



2015 Emerging Risks Survey



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2015 Emerging Risks Survey

SPONSOR

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Ninth Survey of Emerging Risks

Risk management can be looked at in many ways—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 information about risks that, over a long time horizon, could have a great impact on an entity's survival. By identifying these risks proactively, a firm can start thinking about how to react if they occur. This planned resiliency can make a big difference in combating 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 as they lie dormant, or are new. Known-unknowns cover risks we understand exist but whose implications are unclear. The ultimate impact of asbestos, many years after it was declared a health hazard, is 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—which act either 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 Ninth Survey of Emerging Risks conducted by the Joint Risk Management Section, a collaboration of the Canadian Institute of Actuaries (CIA), Casualty Actuarial Society (CAS) and Society of Actuaries (SOA). 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, give risk managers a way to network with peers and share the new ways they are thinking about risks. Each round 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. Notable in the respondent data is the much higher number of CAS credentialed risk managers who participated, making the results more robust.

Executive Summary

Systemic risks are more important than ever, with firms' limited ability to mitigate or avoid the risk of everything from interest rates to the Zika virus. Emerging risks can provide a competitive advantage for those who acknowledge their presence in advance and proactively consider outcomes that may or may not occur.

Risk management practices continue to evolve as diverse events occur regularly around the world. While currency wars, infectious diseases and climate change grab many headlines, the heavy burden of regulations, regional instability and demographic shifts also interact to form worrying risk combinations. The year 2015 seemed like a down year for risk, with regional conflicts neither going away nor escalating, the Ebola crisis fading (and Zika not yet in the news), the Paris terror attack and record flooding in multiple locations. Cyber risk continues to be a game of leapfrog between companies and hackers. This year's Survey of Emerging Risks, the ninth in the series, captures this shift. Technological emerging risks have continued to increase, taking share from Geopolitical risks.

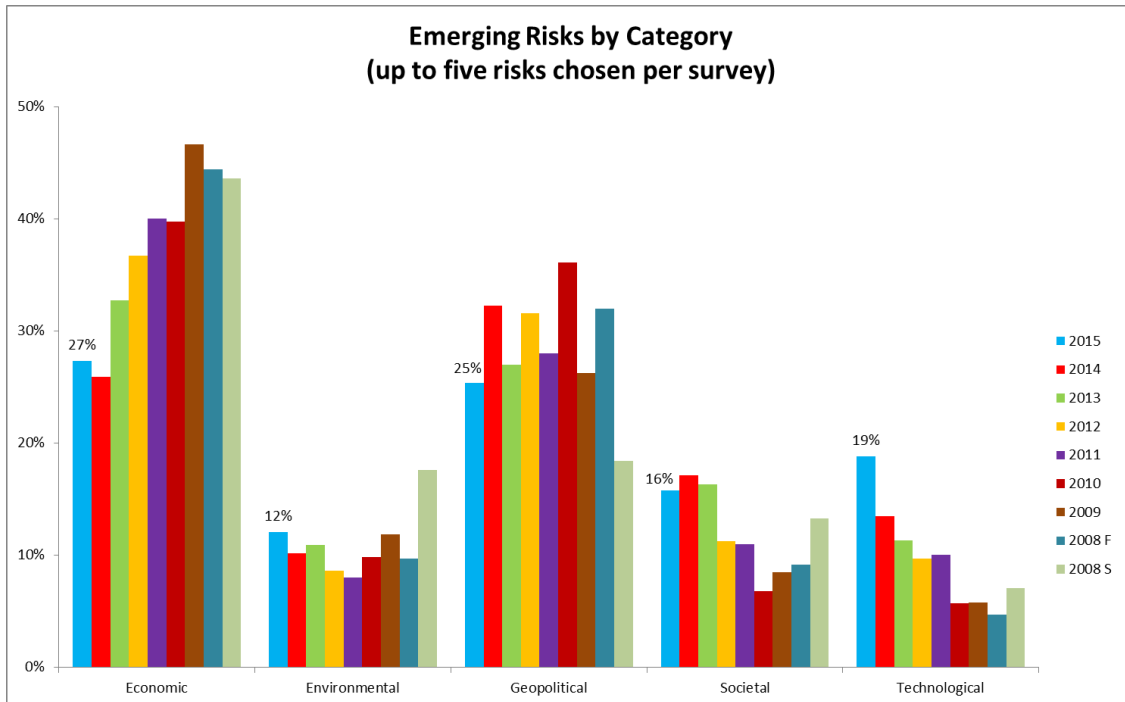
A natural bias is to spend the most time on risks that have recently occurred and are still in our short-term memory. This survey attempts to interpret emerging risks over a longer time horizon. Each year another data point is added. In addition, the evolving role of emerging risks in an enterprise risk management (ERM) environment is explored (often based on comments shared in earlier surveys). This survey will continue to explore the implementation of ERM.

