2 | 0 | 0 | 3 | 3 | 0 | 4 | 3 | 5 | 0 | 55 |
| 5 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 3 | 0 | 1 | 5 | 0 | 6 | 7 | 4 | 0 | 7 | 8 | 10 | 0 | 53 |
| 6 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 7 | 0 | 6 | 3 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 28 |
| 7 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 6 |
| 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 0 | 3 |
| 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11 | 6 | 7 | 3 | 2 | 6 | 2 | 0 | 1 | 1 | 16 | 0 | 0 | 55 |
| 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 7 |
| 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 2 | 4 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15 |
| 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 9 | 2 | 0 | 2 | 1 | 2 | 0 | 0 | 0 | 20 |
| 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 4 | 0 | 7 | |
| 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 2 | 1 | 2 | 0 | 0 | 9 | |
| 17 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 1 | 1 | 1 | 4 | 0 | 0 | 12 | |
| 18 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 2 | |
| 19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 1 | 0 | 0 | 6 | |
| 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 2 | 2 | |
| 21 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 |
| 22 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 22 | 0 | 2 | 2 |
| 23 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 0 | 0 |
| 367 | 0 | 4 | 5 | 19 | 42 | 5 | 11 | 9 | 1 | 9 | 12 | 11 | 18 | 32 | 7 | 15 | 39 | 28 | 1 | 24 | 18 | 53 | 4 | 367 |

A graphical representation using the open source Gephi source graphing software provides an interesting visual analysis of the combination data. Each node represents a single risk, and the edges between nodes represent the number of combinations reported between the two connected risks. A thicker edge represents a more popular combination. The graph makes intuitive sense, somewhat validating the results for other parts of the survey. In order to make the graph easier to read all edges with three or fewer responses have been hidden.

Interestingly, all of the risks (nodes) except *Natural catastrophe: earthquakes* and *Technology/space weather* had a risk combination of at least four. *Climate change* was the only combination chosen (by at least four respondents) for three risks; *Natural catastrophe: severe weather*, *Natural catastrophe: tropical storms* and *Loss of freshwater services*.





A similar chart from the 2013 survey shows similar results. This type of analysis is not as sophisticated as one might guess from the result but provides a useful visual representation of the results.

Leading combinations were

30 responses (8%) 7% in prior survey, ranked No. 1 previously

Asset price collapse

Financial volatility

16 responses (4%) 4%, No. 2T

International terrorism

Cybersecurity/interconnectedness of infrastructure

- 11 responses (3%) 3%, No. 8T
Chinese economic hard landing
Asset price collapse
- 11 responses (3%) 3%, No. 5T
International terrorism
Proliferation of weapons of mass destruction (WMD)
- 10 responses (3%) 1%, NR
Climate change
Loss of freshwater services
- 10 responses (3%) 3%, No. 8T
Financial volatility
Cybersecurity/interconnectedness of infrastructure
- 9 responses (2%) 3%, NR
Failed and failing states
Regional instability
- 8 responses (2%) 4%, No. 2T
Financial volatility
Liability regimes and regulatory framework
- 7 responses (2%) 4%, No. 2
Chinese economic hard landing
Financial volatility
- 7 responses (2%) 1%, NR
Financial volatility
Demographic shift
- 7 responses (2%) 1%, NR
Climate change
Natural catastrophe: Tropical storms
- 7 responses (2%) 1%, NR
Interstate and civil wars
Failed and failing states
- 7 responses (2%) 0.4%, NR
International terrorism
Failed and failing states
- 7 responses (2%) 2%, NR
Financial volatility
Regional instability

Leading combinations (top 10) in 2013 not in the top 14 in the current survey

- 2 responses (1%) 3%, No. 5T
Currency trend
Financial volatility
- 4 responses (1%) 3%, No. 5T
Transnational crime and corruption
Cybersecurity/interconnectedness of infrastructure

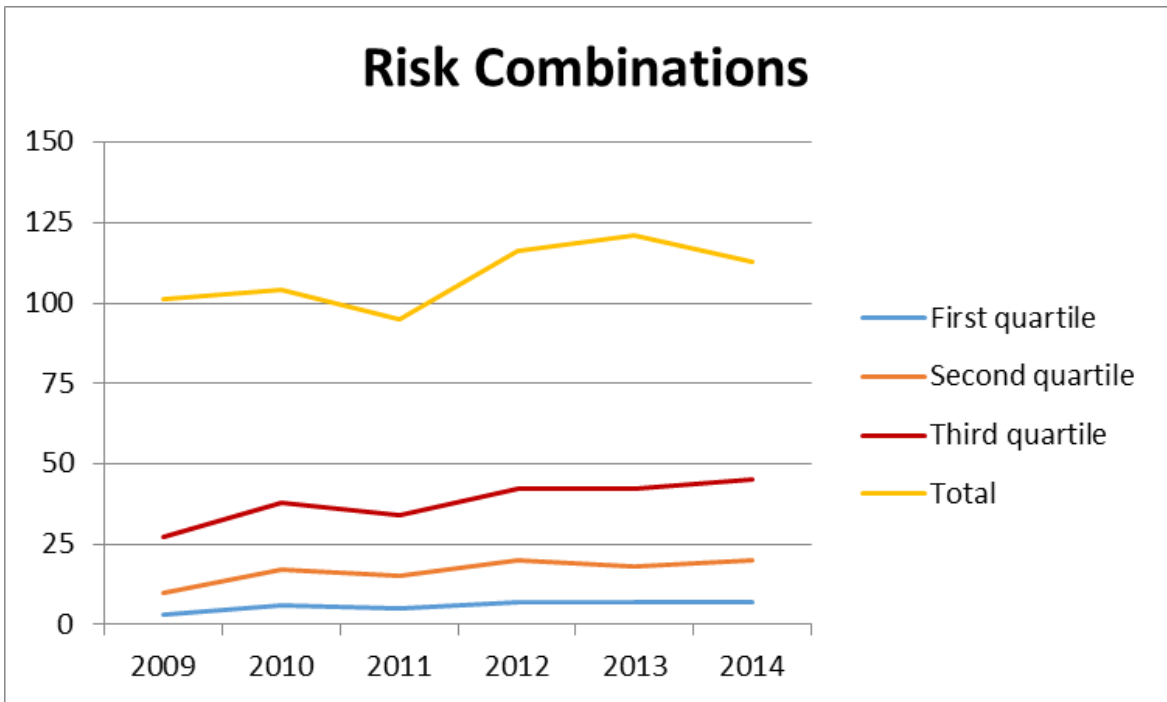
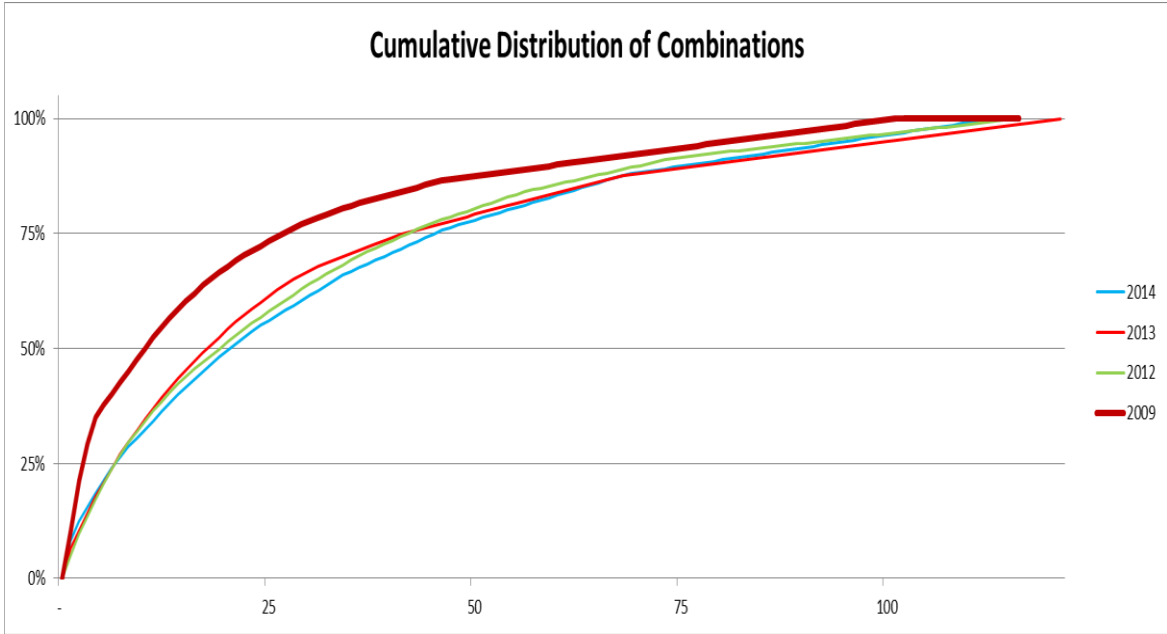
2 responses (1%) 3%, No. 8T
Currency trend
Chinese economic hard landing

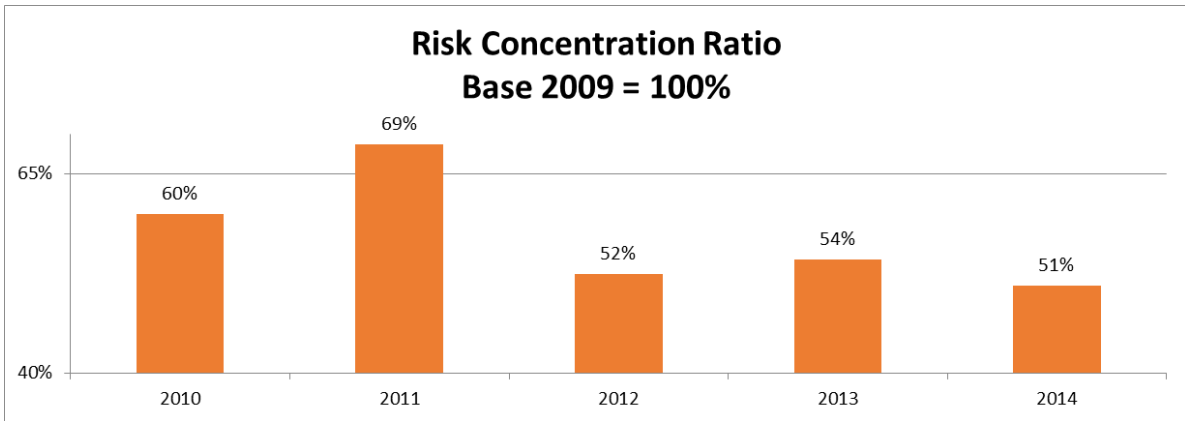
Combinations by category

| | | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|---------------|---------------|------|------|------|------|------|------|------|
| Economic | Economic | 34% | 42% | 29% | 29% | 29% | 24% | 19% |
| Economic | Environmental | 2% | 3% | 5% | 3% | 3% | 2% | 2% |
| Economic | Geopolitical | 22% | 16% | 21% | 24% | 21% | 18% | 15% |
| Economic | Societal | 2% | 3% | 2% | 6% | 6% | 7% | 9% |
| Economic | Technological | 1% | 1% | 3% | 4% | 3% | 4% | 4% |
| Environmental | Environmental | 7% | 9% | 7% | 4% | 6% | 7% | 7% |
| Environmental | Geopolitical | 2% | 2% | 3% | 2% | 2% | 4% | 2% |
| Environmental | Societal | 5% | 3% | 2% | 2% | 1% | 2% | 1% |
| Environmental | Technological | 0% | 0% | 0% | 0% | 0% | 0% | 1% |
| Geopolitical | Geopolitical | 16% | 14% | 20% | 14% | 18% | 15% | 19% |
| Geopolitical | Societal | 4% | 2% | 2% | 1% | 2% | 4% | 7% |
| Geopolitical | Technological | 1% | 2% | 3% | 7% | 4% | 9% | 8% |
| Societal | Societal | 2% | 1% | 2% | 1% | 2% | 2% | 2% |
| Societal | Technological | 1% | 0% | 1% | 0% | 1% | 1% | 2% |
| Technological | Technological | 0% | 1% | 0% | 1% | 1% | 2% | 1% |

Combinations by choice 1, 2, 3

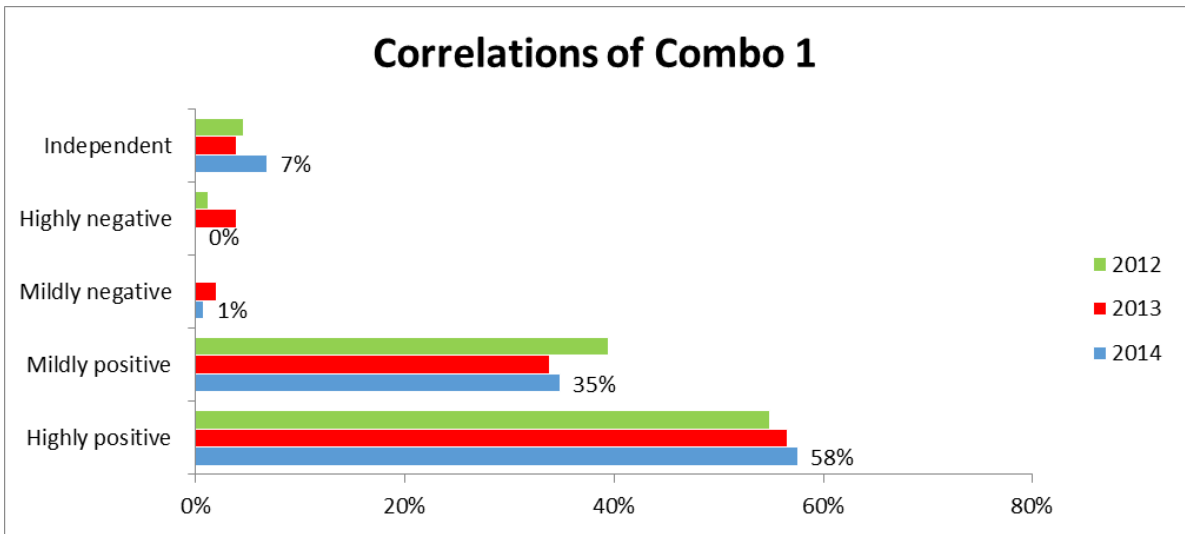
| | | Combo 1 | Combo 2/3 | Combo 1 | Combo 2 | Combo 3 | Total |
|---------------|---------------|---------|-----------|---------|---------|---------|-------|
| Economic | Economic | 27% | 15% | 35 | 21 | 14 | 70 |
| Economic | Environmental | 5% | 1% | 6 | 2 | 1 | 9 |
| Economic | Geopolitical | 12% | 17% | 16 | 23 | 17 | 56 |
| Economic | Societal | 11% | 8% | 14 | 7 | 12 | 33 |
| Economic | Technological | 4% | 5% | 5 | 5 | 6 | 16 |
| Environmental | Environmental | 6% | 8% | 8 | 12 | 6 | 26 |
| Environmental | Geopolitical | 1% | 3% | 1 | 3 | 5 | 9 |
| Environmental | Societal | 1% | 1% | 1 | 2 | 0 | 3 |
| Environmental | Technological | 1% | 0% | 1 | 0 | 1 | 2 |
| Geopolitical | Geopolitical | 15% | 21% | 19 | 26 | 24 | 69 |
| Geopolitical | Societal | 4% | 9% | 5 | 11 | 11 | 27 |
| Geopolitical | Technological | 9% | 7% | 12 | 9 | 8 | 29 |
| Societal | Societal | 2% | 2% | 3 | 1 | 4 | 8 |
| Societal | Technological | 3% | 2% | 4 | 2 | 2 | 8 |
| Technological | Technological | 1% | 0% | 1 | 0 | 1 | 2 |
| | | 100% | 100% | 131 | 124 | 112 | 367 |





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

- 76 responses 58%/56%/55% Highly positively correlated
- 46 responses 35%/34%/39% Mildly positively correlated
- 1 response 1%/2%/0% Mildly negatively correlated
- 0 responses 0%/4%/1% Highly negatively correlated
- 9 responses 7%/4%/5% Independent
- 0 responses 0%/0%/0% Not applicable



Question 5. Which risks do you expect to have the greatest interaction with population growth? (Please select no more than three.)