Emerging Risks

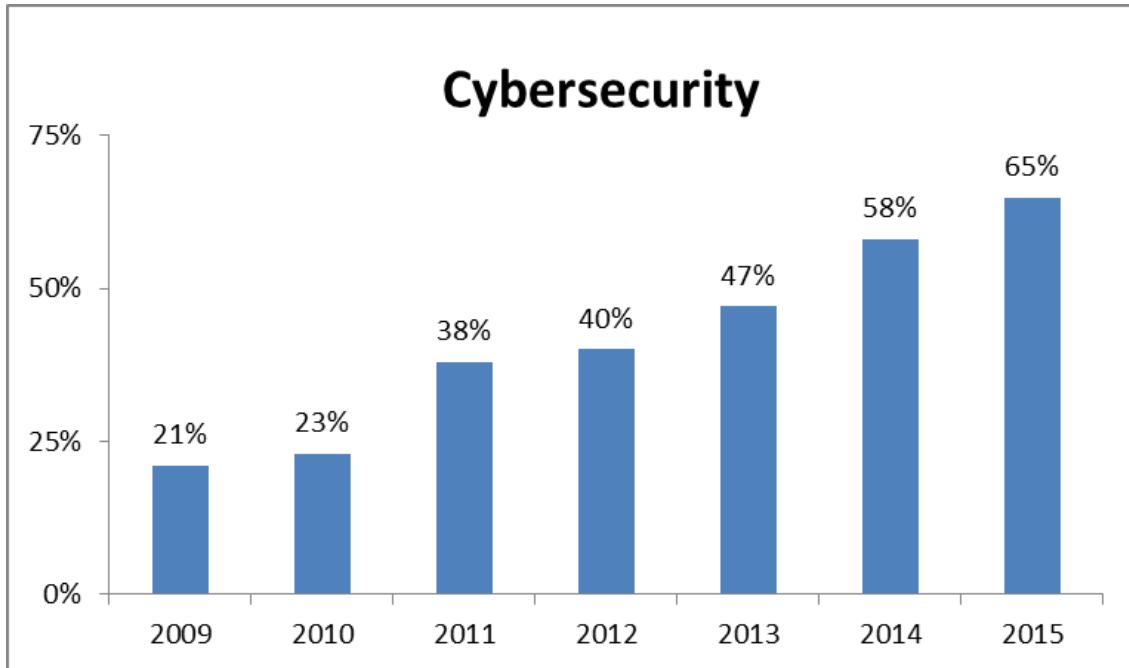
The initial question looks at the top current risks before addressing those that are expected to emerge over a longer time horizon. Risk combinations also show surprises, as some risks are common when viewed with others but not by themselves.

Top Five Emerging Risks

Due to the ongoing nature of the survey, each year's data set is fascinating to review both in isolation, given recent events, and in context of the longer term trends and demographic makeup of the respondents. The Geopolitical category of risks ceded ground to Technological risks (19 percent when up to five emerging risks were selected), falling to its lowest result since the initial survey in spring 2008 (25 percent). The Societal (down slightly) and Environmental (up slightly to its highest since spring 2008) categories each had small changes from the prior survey. The Economic category finished first overall (27 percent) over a balanced field. Top choices (all in the top five) in the category were *Financial volatility* (45 percent up from 44 percent) and *Asset price collapse* (steady at 31 percent). Risks with new highs across the survey history were *Cybersecurity/interconnectedness of infrastructure* (65 percent, overall leader) and *Technology* (24 percent). New lows were recorded by the *Chinese economic hard landing* (25 percent) and *Retrenchment from globalization* (6 percent) risks.



Cybersecurity strengthened its position at the top of the list of emerging risks, trending up from 21 percent in 2009 to this year's survey, in which 65 percent of respondents listed it among their top five emerging risks. This risk has consistently increased each year it has been in the survey. It is amazing how quickly this risk has come to dominate the survey, as it was not even considered a distinct risk when the World Economic Forum (WEF) published its first Global Risk Survey in 2006.



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 increased cyberthreats and reduced regional tensions and infectious disease coverage.

The evolution of the top five 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* (ranked 3, 2, 1 and currently 1 in the past four years) shows how concerns are evolving away from the Economic category. In this survey, for the first time, *Cybersecurity/interconnectedness of infrastructure* is the top current risk, as well as the top emerging risk both when choosing five or a single risk.

Year	2012	2013	2014	2015
1	Financial volatility	Financial volatility	Cybersecurity / interconnectedness of infrastructure	Cybersecurity / interconnectedness of infrastructure
2	Regional instability	Cybersecurity / interconnectedness of infrastructure	Financial volatility	Financial volatility
3	Cybersecurity / interconnectedness of infrastructure	Asset price collapse	Terrorism	Terrorism
4	Failed and failing states	Demographic shift	Regional instability	Asset price collapse
5	Chinese economic hard landing	Failed and failing states / Regional instability (tie)	Asset price collapse	Regional instability

Four risks increased materially. As previously discussed, *Cybersecurity/ interconnectedness of infrastructure* and its fellow risk from the Technological category, *Technology*, each rose. In addition, *Currency shock* (7 percent to 14 percent) and *Climate change (includes space weather)* (19 percent to 26 percent) both showed higher results. Each was in the news a lot in 2015, with the Paris climate summit and record high temperatures reflecting the interest in climatology topics and large moves in the major currencies impacting world economies. Those risks decreasing materially were mostly in the Geopolitical category. They included *Failed and failing states* (28 percent to 18 percent), *Transnational crime and corruption* (from 10 percent to 5 percent), *Regional instability* (37 percent to 26 percent) and *Pandemics/infectious diseases* (30 percent to 17 percent). Geopolitical risks seem to be dropped when Technological risks rise. It will be interesting to see which risks decrease in the future when regional hostilities spike.

Respondents select from 23 risks in five categories as shown below. When a chart shows 24 risks, the last one is *Other*, and the survey asks specifically which risks are missing so they can be considered for future surveys.