132 respondents chose at least one for a total of 346 responses (2.6 average)

Economic—8%

- 13 responses 4% Energy price shock
- 1 response 0% Currency trend
- 4 response 1% Chinese economic hard landing
- 4 responses 1% Asset price collapse
- 6 responses 2% Financial volatility

Environmental—18%

- 19 responses 5% Climate change
- 39 responses 11% 3 Loss of freshwater services
- 3 responses 1% Natural catastrophe: tropical storms
- 0 responses 0% Natural catastrophe: earthquakes
- 3 responses 1% Natural catastrophe: severe weather

Geopolitical—31%

- 7 responses 2% International terrorism
- 5 responses 1% Proliferation of weapons of mass destruction (WMD)
- 24 responses 7% Interstate and civil wars
- 24 responses 7% Failed and failing states
- 6 responses 2% Transnational crime and corruption
- 7 responses 2% Retrenchment from globalization
- 35 responses 10% 4 Regional instability

Societal—40%

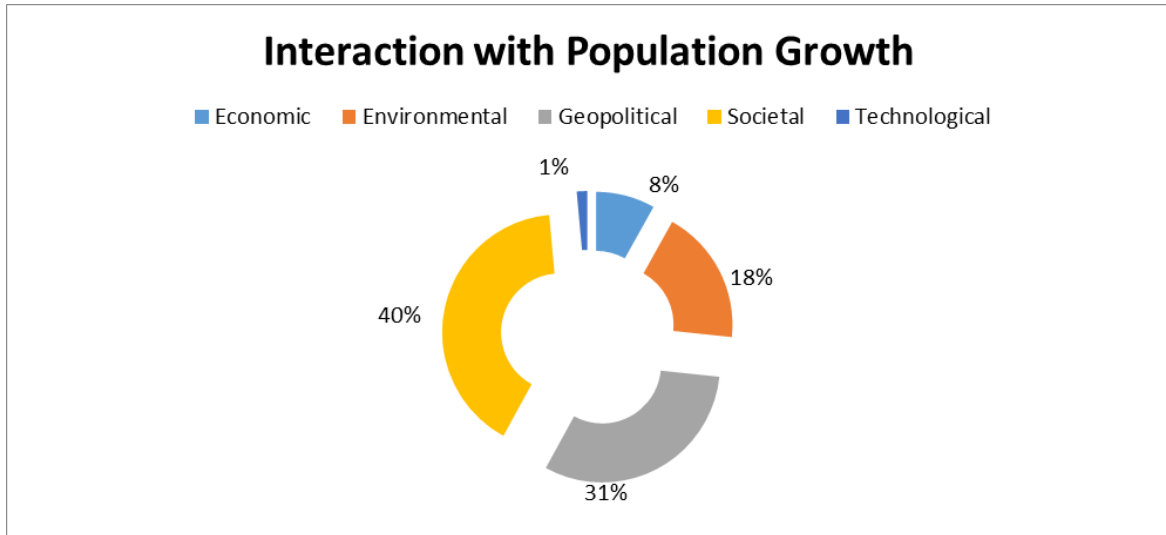
- 49 responses 14% 2 Pandemics/infectious diseases
- 27 responses 8% 5 Chronic diseases
- 63 responses 18% 1 Demographic shift
- 1 response 0% Liability regimes/regulatory framework

Technological—1%

- 4 responses 1% Cybersecurity/interconnectedness of infrastructure
- 1 response 0% Technology/space weather

Not Sure—1 response (0%)

Other—0%



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, and why?

- Demographic shift—monitor to project the change to our market niche
- Climate change
- I don’t monitor such opportunities.
- Demographic shifts—can result in new product opportunities
- Demographic shift—misunderstanding of longevity risk and drivers, pure statistical models don’t account for drivers of longevity change
- Cyberrisk—need for protection, in infancy with definitions of exposure, the risk itself, etc.
- Liquidity lockups in the financial sector provide opportunities to those with cash, e.g., Warren Buffett buying preferred stock from Goldman Sachs.
- Climate change turns out to be a mirage (not the change per se, but the effect of it).
- Demographic shifts, regulatory framework
- As a consultant I monitor emerging regulation so I can help clients deal with it. Emerging regulations are a big opportunity for consultants.
- Climate change as general insurance companies can deliver insurance solution for perceived needs
- Asset price collapse and financial volatility—these provide investment opportunities for our company.
- Ebola
- None
- NA
- Regulatory change—thinking about secondary effects that were unanticipated
- The growth of the Hispanic as well as Asian market in the USA
- Monitor bad news to trade on market over-reaction.

- Asset collapse is a great buying opportunity.
- Private equity entry into insurance industry; regulatory arbitrage especially with respect to capital regimes
- Not sure
- Financial volatility—opportunity to secure long-term assets at low price
- Cybersecurity—potential for major interruption in world economy with significant financial downside
- Looking for relative performance in financial assets. Looking for absolute return performance. Prefer to stay away from products or assets affected by negative demographics.
- Potential asset bubbles for personal investing and impact on interest rates
- None—ERM group is more reactionary than proactive
- Investment buying opportunities
- None are monitored for this purpose
- Growth of actuarial profession in nontraditional areas (the number and types of emerging risks are increasing) (more scope for actuaries to add value)
- Financial volatility, regulatory framework, demographic shift
- Demographic shift in the workplace, as workers get older they delay retirement but also get injured more.
- Terrorism, as its impacts are very significant
- Cybercrime presents an opportunity for insurance.
- Currency trends
- None
- Financial volatility, to see if there are any investing opportunities to hedge risks in insurance portfolios.
- Changing customer preferences and behaviors
- Use of advanced analytics
- N/A
- Demographic shifts; financial volatility
- We recently began seriously monitoring climate change to begin looking for opportunities.
- Share prices of network security companies
- Energy price shock—this risk has volatility and market to profit from. The other risks are too broad and fragile to benefit from in the very short term.
- None
- Changing demographics—the social aspects of our economy always cause reactions that are unexpected in the “efficient” market that most individuals keep as the current paradigm of thought today
- Not my function
- Demographic shifts—source of business revenue and risks
- FX
- None
- None

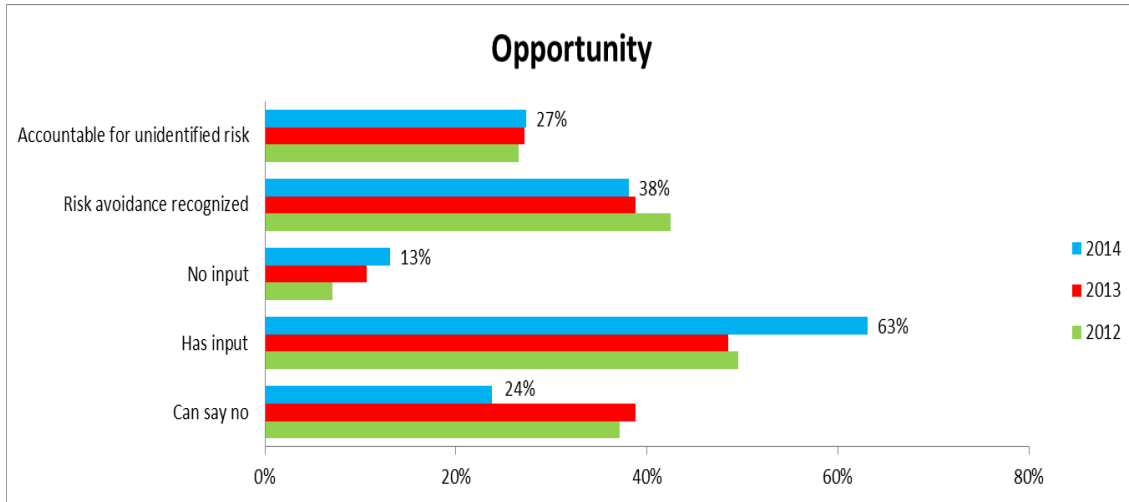
- N/A
- None
- Alternative energy sources
- Large changes in oil and metals prices are often overreactions, so contrary approach can exploit that
- Mortality improvement because it has been underestimated
- Emerging technologies that impact Life & Health as well as P&C
- Impacts of climate change on Life & Health as well as P&C
- Asset price collapse, and climate change. Diversification of assets into instruments that are uncorrelated may mitigate risk and create opportunity in the short term. Climate change, while slow moving, seems likely to have different impact on different industries, some of which (for example, home building, engineering) will see opportunity as weather patterns change.
- Demographic shift, because it directly affects our market.
- More mortality to offset longevity
- Expanding the mechanisms for individual retirement savings beyond traditional deferred income solutions
- Underpriced assets as it is more observable.
- Our firm monitors all emerging opportunities. The one category we monitor the most would be asset price/financial volatility, since that could have the biggest impact to our balance sheet.
- Energy prices, currency trends, asset prices and financial volatility for investment purposes
- Pandemics, chronic diseases and demography shifts for underwriting and product impacts
- Closely monitor chronic diseases in an attempt to find better ways to more effectively manage medical/Rx costs
- China's stock market is undervalued.
- NA
- None currently

Question 7. The true measure of an ERM program is how it is received by the board and senior management. Which of these is true in your situation? (Please select all that apply.)

Percentages back out those stating question is not applicable to them.

- 24%/39%/34% Our ERM function can say no to a strategic opportunity
- 63%/49%/25% Our ERM function has input but not a vote when a strategic opportunity is being considered
- 85% report at least one of the preceding is true
- 13%/11%/33% Our ERM function has no input when a strategic opportunity is being considered

- 38%/39%/5% If the firm avoided a risk identified by the ERM department, the value of the department is recognized
- 27%/27%/28% If the firm was subjected to a risk not identified, the ERM department would be held accountable



Comments/Examples

- ERM function composed by board members
- Our risk committees can, and do, say no to strategic opportunities; “ERM” cannot.
- Building program
- Actually it’s the opposite ... the ERM program will be more valuable if supported, or established by board/senior management.
- ERM is still maturing.

Question 8. No list of risks is ever complete. Are there other emerging risks that you feel are significant that should be considered for future surveys?

Option 1

- Breakdown of government in supposedly stable nations (such as U.S.) due to citizen discontent
- Income disparity
- Pension funding crisis
- Food supply inequity
- Massive replacement of workers by technology (e.g., self-driving trucks)
- Government non-functionality
- Longevity
- Europe recession
- Volcanic eruptions
- Big data and loss of privacy (aggravating factor for failing states, terrorism ...)
- Inflation impact on seniors

- Major tax law reform (in either direction)
- Methane release
- WMD regardless whether they proliferate
- U.S. loss of ability to borrow in dollar terms
- Financial market collapse
- Inflation
- The degree of interconnectedness of the major risks—reinforcement and amplification
- Global economic slowdown
- Wealth concentration leading to political instability or deflation
- Longevity trend shifts
- Low interest rates
- Geopolitical influences (e.g., U.K. continued membership in EU)
- Rapidly changing consumer technology
- Unrecognized impacts of new technology
- Depletion of resources
- Sun spots and solar flares
- Prolonged economic stagnation/deflation
- Weather risk instead of climate change
- Medical advancements
- Government regulators
- Increasing deficits globally ability to communicate effectively
- Transient electromagnetic disturbance (aka EMP)
- Deflation
- Increasing regulatory requirement
- Decentralization of currency/banking system (Bitcoin)
- Scarcity of workers
- Expansion of America's military and police class threatens liberty
- EMP attack
- U.S. political gridlock
- Systemic risk
- Sharing economy (Uber, Airbnb, etc.)
- War involving large countries
- Distribution channels
- Aging population leading to insolvency of national savings programs
- U.S. protectionism/"Buy America" policies
- Cyberterror
- Longer than three to five years (CLIMATE CHANGE!!!)
- Misjudgment from the board and/or senior management
- None right now

Option 2

- U.S. political gridlock—affects global economic system

- Health care affordability and access
- Euro breakup
- Inability to make decision by democratic countries (polarization in the U.S., France, U.K., poor UN governance)
- Social security changes
- Staffing concerns as baby boomers retire (having knowledgeable workers)
- U.S. military aggression
- Failure of the EC to remain unified
- Antibiotic resistant bacteria
- Unemployment
- The burden of health care—could be expanded as part of demographic risk but it could be very divisive in societies
- Regional debt default/servicing
- Lack of trustworthiness increasing inefficiencies in capitalistic markets
- Unexpected change to long-term means (interest rates, equity growth, etc.) aka secular stagnation
- Legislative risk
- New competitors/dissolution of industry boundaries
- Hyperinflation
- Asteroids
- Youth unemployment
- Taxation changes
- Immigration
- Illegal immigration across borders
- Genetic engineering
- High jobless rate
- Reduction of competition/fewer companies in market
- International competition over natural resources
- America's severe debt will necessitate further confiscatory taxation.
- Decline of American empire
- Autonomous vehicles (including drones)
- Food shortage/famine
- Actuarial assumptions
- Dumb foreign policy moves by U.S.
- Obesity/aging population

Option 3

- Collapse of defined-benefit plans
- Speed of technological change
- Marginalizing the intelligent
- Increasing power of transnational corporations versus governments
- U.S. political system collapse
- Inflation

- Government collapse
- Financial regulatory framework
- Wealth concentration
- Welfare state
- Military aggression
- Extinction of the middle class
- Shrinking of America’s middle class will create more crime.
- Major war (U.S./Russia, U.S./China, China/Japan, e.g.)
- Interconnectedness (the “Internet of Things”)
- Legal and regulatory changes

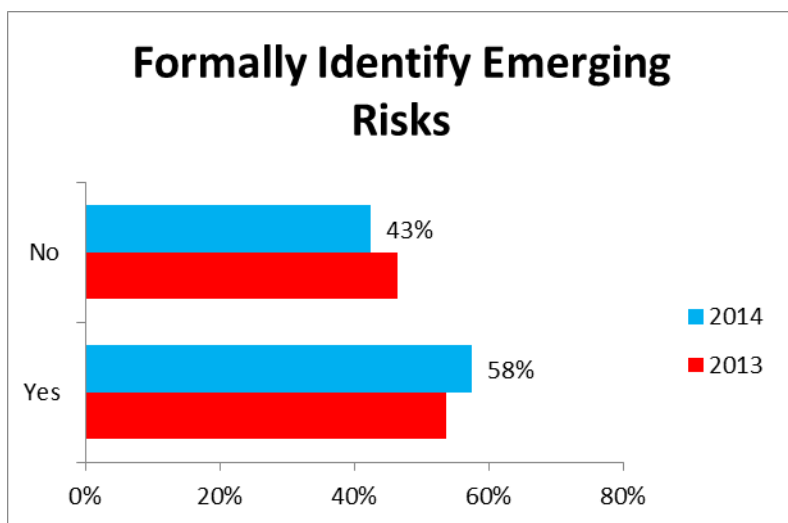
Section 2: Leading Indicators

Some questions require an industry perspective. Please choose an industry where you are a risk expert and answer questions consistently throughout.

Question 1. Do you formally identify emerging risks?

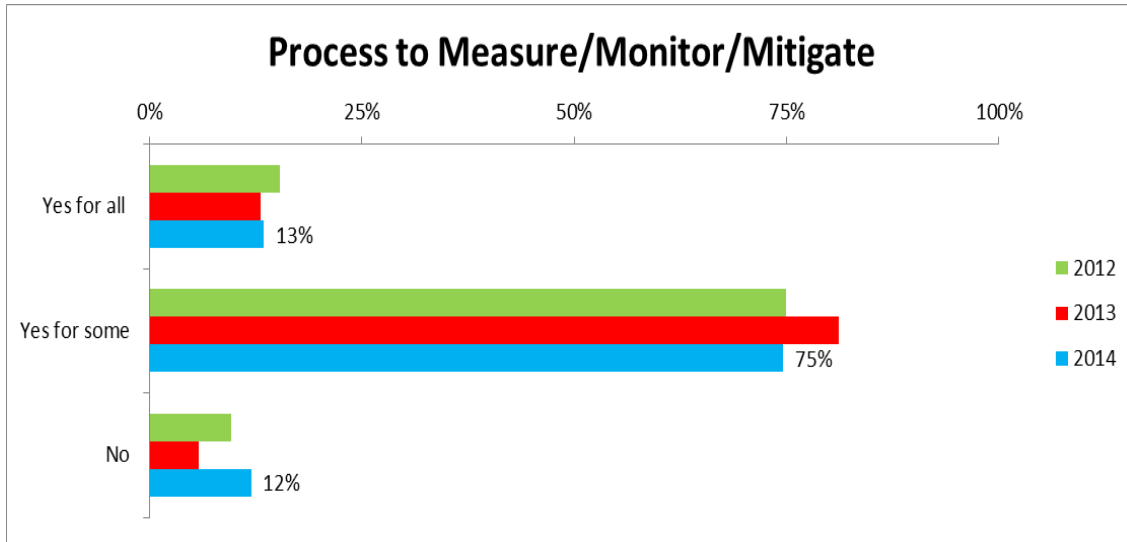
Percentages back out those stating question is not applicable to them.

- 58%/54% Yes
- 43%/46% No



Question 2. Once an emerging risk is identified, do you have a process to measure, monitor, and/or mitigate the risk?

- 13%/13%/15%/18%/7%/7% Yes for all
- 75%/81%/75%/78%/79%/72% Yes for some
- 12%/6%/10%/5%/14%/21% No



Question 3. If yes, please provide examples.

- Age, gender and dependent distribution for medical coverages
- UN data on climate change
- Monitoring of social media against reputation risk emerging from new social media
- Monitoring cybercrime in industry
- E.g., Ebola and other infectious diseases are an emerging risk to my firm. It has been added to the Emerging Risks log and it is monitored closely.
- Longevity
- Ebola
- **Risk that rates in U.S. stay down much longer than expected due to global recession and flight to quality as Europe drops and China slows more dramatically. How low can yields go and stay for long periods of time compared to our floor of credited rates, thus squeezing margins?**
- Regular feedback mechanism from customers provides information on the risk to become irrelevant, emerging competitor, product or distribution channel.
- We have methods to identify, and some mitigation steps identified; monitoring is not as complete as I would like (based on KRIs as well as scenario implications).
- Key emerging risks from the market for our services are monitored continuously and strategy adapted to allow for these.
- Try to address what can go wrong and potential safeguards against it.
- Monitor regulatory actions/decisions affecting other companies.
- Tracking Ebola
- For any/all emerging risks, we will monitor. As facts/circumstances warrant, we may also measure and/or mitigate with mitigation ranging from partial to total.
- Look at industry history to see examples of the size of a mass tort.
- Impact of prolonged economic cycles

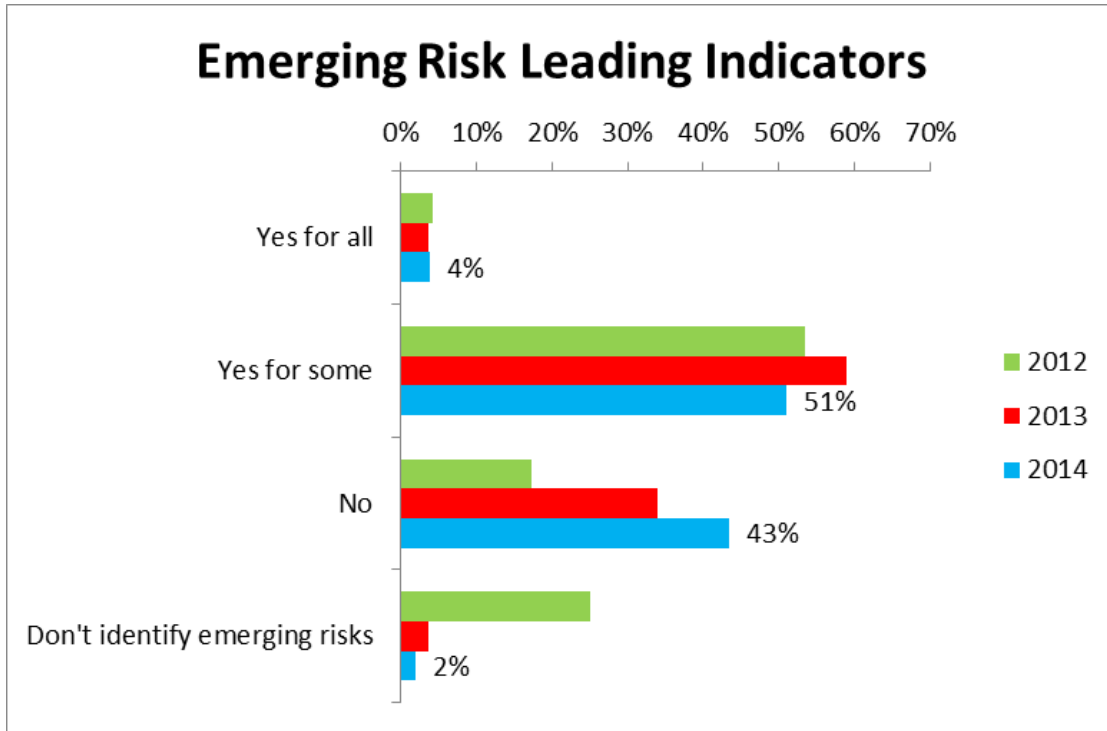
- Selected risks are assessed and referred to business unit risk committees for action.
- Regulatory developments
- Regulatory changes—determine impact on business and clients, develop possible solution depending on potential outcomes
- We recently identified Ebola as an emerging risk, attempted to quantify its impact, and have taken some management action surrounding it. We continue to monitor the situation.
- Cyberrisk, industrial disease (e.g., silicosis)
- Risks are selected and then potential magnitudes of the risks are determined and applied in models to determine the financial impact.
- Financial cost trending, predictive modeling
- FX/interest rates are monitored, hedged and matched.
- Changes in regulatory regimes
- Current threat of Ebola spread in the U.S.
- Mortality/morbidity trends
- Four pillars in ER program: environmental scan, risk owner survey, workshops with groups outside the company (e.g., academics, community leaders, etc.), stress testing
- Climate change risk and insurance; or cybersecurity risk
- Added to board risk dashboard. Quarterly monitoring of status.
- Plan vs. actual variance and attribution analysis for main drivers
- Regular review of public disclosure on retirement savings data
- One emerging risk that we have monitored very closely is the expiration of TRIPRA. We have been watching the developments in Washington, D.C. very closely and have taken a number of actions to prepare our firm in the event that the legislation is not renewed or extended.
- Ongoing risk monitors and periodic re-evaluations
- Create dashboard and set up threshold for additional analysis if the leading indicator breaches the threshold
- Risks added to the Emerging Risk Tracker. Emerging Risk Task Force meets one to two times per month to discuss all risks on tracker and add or delete risks as required.

Question 4. 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 the threat's credibility.)

Percentages back out those stating question is not applicable to them or they are not sure of the correct response.

- | | |
|---------------------------|--------------|
| • 4%/4%/4%/4%/4%/5% | Yes for all |
| • 51%/59%/53%/54%/58%/42% | Yes for some |
| • 43%/34%/17%/20%/15%/22% | No |

- 2%/4%/25%/22%/24%/31% We do not formally identify emerging risks.



Question 5. If yes, please provide examples of these methods, including the specific emerging risk and leading indicators.

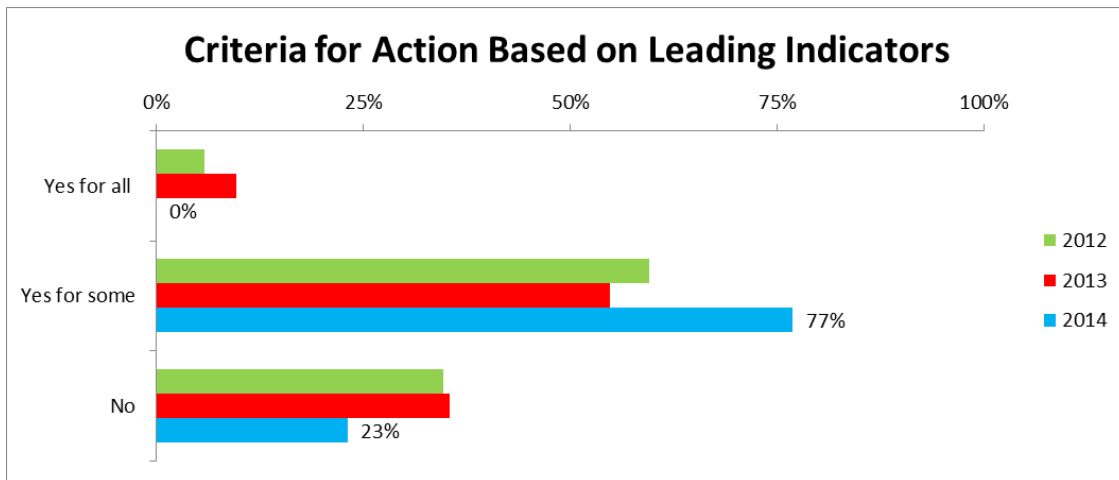
- Greenhouse gas emissions and climate change
- Monitor Fed actions as an indicator for interest rate movements
- Monitoring fund flows out of Europe into U.S.
- Same as above
- In addition, brainstorming sessions with key stakeholders and leaders from various background is used
- Migration from mainframe to outside vendor (and server based), KRIs are number of processes that have to be moved, number that have been moved, risk is monitored inside each process as it is being transformed as well (by stakeholder).
- Competitor practice and performance plus demand indicators from clients
- Review of varied media reports, maintenance of objectivity, review of comments by others on the same risks
- Decline to answer
- Predictive modeling
- Policymakers could change the regulations, need to monitor how the reactions/changes made by the major companies within the industry
- Regarding cybersecurity, measurement of cyberattacks, proliferation of malware; but it's often more important to implement risk mitigation than to attempt

accurate risk measurement! This is particularly true of operational risk but also other risks, regardless of their estimated probability.

- For retirement income risk, leading indicators relate to trends in individual savings patterns and employer/national savings programs.
- Severe weather, specifically tornado/hail. Frequency and severity of storms are monitored closely by geographic area.
- I don't have enough information.
- Track votes in the federal and state legislative bodies (Senate and House) on related issues. Track which parties have majority and individual members to determine who has the potential to affect regulations.

Question 6. If you identify leading indicators of emerging risks, do you have criteria for when to take action to mitigate (or accept) the risk?

- 0%/10%/6%/7%/2%/13% Yes for all
- 77%/55%/60%/56%/59%/50% Yes for some
- 23%/35%/35%/37%/39%/37% No



Question 7. If yes, please provide examples.