Economic Risks

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

Environmental Risks

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

Geopolitical

11. 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

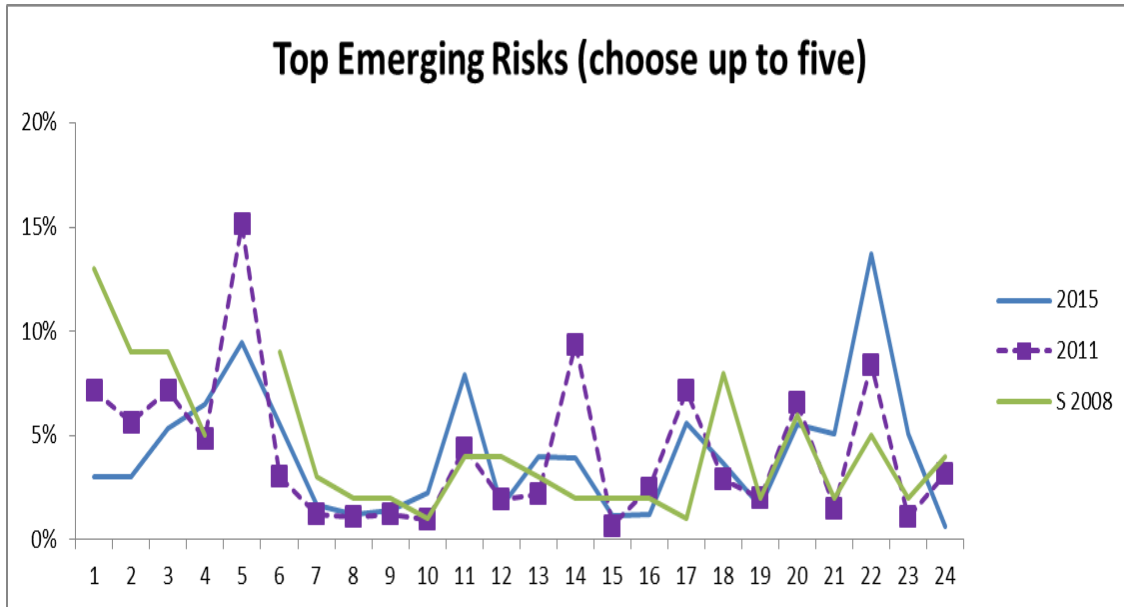
Societal

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

Technological

22. Cybersecurity/interconnectedness of infrastructure
23. Technology

These results evolve over time, with risk responses ebbing and flowing. The following chart shows an example of how the responses for each risk have changed over time, displaying results from spring 2008, 2011 and 2015 (note that risk number 5 was added after the spring 2008 survey).



Top Emerging Risk

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

The results for the top emerging risk in November 2015 were as follows (the five highest were named by 57 percent of respondents, up from the previous survey’s result of 54 percent):

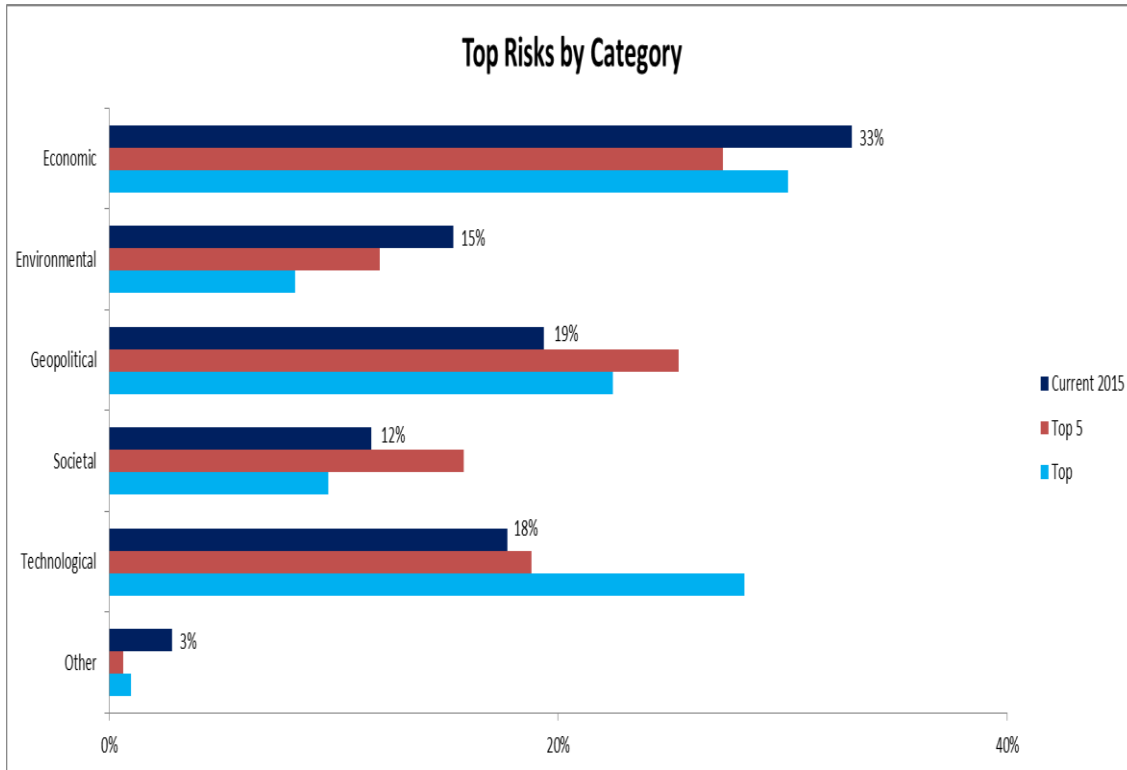
1. *Cybersecurity/interconnectedness of infrastructure* (23 percent)
2. *Financial volatility* (13 percent)
3. *Liability regimes/regulatory framework* (7 percent)
4. *Chinese economic hard landing* (7 percent)
5. *Terrorism* (6 percent)

Failed and failing states and *Asset price collapse* dropped out of the top five. Interestingly, while *Chinese economic hard landing* continued to fall when respondents were asked to choose five emerging risks, it received more focus when they were asked to choose just one.

All of the risks except *Chronic diseases* received at least one vote for top emerging risk in this year’s survey, down from four risks that were not chosen in the last survey.

Trending

The following chart shows results for this survey by category for the top emerging risk, measured by top five and top overall, and compares it to the top current risk. If this is considered a leading indicator, we should expect additional interest in the Technological and Geopolitical categories and less in the Economic and Environmental categories.

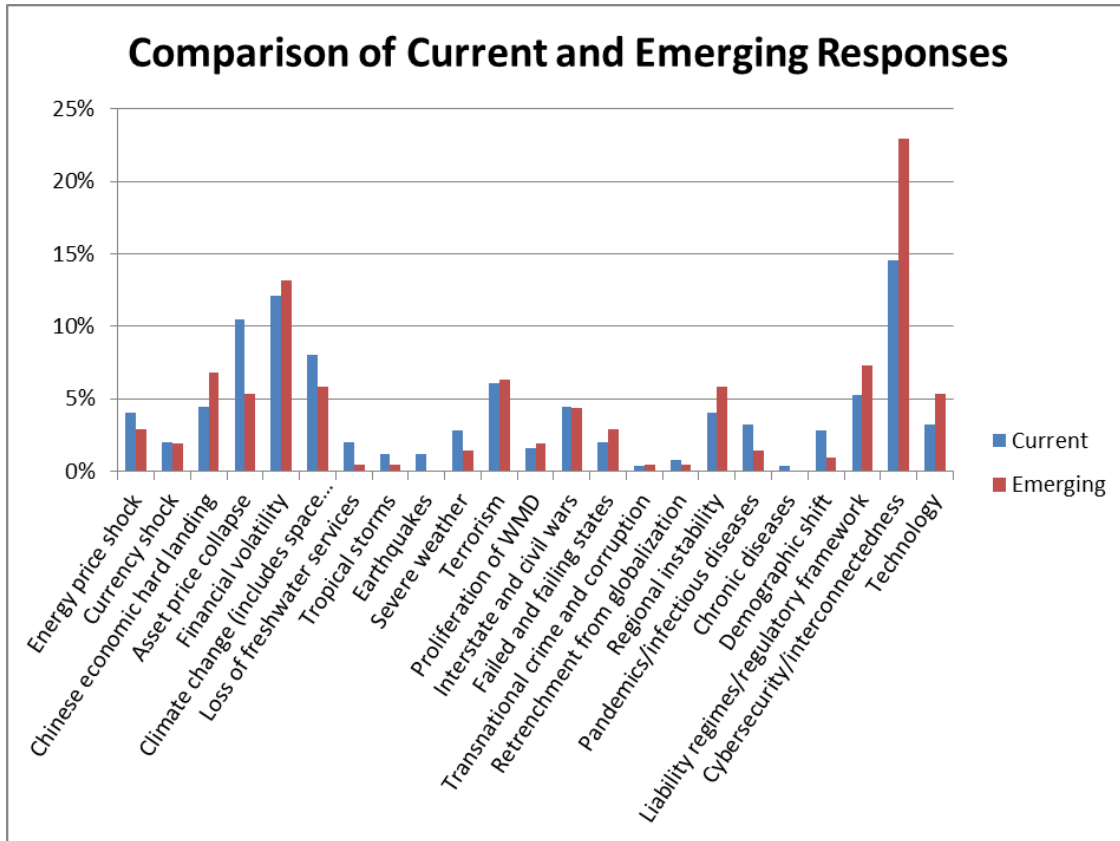


The next chart compares the current risk results to the top emerging risk at the individual risk level. Hypothesizing why there are discrepancies is useful, and readers may have different viewpoints. The risks with the greatest disparity favoring the top emerging risk category over the current risk category are

- *Cybersecurity/interconnectedness of infrastructure* (8.2%)
- *Chinese economic hard landing* (2.4%)
- *Technology* (2.1%)