- Managing potable water supplies affected by climate change
- When an emerging risk becomes material, it is added to our Risk Register and assessed a likelihood and impact score, as well as a risk tolerance. If the assessed risk scores are beyond the risk tolerance, the risk is escalated. Management and board would be notified and an action plan would be developed.
- If a leading indicator is a date (with key dates in between), these are closely monitored. If we miss a date at a certain step in the process, what impact does that have on the risk? Who is this escalated to? We cover this.
- When 20 percent of revenue is under significant threat as measured by a trend over at least 12 months

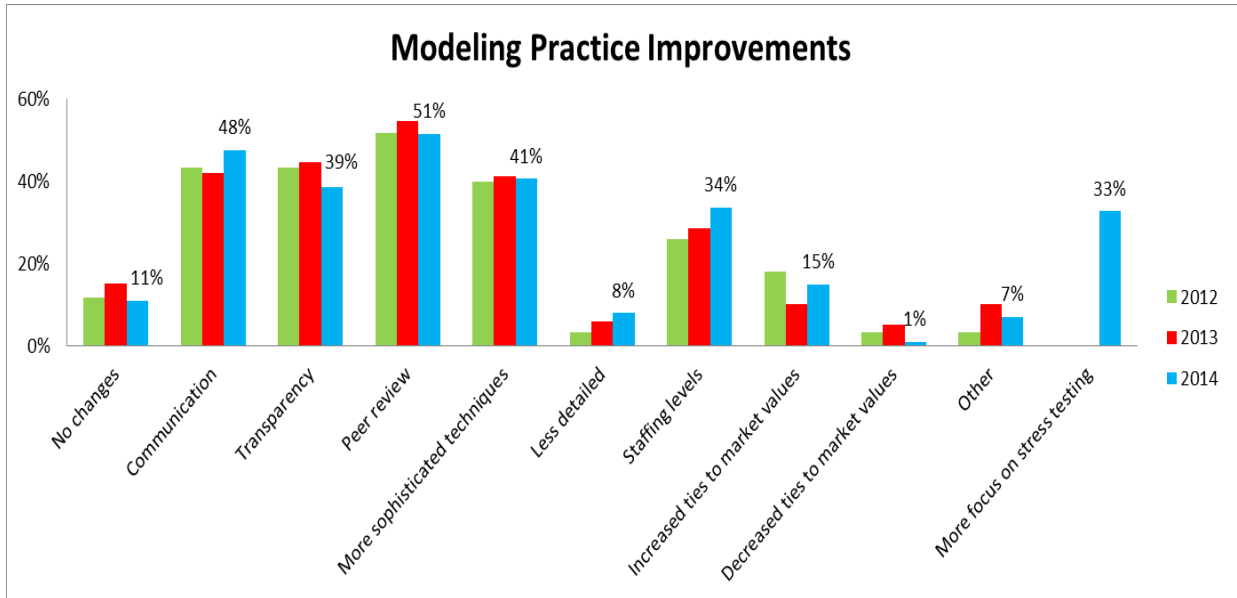
- Identify relative valuation measures, assess the behavior of related correlated assets.
- Estimated capital impact of scenario
- Changes in premium rates, definition of benefit coverages, health provider contracts
- Based on the effective date back calculate the timeline for collecting the information. If no information gathered by the deadline, people need to make decisions based on best judgment.
- Risk is generally quantified as impact on earnings, or impact on surplus. Ten percent of earnings would be considered a threshold. Quantification is attempted through various models but decision-making is highly judgmental.
- We look at potential impact and **velocity**
- Impetus for new product innovation; increase or decrease volume of certain products being offered
- IPS guidelines

Section 3: Methodology

Question 1. Models have received increased scrutiny and review over the past several years. How have your modeling practices improved over the past year? (Please select all that apply.)

300 responses from 116 (2.6 average)

- 11%/15%/12%/16%/17%/22% No changes
- 48%/42%/43%/49%/39%/42% Communication
- 39%/45%/43%/38%/44%/42% Transparency
- 51%/55%/52%/50%/43%/43% Peer review
- 41%/41%/40%/40%/36%/25% More sophisticated techniques
- 8%/6%/3%/2%/6%/1% Less detailed
- 34%/29%/26%/30%/26%/18% Staffing levels
- 15%/10%/18%/15%/14%/10% Increased ties to market value
- 1%/5%/3%/1%/2%/4% Decreased ties to market value
- 33% (new in 2014) More focus on stress testing rather than stochastic analysis
- Other
 - Increased governance and approvals
 - **Formalized and structured model validation**
 - Building out model risk management protocol
 - More robust models
 - Increased documentation
 - Enhanced documentation
 - Using multiple models



Question 2. Historical data is rarely available for emerging risks. How do you develop assumptions for the quantification performed by models?

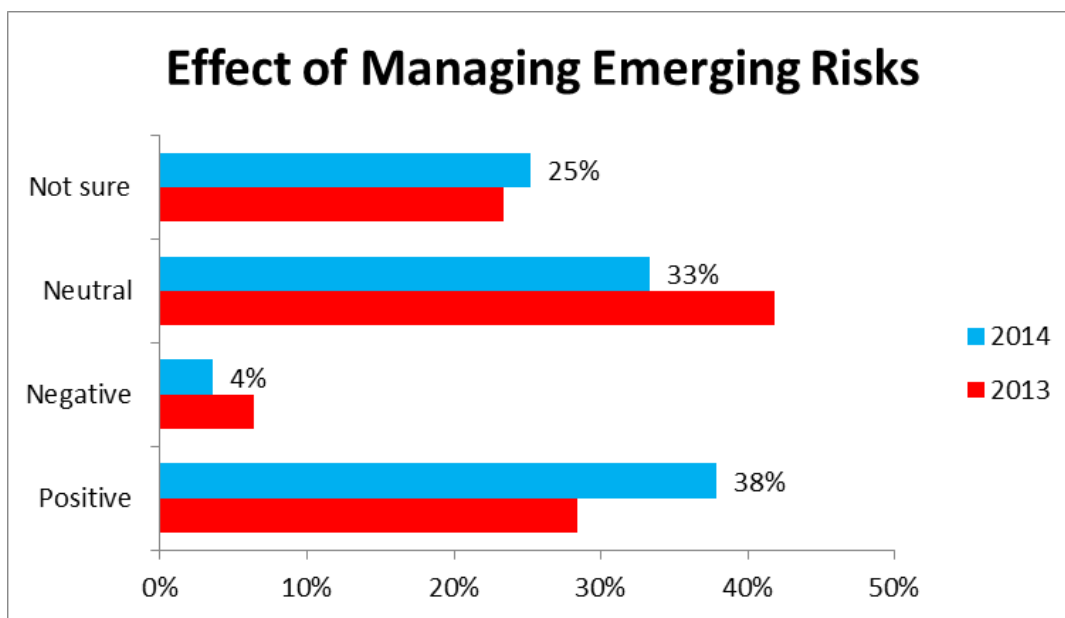
- Reliance on consultants and best practices of others
- Historical data is available for the impact of climate change.
- Emerging risks are usually based on expert judgments, esp. from underwriters. Board-level committees then review/challenges those inputs before being put into a model.
- Expert judgment (**from a group, not one person**) and then sensitivity test alternatives
- Expert judgment
- Judgment
- Try to relate it to something we do have data for.
- What would it take to break the bank?
- We do not model emerging risks. Model sophistication for any risk will differ based on the data available for assumption development—e.g., less data, more simple/high-level modeling.
- Judgment; look at similar situations
- Panel of experts supporting with analysis of external research
- We ask operational staff to rate risks by probability and consequence as low, medium or high.
- Expert judgment and analysis
- Not applicable
- Delphi
- We use subject matter experts and empirical data to begin.
- Have not done any
- Scenario testing plus study of relevant historic trends

- **Develop more subjective and critical views, more pessimistic**
- **Look outside the U.S. and far back in history (hundreds of years)**
- Stress testing to gauge sensitivity, then the assumption is typically set to be conservative until experience data is available.
- Not usually measured
- Industry and general population data
- Reference industry
- Stress testing. Worst case scenario analysis.
- **Use logic to infer what would happen based on the choices the participants would have.**
- Observation and discussion
- Reading the press accounts. Google for statistics.
- Judgment
- Expert judgment
- Don't yet measure emerging risks.
- Most are not quantified. Implicit assumptions may be included in stochastic distributions.
- Subjective analysis. Research performed by the scientific community.
- Just what-if scenario analysis
- Experience and judgment
- Scenario testing, measure results sensitivity to parameters/inputs
- Qualitative assessments, anticipatory thinking, scenario analysis
- Expert judgment, review of peer companies
- Best estimate and then stress test
- Delphi surveys
- Qualitative analysis
- Industry discussions, "think tank"
- Stress tests, Delphi
- Assumptions verified by an actuarial department unit
- Draw parallels from similar risks
- Use assumptions assumed to be reasonable.
- Through brainstorming workshops
- Discussion with consultants and/or internal staff on reasonable assumptions, along with variables and levels to stress test
- Based on literature research
- Test a variety of potential assumption sets in order to evaluate outcome boundaries
- Expert judgment
- Researching global trends—talking to reinsurers
- Extreme value theory can be applied
- Emerging risk program; management and board discussion
- Guess estimates to start the process
- Look at past examples of emerging risk development

- Expert elicitation. Quite subjective especially as the experts can be wrong if they rely on historical experience. But you gotta try! **Lack of historical data is a poor excuse for doing nothing.**
- Online research
- Not modeled
- N/A
- Delphi, experience, stress tests of assumptions
- Adding some provisions of adverse deviations and actuarial judgment.
- We don't use sophisticated modeling for emerging risks. We use broad bands of company-specific impact and likelihood to calculate a simple expected loss for ranking purposes.
- Discussion with peers
- Analysis based on assumptions

Question 3. Has the management of emerging risks had a positive, negative or neutral effect in your company/industry?

- 38%/28% Positive
- 4%/6% Negative
- 33%/42% Neutral
- 25%/23% Not sure



Question 4. Why?

Positive

- Better prepared for disaster
- More awareness of what we could be facing and the need to act now

- Made us more aware of what could happen in worst case scenario—sometimes the results are more dramatic than anyone expected
- Identification and discussion leads to awareness of vulnerable spots—helps build agility.
- Increased the use of risk management techniques
- Increases intelligence awareness across the board, not just in respect of risk itself
- Increase confidence in risk management identification process
- Board and staff now use risk evaluation on a regular basis and are aware of the need
- We are trying to think of any risks possible and be open to any ideas of items to monitor
- Those involved have stated that they have learned a lot in the process about the challenges we face and how to be better prepared to face those challenges. Being prepared of course allows you (hopefully) to not have knee jerk reaction to an event when it does occur.
- Prompted action to address emerging threats and developed sharper focus on future prospects
- Raised awareness, less complacency
- Always good to consider emerging risks
- New identification of risks
- Provides for a better basis for making decisions.
- More aware of risks in general
- Because it helps us prepare for oncoming risks
- Highlights importance of strategic thinking without being bound by historical data/results
- Mitigate impact before fully realized
- It helped to expand understanding and appreciation for the risks we already take on and manage.
- We are in Pension LDI—leading Canadian firm.
- Results have been positive in dealing with recent market changes.
- We will address emerging risks more formally in the next few years as our ERM function develops, but in certain cases in the recent past, management actions have been supported by the understanding of the financial impact of such action and has improved the value of our company as a result
- It is always good to plan ahead not just react to issues.
- Emerging risks are getting more visibility and more thought put behind managing the risk
- Awareness of risk. Decisions are not just cost/benefit but rather cost/benefit/risk. Strategic planning tends to be more strategic.
- I think we're better equipped to react to events
- Keeps the risk in front of the board and executive leadership, which encourages attention elsewhere to the risk.
- Can come up with countermeasures
- Industry is more forward looking, and for some risks, is leading the marketplace.

- Time horizon on life products is very long—must look at risks out 50 or more years
- We have much more awareness of emerging risks across the company as a result of our Emerging Risk framework and governance processes.

Negative

- The more one reviews risks, the more fearful and conservative management can become.
- Some insurers have acted very aggressively when pricing and selling GMWB rider on EIAs, grossly undervaluing the risk of poorer returns or efficient policyholder behavior . . . part of which is likely driven by the shorter-term view of the PE firms pulling the strings. This has hurt sales for more conservative firms while increasing the total annuity system risk.
- Done poorly or not at all

Neutral

- The risk is still emerging
- It is done so poorly that there is no point doing it
- I don't think we're really doing it yet
- Reluctance to act before some degree of emergence
- N/A
- I don't believe companies are doing a fundamentally better job today than they were in the past.
- Hasn't really affected behavior
- Ability to protect or exploit risks is difficult.
- Not yet mature enough to tell
- I don't think there are effective best practices for the industry. Overall, the costs of developing and implementing a process have offset the limited benefits.
- It is "emerging"—there is a "short-term bias" on strategic issues over a "long term bias."
- No significant risk has been identified.
- There is barely an ERM function here.
- Still early in the development
- The ERM function is built recently, need more time to observe the impact.

Not sure

- Difficult to know if our actions moved the needle
- So far, emerging risks have waxed and waned, but none have come to full fruition.
- Emerging risks have been handled by people more senior than me.
- Not much has been done in this regard.
- My company and industry is an "emerging."

- Insurers identifying emerging risks is beneficial to the stockholders initially, but may harm long-term value, as the insurance industry becomes more strongly accused of “dodging” risk rather than insuring against it.
- I am not participating in the decision.

Question 5. Under what circumstances have quantification efforts enabled better decision-making?

- Filling in the blanks in existing data on the emerging risks provides a more complete picture of the impact of the risks.
- When combining model results for several organizations together and seeing overall corporate impact
- Allocation of resources
- Hedging a risk offset
- Not obvious that it has
- Good market risk quantification aids in anticipating impacts from unusual market movements, enabling decisions to be made sooner with respect to mitigation
- When result of quantification shows a material impact on economic capital
- We are better focused on the important risks.
- Help us change how we define items like dynamic lapses vs. shock lapses
- Not applicable
- Focus, elimination of red herring
- While our models are good and actuarial, investment and accounting can wrap their minds around the results (our president can too), we have not yet applied this process to decision-making (we are on the verge of that).
- Sensitivity testing of adverse scenarios useful to focus attention
- N/A
- When line of business is under competitive threat, the potential impact on profitability of different response scenarios has helped decision-making.
- Behaviour and actions have become more cautious.
- Better able to encourage marketing to consider alternative designs when in the product development process, better able to explain risks to senior management, especially when the corporate narrative is at odds with the model results.
- Not sure
- Creates an awareness of the developing situation
- Hedge management, considering strategic opportunities
- To the extent the quantifications are accurate, they may lead to better decision-making.
- When the residual risk is shown to be out of step (much higher) than what the company tolerates with other risks, leading to increased mitigation efforts
- Allow key decision-makers to stress test their current plan design
- Output of stochastic analysis helps understand the risks
- Financial risks primarily
- Perspective on relative importance of risks

- Risks with manifestation in financial markets are more readily quantifiable, and the impact of mitigation efforts can be more easily modeled.
- Specifically, we can help decide if the emerging risk is a very large risk, or one within our risk tolerance.
- Not sure
- We have been able to quantify data breach/privacy risk, which helped to inform insurance decisions as well as business remediation expenditures to reduce risk exposure level.
- Measuring financial exposure to unexpected events
- Only if past data is available to “predict” future outcomes, e.g., energy risk is a good example.
- Some actual impact to company or actions by peer companies can be cited
- Asset allocation
- Mitigation, e.g., reinsurance, or eliminating products
- Decisions to sell or not sell in any given market, alteration of product benefits
- Not sure they have
- N/A
- Generally, when they are well conceived, developed, thoroughly peer reviewed and upper management is engaged
- Hasn’t as yet
- It has supported management decisions that were planned to be taken via an analysis of our current market and the company’s standing with regard to our investments and liabilities
- More accurate information has been gathered
- When the “costs” of the particular risk qualities are better understood and able to be reflected in the actual pricing, the decision of the underwriter can be easier to make for a broader variety of risks.
- Formal and clear financial statement
- Good, old-fashioned actuarial stochastic models have moved insurance decision-making up a quantum level. That’s been around for a few years. Emerging risks are harder to quantify, not as much impact there.
- N/A
- **Made decision-making more fact-based; enabled better goal-setting**
- Ran stochastic models, picked out worst results, looked at those more closely
- Financial impact estimation, worst case scenarios
- Helps with ranking our risks and for making decisions on where to focus our efforts in terms of action plans for mitigating emerging risks
- Market related and regulatory preparedness

Question 6. Under what circumstances has qualitative analysis enabled better decision-making?

- Seeing the past and projected future impact of climate change allows countries to understand the impact of their behavior.

- Developed response agility
- Reputational risks
- Every time it creates awareness of something that had been ignored
- Qualitative assessment of operational risks has helped focus limited resources to more value-added mitigations.
- Increase awareness of experts from business side of potential impact of emerging risks
- Don't have any examples
- Analyzing more dynamic performance against external movements
- Not applicable
- Focus, elimination of red herring
- Monitoring legislation in a specific state that could have impacted our corporate structure.
- **A poor quantification trumps a strong qualitative discussion. Even an illustration is better.**
- N/A
- N/A
- Looking beyond numbers to bring experienced leadership to look at market trends and to gather insights from personal connections in the market; also, to judge the capability of our organization to respond to emerging risks
- Is a good check on emotional decisions
- Tweaking the structure of commission programs, understanding in what circumstances the hedge program is going to struggle or fail
- Brainstorming of various scenarios
- Creates an awareness of the developing situation
- Considering strategic opportunities
- Better decision-making is possible where the analysis has led to more collaboration than would have occurred otherwise.
- Conversation helped make it clear a worry was just that and not a significant risk.
- Allows key decision-makers to see the relative "health" of their pension plan
- Help guide the path to a better organization in recognizing risks
- For regulatory or demographic changes
- Implementing better monitoring to determine if acceptable risks are evolving in a bad way. Has helped with confirmation bias in decision-making.
- Strategic, demographic, and behavioral risks. Qualitative analysis of where the market is going and an appropriate strategic response is more useful than an attempt to quantify the impact of the change.
- Qualitative analysis has allowed us to determine management action on a smaller scale—for instance, satellite offices may need to take a particular action, while the company as a whole can take no action.
- Not sure
- We are now including qualitative impact scoring as it relates to those risks we are currently unable to quantify. This allows us to include those risks in our register

with some relative indication of the risk level compared to those we are able to quantify.

- Scenario testing for events without associated probabilities
- Provides a better balanced and broader view not necessarily a complete view
- Collaboration across disciplines
- Asset allocation
- Similar to—mitigation, e.g., reinsurance, or eliminating products
- Health care reform in USA
- The jury is out.
- N/A
- Generally, only when they are well conceived, developed, pros/cons thoroughly vetted and upper management is engaged.
- Hasn't as yet
- Faster identification and better management preparedness
- Qualitative analysis provides the backbone of management decision-making, including development of our corporate planning process and improvements in IT made in recent years.
- Better/feasible assumptions
- When there is less pricing flexibility, either due to statutory or market limitations
- Consistency risk culture and management procedure
- More members of management have gotten involved in decision-making.
- **Prioritization**
- Recognition that even if all the data is not available, emerging risks should be monitored and action steps developed early
- Identified the herd moving in 2006, moved away from RMBS and SPDA product that required it
- Customer services' feedback on customer's reactions
- Our emerging risk framework and ranking process has enabled us to identify potential markets to get into and out of.
- All emerging risks are qualitatively assessed as impact to decision-making.

Question 7. Under what circumstances has a combination of qualitative and quantitative analysis enabled better decision-making?

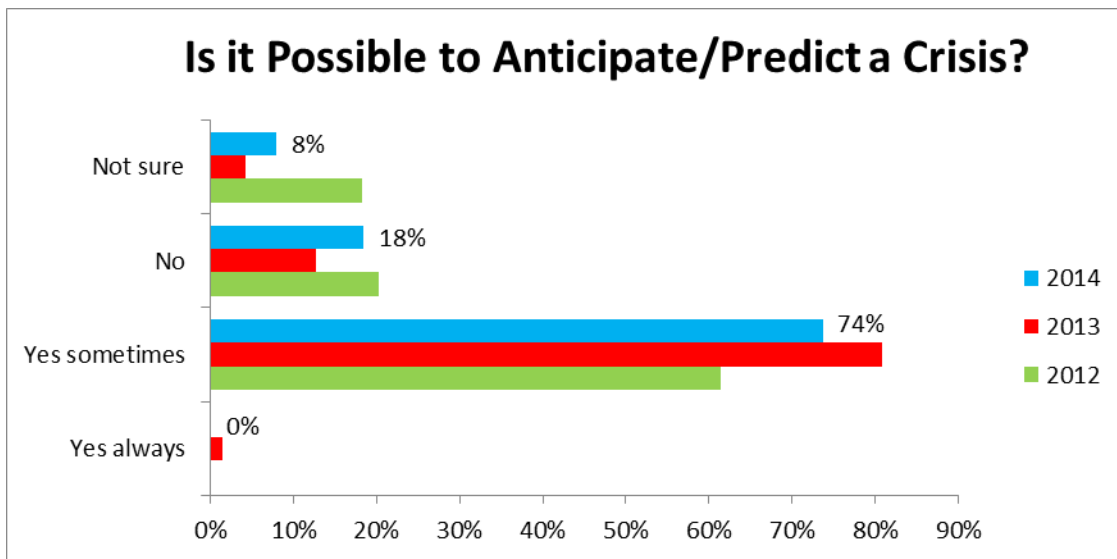
- The complete picture of the impact of the emerging risks provides a stronger argument for addressing the risks and reduces the arguments of the detractors.
- Developed response agility
- We are better focused on the important risks, at the Risk Management Committee and board levels.
- React sooner or more predictive in the true nature of underlying business
- Not applicable
- Focus, elimination of red herring
- In choosing to move off the mainframe system and both qualitative and quantitative data were used

- Once you get their attention with numbers, it is easier to talk about conceptual issues.
- N/A
- Almost all—the quantitative helps frame the risk and its impact but the qualitative helps put it in context for the actual organization and its capabilities/resources
- In times of market stress or exuberance
- Stress testing when walking through scenarios that reflect several assumptions changing in concert with one another
- Not sure
- Creates an awareness of the developing situation
- Considering strategic opportunities
- To the extent the quantifications are accurate, they may lead to better decision-making. Better decision-making is possible where the analysis has led to more collaboration than would have occurred otherwise.
- Quantification helped narrow the range somewhat and qualitative helped rule in or out some scenarios.
- A combination of the two lends insight into the real risks we face.
- Best approach for most risks
- Too early to say
- **In almost all cases there is some measure of both. Quantification requires an initial qualitative assessment of how the risk will manifest and the associated impact; otherwise, there is nothing to quantify.**
- Not sure
- Only in situations where risk has had some past quantification/data otherwise it is mostly qualitative.
- Actual impacts and collaboration are both present.
- Asset allocation
- Since neither are perfect, the answer is the same.
- Health care reform, preparation for, reaction to
- The jury is out
- N/A
- **Almost always—in all circumstances**
- **Hasn't as yet**
- The combination of these analyses better supports management actions and provides a clearer picture for management to confidently take action.
- Collect information, digest the information and make reasonable assumptions
- Unsure
- No idea
- A broad question but seems like it's always a good idea
- Prioritization
- Decisions should always be a combination of both quantitative and qualitative analysis. Even if data is available, qualitative analysis is necessary to interpret the data, and to develop and test hypotheses.
- Market related and regulatory preparedness

Section 4: Predictions

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

- 0%/1% (new response in 2013) Yes always
- 74%/81%/61%/55%/56% Yes, sometimes
- 18%/13%/20%/22%/21% No
- 8%/4%/18%/24%/24% Not sure



Question 2. Comments

Yes, sometimes

- Russia and Ukraine conflict predicted some impact to world economy due to sanctions
- If one happens to look in the right direction
- Difficult to predict with much accuracy external events but it is more practical to envisage internal events that could easily lead to a crisis in context of market developments, e.g., critical resource shortages
- There will always be another crisis; it is just a matter of time. The problem is figuring out when and where it will occur.
- Insight and analysis can lead to crisis prediction.
- Asset bubbles are very common and pretty easy to identify. The winding down of those bubbles may be difficult to predict precisely, but it almost always comes.
- Monitoring world events can help to predict the reaction at home.
- Housing crisis was entirely predictable based on emerging homeowner default trends, mortgage credit quality, and other indicators.
- You may be able to see a long-term trend (e.g., housing bubble collapse) but you can't time it.

- You can monitor risk indicators and if you know how they might interact you might be able to anticipate a crisis.
- Regional instability, geopolitical issues, etc. are predictable based on past experience in similar regions.
- The possibility of a crisis may be anticipated.
- Working in the structured products area for MBS in the U.S. we were expecting a crisis, just couldn't say when (2008–2009 crisis).
- Constant vigilance of current events
- Global communications absolutely needed
- In many cases (not all), you can see what is going to happen—before it happens.
- “Recognizing When Black Swans Aren't” by Dr. Werther is an excellent commentary on anticipation of “crises” and the predictability of them.
- If there is a clear relationship between causes and possible outcomes
- If there are leading indicators, reasonable magnitudes of financial impact should be considered.
- See the work of Guntram Werther, Bruce Bueno de Mesquita, Tainter's “The Collapse of Complex Societies,” e.g.
- The 2008 financial crisis was predictable—U.S. house mortgage levels were too high.
- Many if not all crises, in hindsight, seem predictable. The 2008 housing crisis, in retrospect, signaled its arrival years in advance with the Case-Schiller price index, and rents relative to income. How did we NOT see it coming!? In many cases, crises give advance warning and typically society ignores the warning. A good risk manager is alert to those signs.
- Rumsfeld Conundrum (Ed. Note: This is the Unknown Unknowns speech.)
- Tools and metrics such as mark to market and value at risk can be early warning signs of possible crises on the horizon.

No

- No based on an ability to consistently and accurately predict in a way allowing for meaningful action AND knowing in advance whose predictions are right.
- By the time it is predictable it no longer satisfies definition of a crisis.
- There are too many variables.
- Climate change is bogus. There is no point worrying about it. The SOA has had little to say about Ebola and other pandemics, and the most thoughtful comments are from decades ago, suggesting the pandemic will be contained. If not contained, Ebola (a bioweapon, which originated at a U.S. WMD facility in Kenema in Sierra Leone) could wipe out the life insurance practice and contribute to the nationalization of health care in the U.S., wiping out the health insurance practice. Unless Ebola is contained, the SOA needs to focus on it, now. Ongoing U.S. military aggression is causing the 2nd and 3rd world to band together (BRICS) and move toward a gold standard, which could lead to hyperinflation in the U.S. (Ed. Note: All comments are shared verbatim, with only minor edits.)

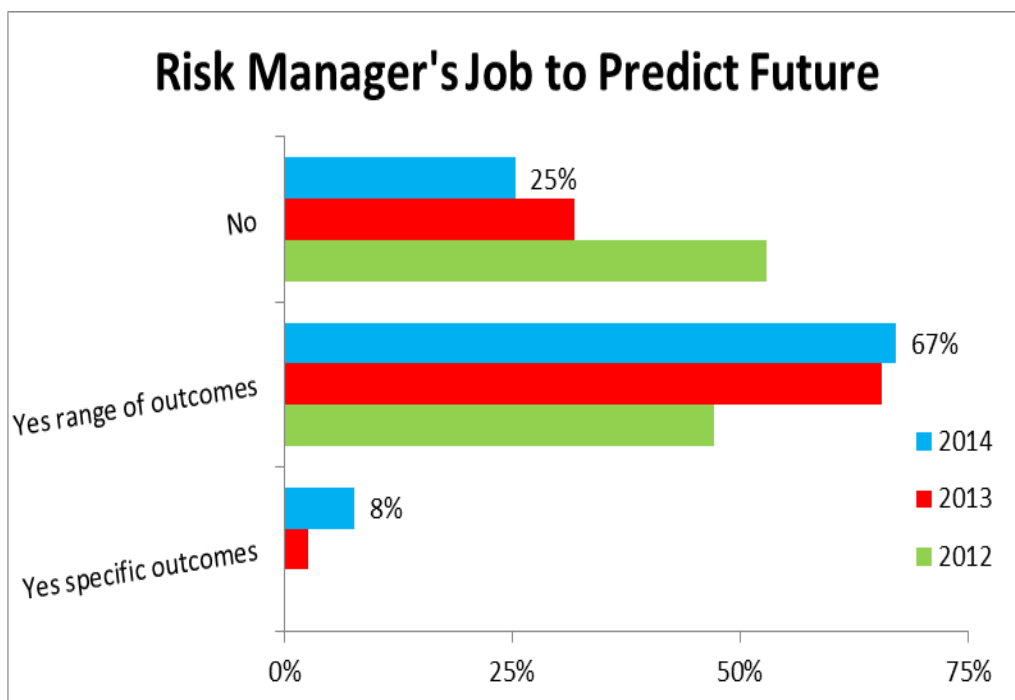
- Can predict likelihood of crisis or circumstances under which it might arise, but I doubt there is much true skill at predicting in advance.
- These are tools not certainty.
- It is not a crisis if it is predictable.
- No resources to participate in the activity
- You can monitor some risk factors, but it is not easy to predict the tipping point when the crisis is more than likely to occur. By the time you predict it, the crisis may be unfolding already.

Not sure

- Often big crises are unpredicted; they come out of nowhere and are unlike previous ones. Wrong to focus too much on combatting crises just like those of the past; the next one will be different.

Question 3. If you consider yourself a risk manager, is predicting the future part of your job?

- X/X/47%/43%/77% Yes (not split prior to 2013)
- 8%/3% Yes—specific outcomes
- 67%/65% Yes—range of outcomes
- 25%/32%/53% 57%/23% No



Question 4. Comments

Yes—specific outcomes

- Yes, thinking of what could go wrong. But not responsible if something else goes wrong/it doesn't go wrong.
- Focus on the specified risk-related to enterprise

Yes—range of outcomes

- Always want to use an expected range for better guidance
- Aim is to anticipate the impact of relevant types of risks and ensure proper assessment and leadership discussion of ability to respond
- None
- Providing a range of outcomes, determining which ones are acceptable and which ones need action, is one of the highest functions of ERM.
- Range of outcomes—prediction is not a science—range is what works best—with some attachment of likelihood.
- Anticipation of possible future is the best ground for preparing for possible futures
- Anticipation of trends, anticipation of regulator responses
- **Risk Manager's job includes alerting management to possible scenarios and ways to mitigate risk. Decisions though, belong to senior management/CEO/Board.**
- What-if analysis is part of the risk manager's role
- Not predicting, but preparing for possibilities

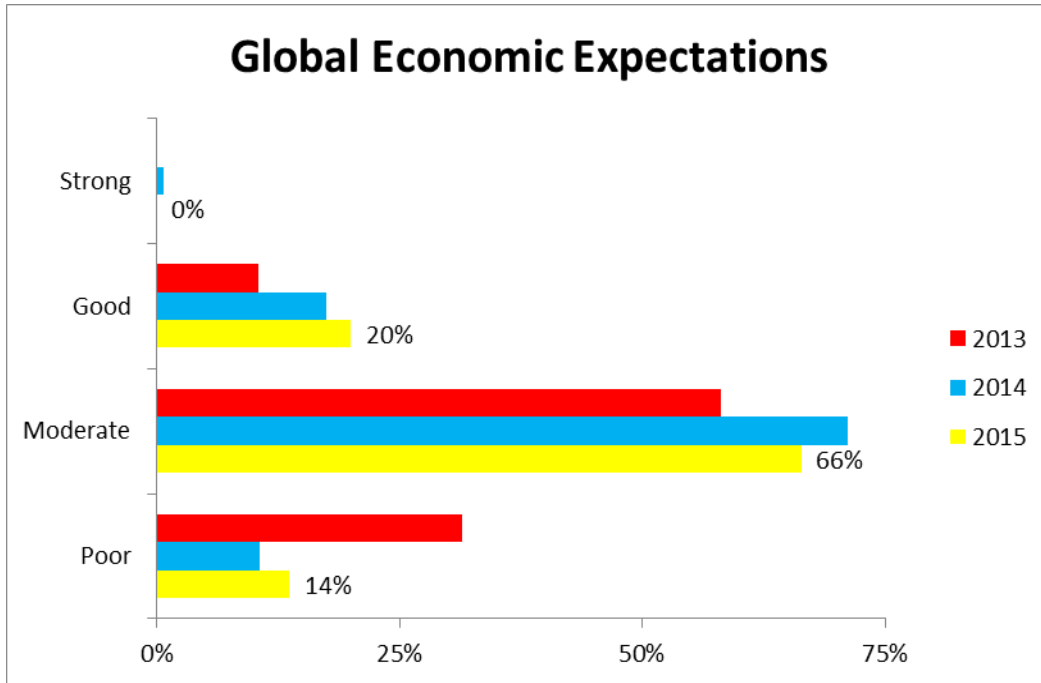
No

- The finance people persist in thinking that the forward curve has predictive power.
- Awareness of future possibilities is my risk management job; awareness and prediction are two very different things.
- Being prepared for what may happen is significantly different than predicting the future.
- It is making management aware of the range of possibilities.
- My goal is to be prepared for the future, not to predict outcomes.
- **It is my job to identify potential risks. They don't need to be likely, merely plausible.**
- Identifying potential futures is part of the job.
- My job is to create a framework that allows our organization to make decisions that are robust across a range of outcomes.
- Predicting no; considering possibilities yes
- More trying to control the future, keep it within acceptable boundaries

Section 5: Current Topics

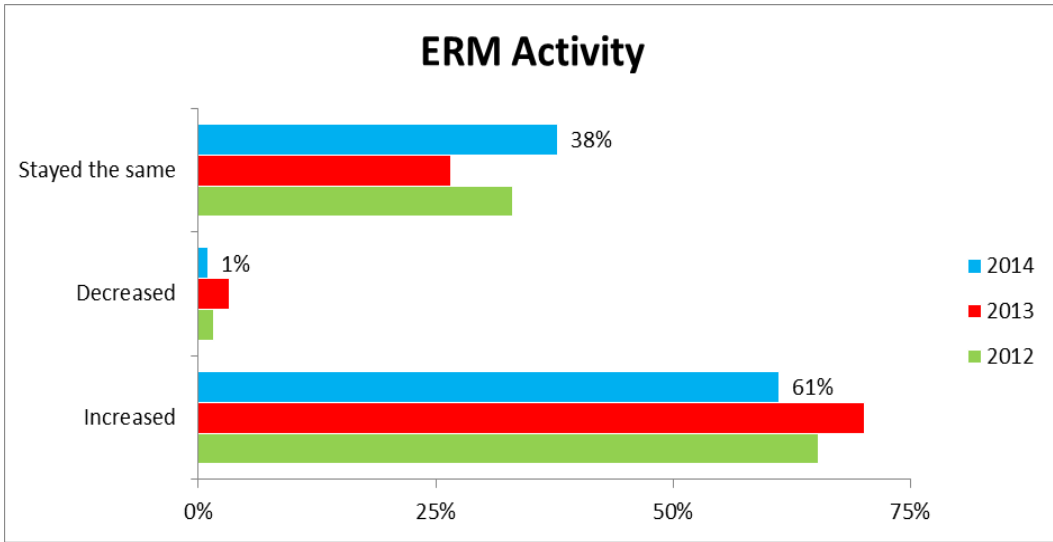
Question 1. Your expectations for the 2015 global economy are:

- 14%/11%/31%/51%/24%/21%/62% Poor
- 66%/71%/58%/42%/66%/65%/35% Moderate
- 20%/17%/10%/5%/10%/13%/3% Good
- 0%/1%/0%/1%/0%/1%/0% Strong



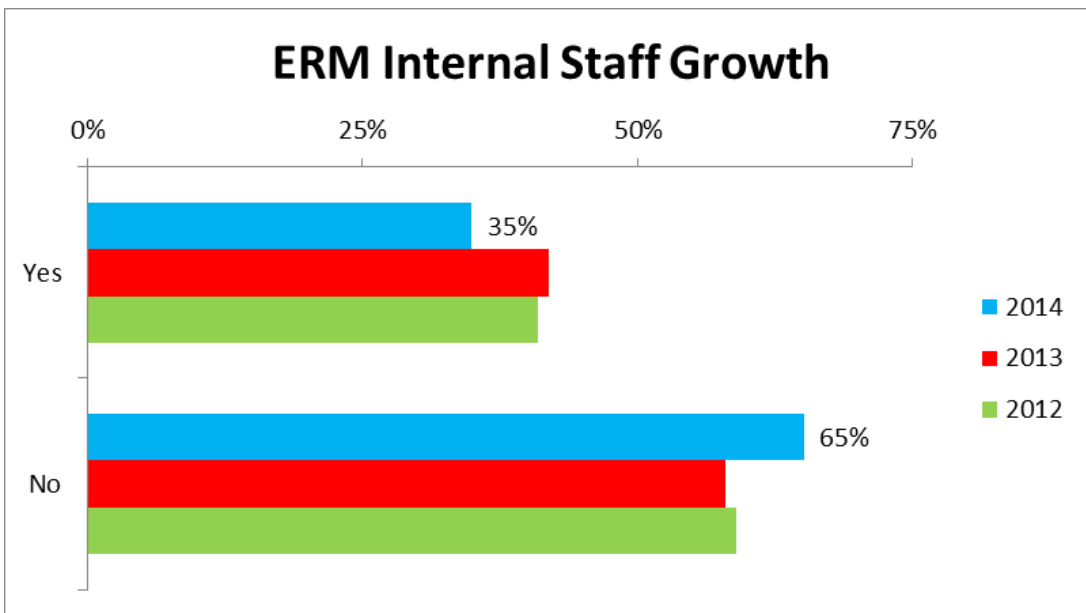
Question 2. Did you experience a change in the level of ERM-focused activities for your organization or clients in 2014?

- 61%/70%/65%/63%/75% Increased
- 1%/3%/2%/3%/1% Decreased
- 38%/27%/33%/34%/24% Stayed the same



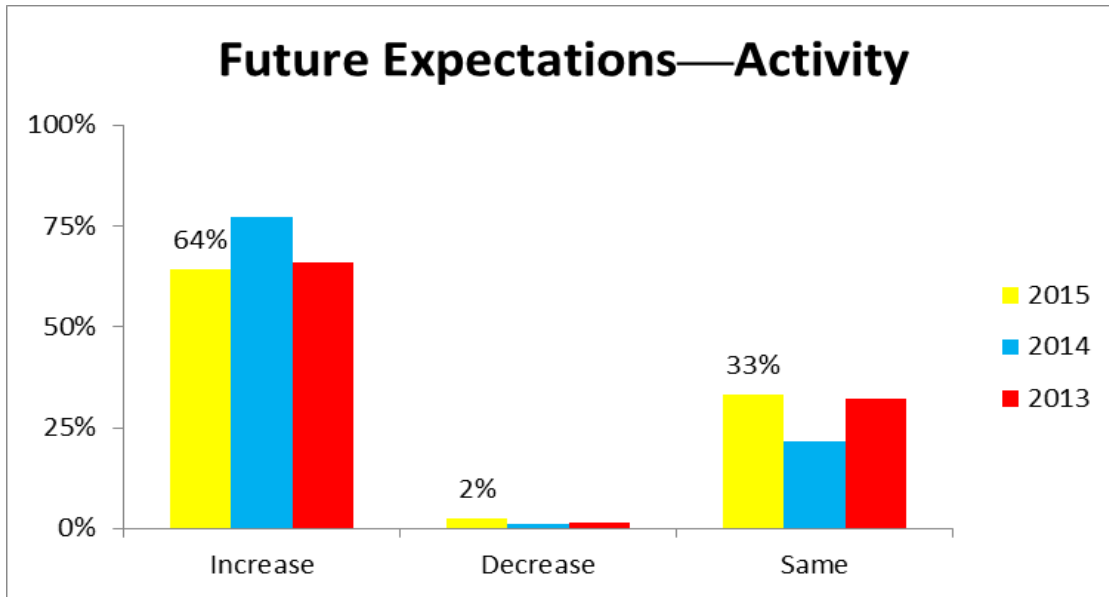
Question 3. Did your internal ERM staff increase in 2014?

- 35% (42%/41%/50%/50%/39%) Yes
- 65% (58%/59%/50%/50%/61%) No



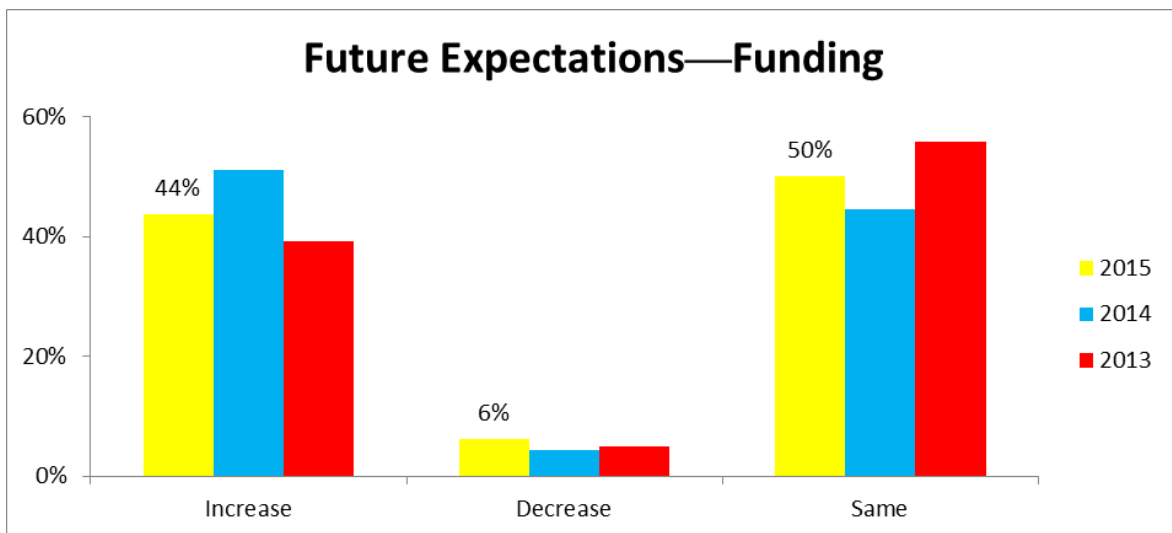
Question 4. Do you anticipate a change in the level of ERM-focused activities for your organization or clients in 2015 relative to 2014?

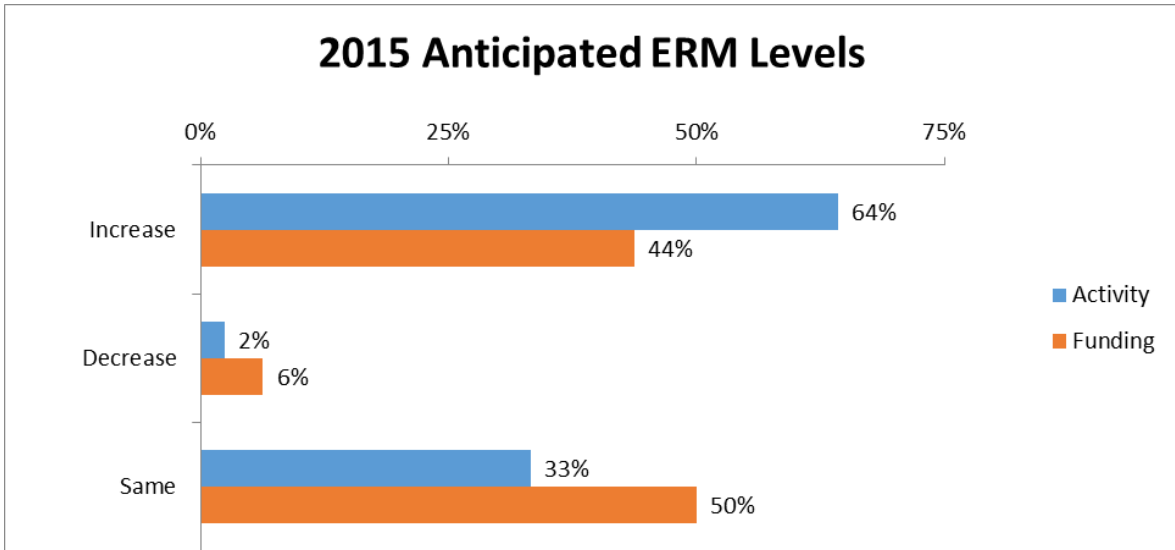
- 64%/77%/66%/59%/69%/67%/73% Increase
- 2%/1%/2%/0%/1%/1%/3% Decrease
- 33%/22%/32%/41%/30%/32%/24% Stay the same



Question 5. Do you anticipate a change in the level of funding dedicated to ERM-focused activities for your organization or clients in 2015 relative to 2014?

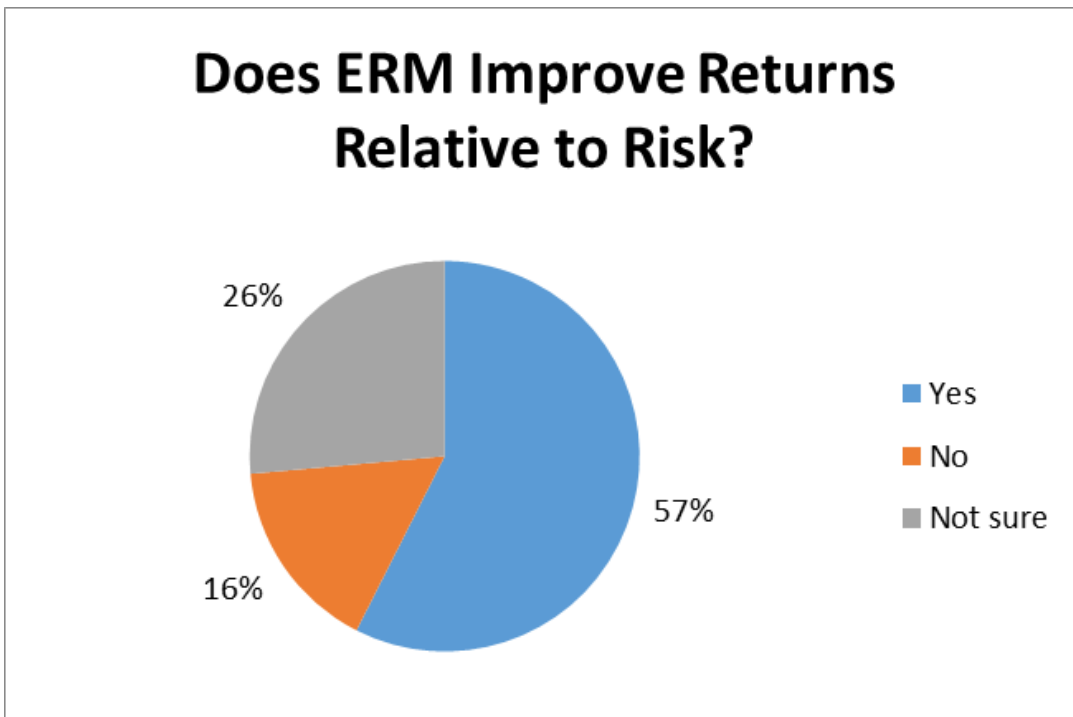
- 44%/51%/39%/39%/47%/54%/37% Increase
- 6%/4%/5%/3%/3%/2%/9% Decrease
- 50%/45%/56%/58%/49%/43%/54% Stay the same





Question 6. Does implementing ERM improve company returns relative to the amount of risk? (Please select one.)

- 57% Yes
- 16% No
- 26% Not sure



Question 7. Why or why not?

Yes

- Reduce likelihood of major losses
- More measure of return based on true risk
- I hope it will and I plan to demonstrate so. We should always be making decisions to increase corporate value and returns. (There are limits of course.)
- Increased awareness of relationship between reward and risks and greater transparency of assumptions
- Better able to chop off the tails of returns primarily through risk avoidance in product design, and to better quantify ALM mismatches and opportunities to take strategic positions related to them
- Do a better job of selecting risks to take
- Helps identify and mitigate some tail risk that might have otherwise been passively accepted
- Identification of risk paths
- Stability and forward thinking has generally led to better valuation of our business.
- Should be able to avoid the worst of mistakes
- Prior to ERM there was no way to measure or focus on “the amount of risk.” ERM creates the framework, tools and metrics to evaluate return against risk.
- It enables the company to have better discussions surrounding risk and return. By the nature of having these discussions, the company is posed to make better decisions.
- Better informed business decisions due to knowledge of risk and return, and agreed-upon risk appetite and tolerance of the organization
- Focuses attention on risk/reward balance
- It allows to coordinate significant risks and deal with them collectively—i.e., one business area is not working against another business unit on the same risk.
- Common framework enables quantification of unseen benefits (e.g., diversification).
- We have caught issues earlier because of ERM, so were able to mitigate and minimize the impact.
- Avoidance or mitigation of losses, success with new products priced in anticipation of market changes
- Risk/reward stays in balance.
- It costs money, but can result in decreasing volatility of profitability.
- At least risks are quantified and measured, and returns vs. risk are visible, then it’s possible to measure impact of actions or changes.
- Makes some tough choices easier (for example, acquisition or divestiture)
- Improves returns on a risk adjusted basis
- Better allocations of capital, make better decisions
- Better understanding of diversification and marginal impacts of business decisions

No

- Helps to understand the risks being taken. It would stabilize returns, so reduce volatility and not necessarily the absolute level.
- The purpose of ERM is to avoid the impact of the risks at a minor cost. There is a positive return relative to what would happen otherwise.
- Most activities have so far been regulatory measures.
- Don't have enough process and information to be sure it makes a difference
- It is more a matter of focusing on the risk-return trade-off than it is about ERM.
- ERM is largely involved with quantifying risks; however, senior management doesn't understand and doesn't use any information.
- Creation of a top-heavy bureaucracy with too many unaccountable reviewers
- Avoidance of risk also reduces potential for profit.
- Risk management is to control the risks; ORSA should be considered to balance the returns to the amount of risk.

Not sure

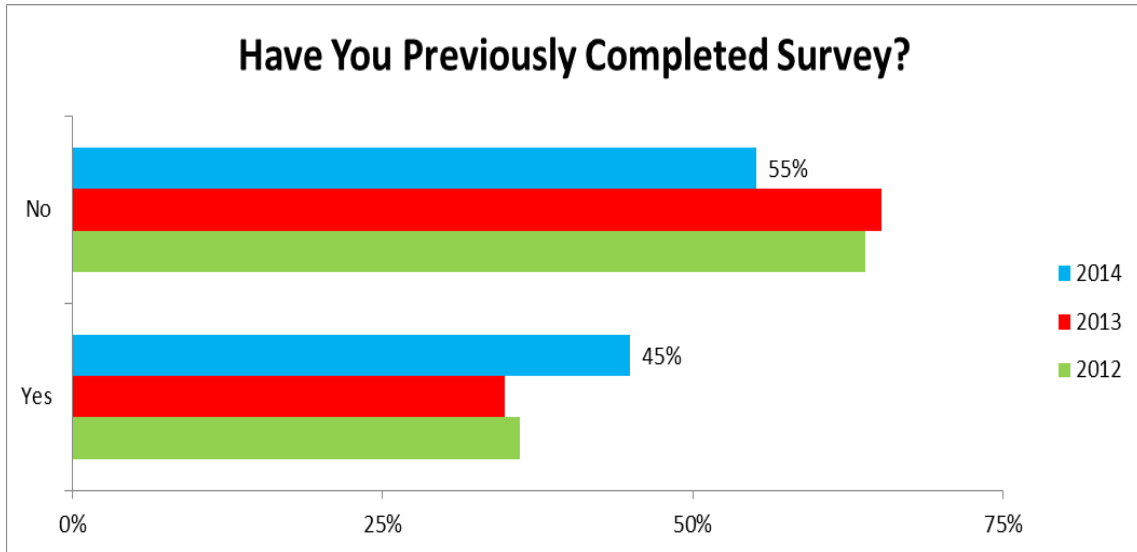
- Results don't play out immediately or even over the next few years, so hard to tell.
- While the cost of ERM staff can be quantified, it is difficult to assess what earnings may have been like without ERM activity. You can more easily say that ERM helps avoid material surprises, but not that it results in x percent improvement to returns.
- Not-for-profit
- Only if an actual risk is deflected. Like buying insurance, poor deal in good times.
- Hard to be definitive—some activity will clearly make a positive contribution but other may not be obvious; ultimately it becomes part of how you do business and it is hard to identify the specific impact
- Measures are not quantifiable but are relative to internal and external financial market performance.
- Hard to demonstrate cause and effect
- “Implementing” implies putting something in place that wasn't there before. As such, it is not applicable to our situation.
- In general, we believe it should result in better returns, but it's possible it does not.
- I believe ERM “should” improve company returns, if it is implemented correctly. However, if a company uses “ERM” in a way to address and possibly void only certain risks (e.g., operational risk), then the value of ERM is more difficult to ascertain and highlight.
- You can't measure what didn't happen.

Section 6: Demographics

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

Question 1. Have you completed this survey in the past?

- 45%/35%/36%/39% Yes
- 55%/65%/64%/61% No



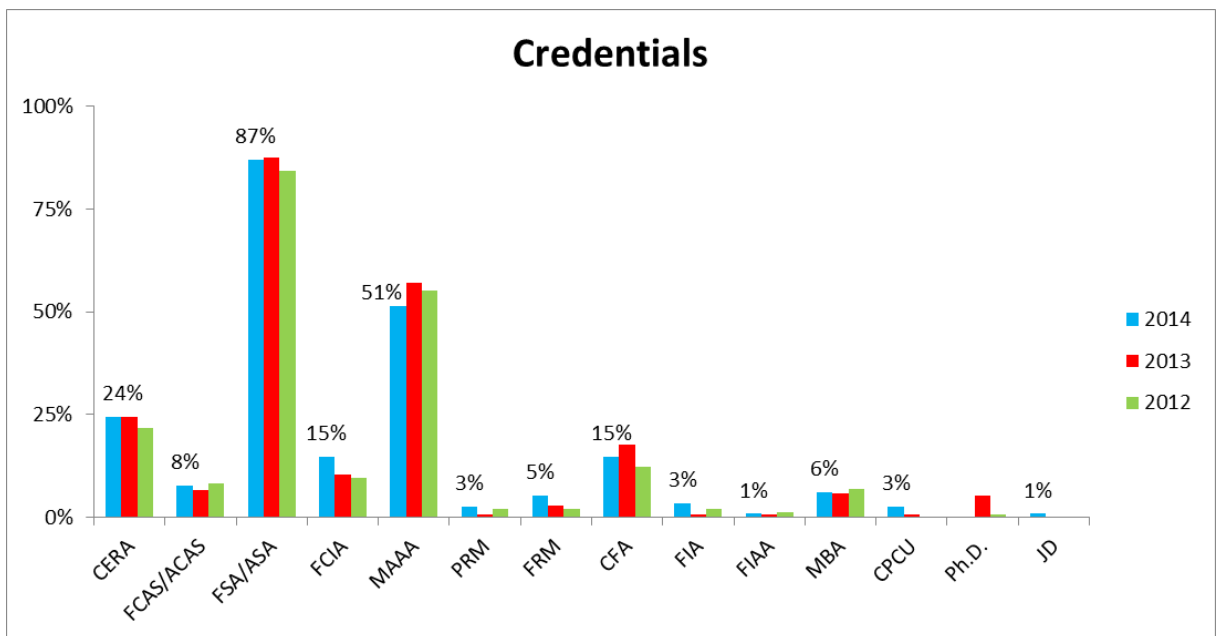
Question 2. What credentials do you currently hold? (Please select all that apply.)

285 responses from 113 surveys (2.5 average)

Percentages are based on 113 surveys

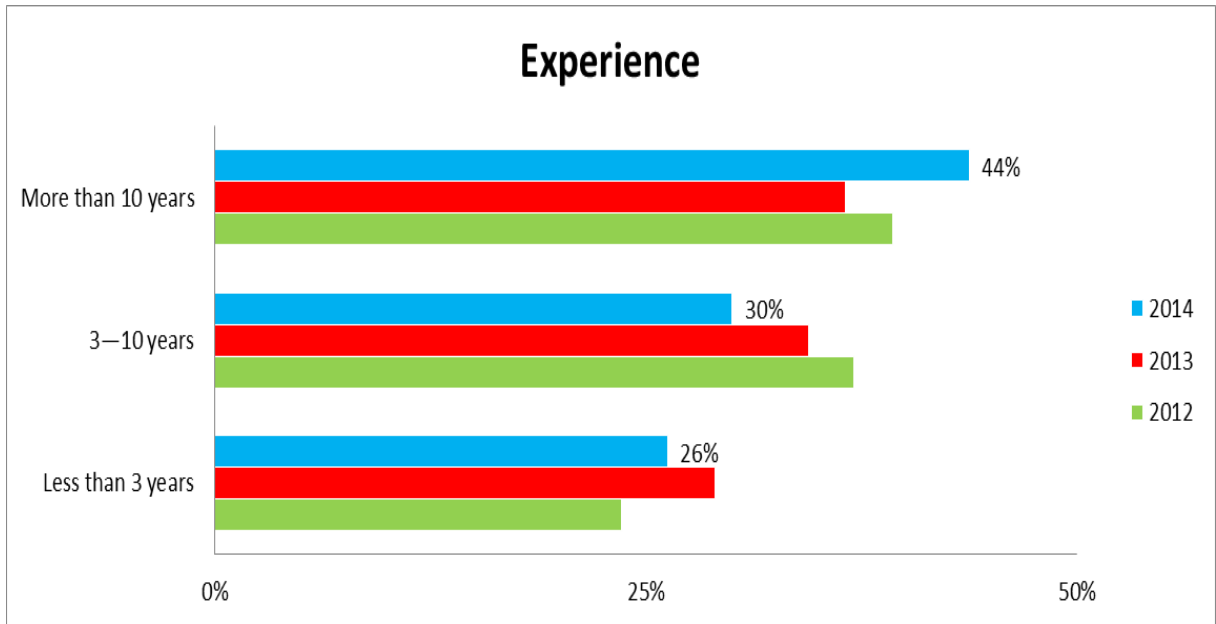
- 24%/24%/22%/20%/24%/28%/27% CERA
- 87%/87%/84%/82%/69%/87% FSA/ASA
- 8%/7%/8%/15%/13%/17% FCAS/ACAS
- 15%/10%/10%/17%/14%/13% FCIA
- 51%/57%/55%/63%/45% MAAA
- 3%/1%/2%/2%/4%/2% PRM
- 5%/3%/2%/3%/2%/4% FRM
- 15%/18%/12%/12%/13%/12% CFA
- 3%/1%/2%/3%/2% FIA
- 1%/1%/1%/2%/2% FIAA
- 6%/6%/7%/5%/10% MBA
- 3%/1%/1% CPCU
- 0%/5%/4%/7%/8% Ph.D.
- 3%/9%/6%/6%/5% Other actuarial credential (please specify)
 - EA
 - French actuary

- Swiss Actuarial Association
- 19%/9%/14%/11%/12% Other non-actuarial credential (please specify)
 - FLMI (9)
 - ARM (2)
 - CLU (2)
 - ChFC
 - ACS
 - FFSI (Loma)
 - CPA
 - ACII
 - M.A. Mathematics
 - CPF
 - CAIA
 - LLIF
 - M.S.
 - B.A. (Math)
 - AIS
 - ARC
 - AICP
 - ICD.D
 - CA



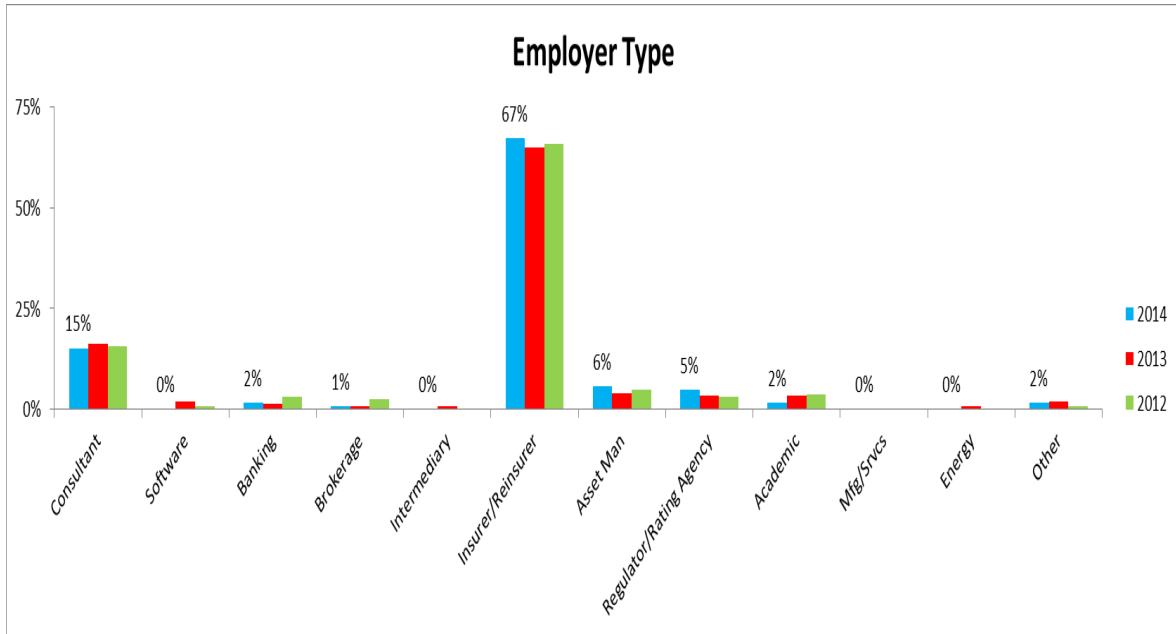
Question 3. How long have you been a risk manager?

- 26%/29%/24%/17%/22%
 - 30%/34%/37%/47%/44%
 - 44%/37%/39%/36%/34%
- Less than 3 years
3–10 years
More than 10 years



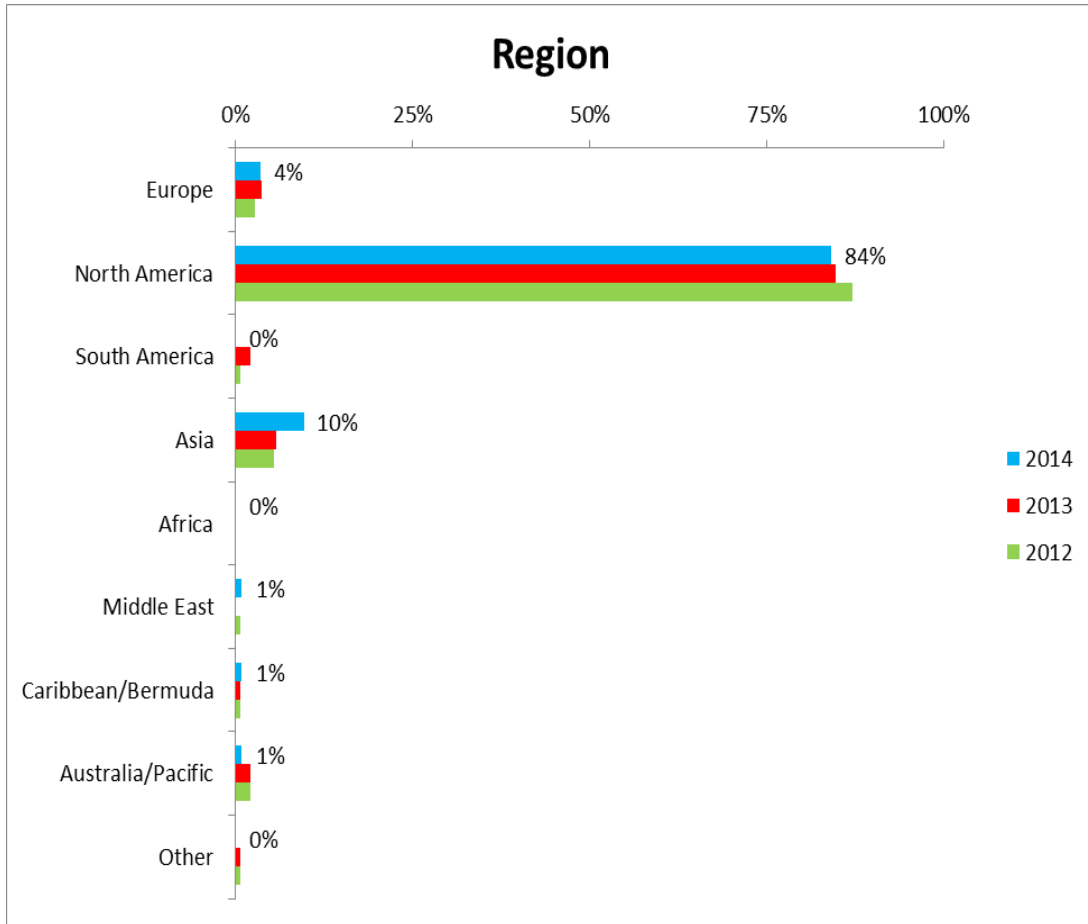
Question 4. Employer type (Please select all that apply.)

- 15%/16%/16% Consultant
- 0%/2%/1% Software
- 2%/1%/3% Banking
- 1%/1%/2% Brokerage
- 0%/1%/0% Intermediary
- 67%/65%/66% Insurance/Reinsurance Company
- 6%/4%/5% Asset Management
- 5%/3%/3% Regulator/Rating Agency
- 2%/3%/4% Academic
- 0%/0%/0% Manufacturing/Services
- 0%/1%/0% Energy
- 0%/0% Military/Defense
- 2%/0% CRO at CRO Council firm
- 0%/1% CRO at CRO Forum firm
- 2%/2%/1% Other
 - Acting CRO
 - Charity



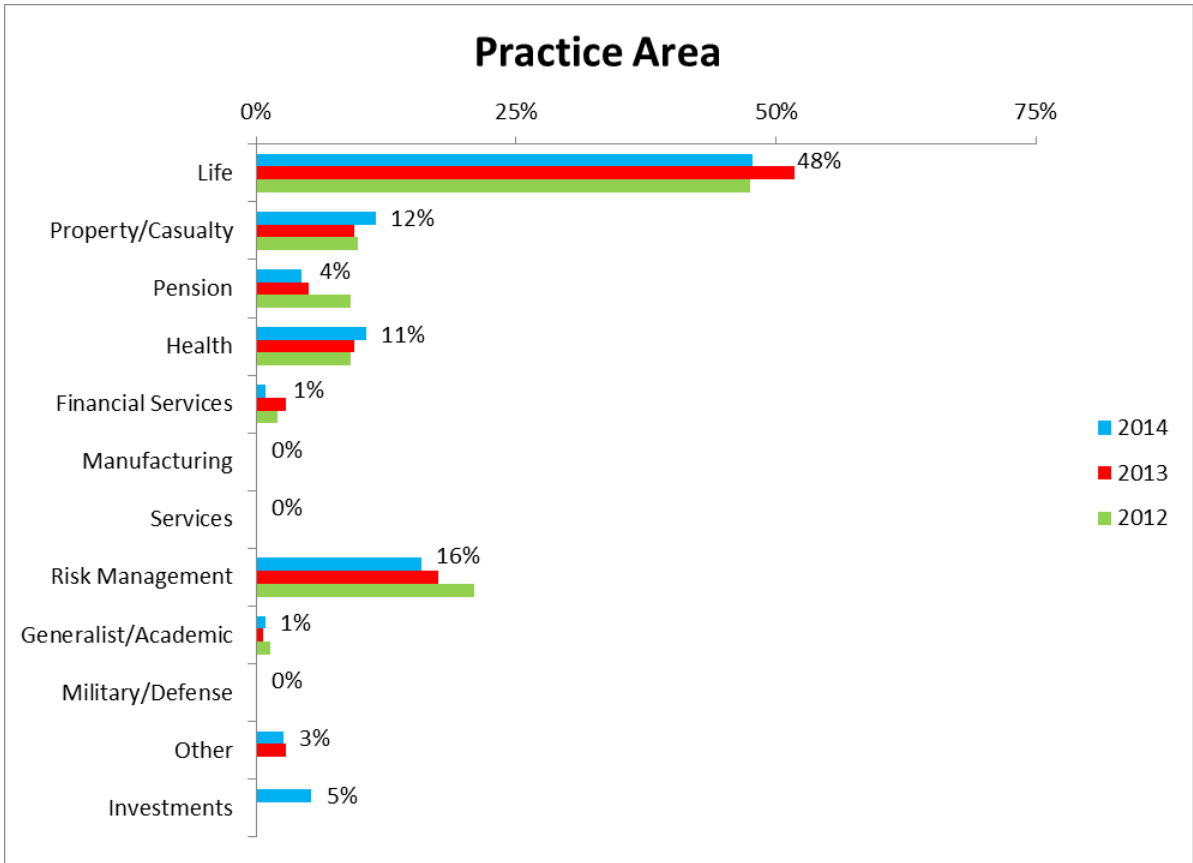
Question 5. Primary region (Please select one.)

- 4%/4%/3% Europe
- 84%/85%/87% North America
- 0%/2%/1% South America
- 10%/6%/5% Asia
- 0%/0%/0% Africa
- 1%/0%/1% Middle East
- 1%/1%/1% Caribbean/Bermuda
- 1%/2%/2% Australia/Pacific
- 0%/1% Other



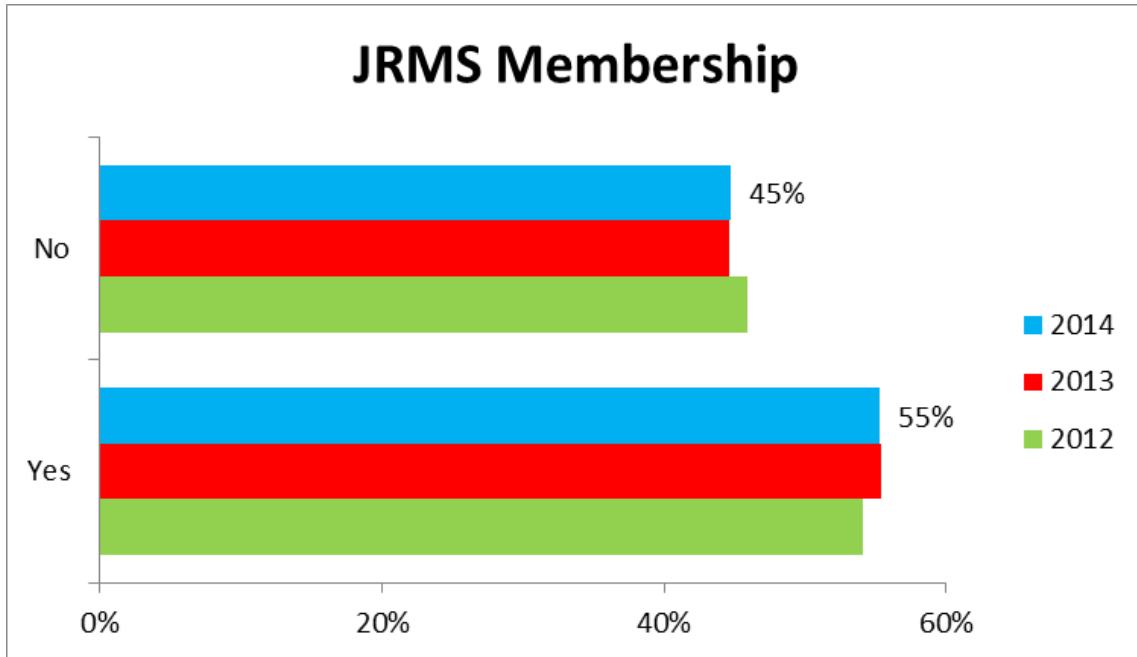
Question 6. Primary area of practice (Please select one.)

- 48%/52%/48% Life
- 12%/9%/10% Prop/Cas (Gen'l Insurance, non-life)
- 4%/5%/9% Pension
- 11%/9%/9% Health
- 1%/3%/2% Financial Services (non-insurance)
- 0%/0%/0% Manufacturing
- 0%/0%/0% Services
- 16%/18%/21% Risk Management
- 1%/1%/1% Generalist/Academic
- 0%/0% Military/Defense
- 5% Investments
- 3% Other
 - Life, Health (equal)
 - Annuities
 - P&C Reinsurance



Question 7. Do you belong to the Joint Risk Management Section, sponsored by the Casualty Actuarial Society, Canadian Institute of Actuaries, and the Society of Actuaries?

- 55%/55%/54% Yes
- 45%/45%/46% No



Question 8. Do you have any comments or suggestions for future iterations of this survey?

- I think this is a useful survey to do every one or two years.
- None other than the comments I already made. The main reason I took the survey this time is that Ebola is on the brink of either being contained and fading away or becoming a very critical issue in the coming year, in which case the SOA needs to focus on it.
- No
- It is a great survey. It would be interesting to have the survey (shorter version—fewer key risks) a little interactive—like a poll survey where you can view the responses in comparison with other input. It would be like an interactive Delphi study!
- No
- I think it would be instructive to include a section related to “lessons learned” from those who currently participate in or are in the process of developing ERM processes. It would help promote the value of ERM and provide concrete examples (if not proprietary information) to those that may be starting to formalize their processes and would appreciate some guidance to the benefits of ERM.
- No
- A good survey. Think about whether you should show prior answers to the survey when asking questions. It would be kind of a Delphi technique.
- Yes, more on which key risk indicators used
- Language needs to be more specific throughout the survey with regards to whether or not you are asking about emerged versus emerging risk. For example

the very first question asks “What is the risk that currently has the greatest impact?” We interpreted that to mean the top emerged risk for the firm, especially since the next question asked to name the Top 5 emerging risks. The same is true for Question 1 in Section 3: Methodology. Were you referring to models for emerged risks or emerging risks? We had to assume it was for emerging risks, since that is the purpose of the survey.

- **There is a typo in the section of the survey that asks about combinations of risks—should be “Liability regimes regulatory framework.”**
- Climate change probably won’t affect the next three to five years greatly, but limiting risks to three to five years risks de-emphasizing climate change.

Thanks for your participation!

[Researcher’s notes for future questions]

Add questions probing

- 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?
- Time horizon
- Low probability crisis you worry about
- What actions do you take between crises to remain influential?
- How prepared is your firm for a major risk event that has never happened before?
- How prepared is your firm for a major risk event of a type that has not happened for more than 10 years? (resilience)
- Expand Natural catastrophe: Tropical storms to include inland convective storms.

May not need Section 4 Question 4 as Comments have become consistent.

Make clear in survey intro that long time horizon should be used for Section 1 but that other questions will have varying time horizons.

Reword Section 1 Question 3.

Change risk from Oil price shock to Energy price shock.

Create a question that talks about avoiding a bad outcome rather than “timing the market”—seems like this is where winners reside.

Appendix III—Survey Results 2013 and Earlier

Prior detailed results can be found at www.soa.org, summarizing all prior surveys.

<http://www.soa.org/Research/Research-Projects/Risk-Management/research-emerging-risks-survey-reports.aspx>