- *Liability regimes/regulatory framework* (2.1%)

Such differences could be due to concerns that these risks have more volatility than they are currently showing or that they could get worse. The opposite situation, where the current risk is higher than the emerging risk, may reflect a belief that the risk is already being managed. The risks with the greatest disparity of this type are

- *Asset price collapse* (5.1%)
- *Climate change (includes space weather)* (2.2%)



Risk Combinations

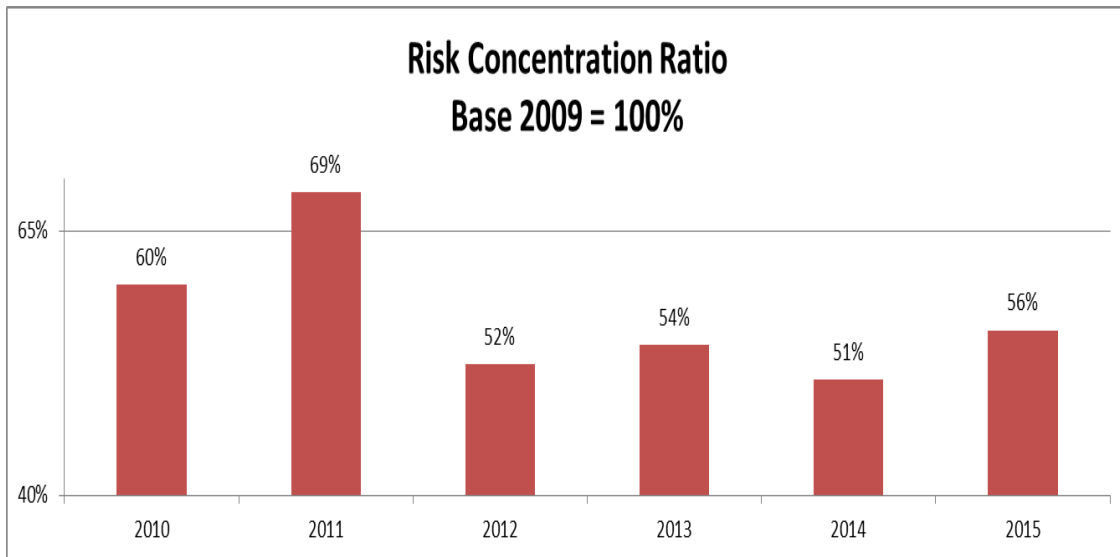
This year’s survey again asked about concerns due to combinations of emerging risks. The top risks chosen in combination included *Cybersecurity/interconnectedness of infrastructure*, *Financial volatility*, *Asset price collapse*, *Terrorism* and *Regional instability*. One combination ranked in the top five after being unranked in the 2014 survey. In second position was *Cybersecurity/interconnectedness of infrastructure* and *Technology* (9 percent). Overall, Geopolitical risks were down in favor of Technological risks, which was consistent with other questions.

Top five combinations selected:

- Terrorism* and *Cybersecurity/interconnectedness of infrastructure*—9 percent
- Cybersecurity/interconnectedness of infrastructure* and *Technology*—9 percent
- Asset price collapse* and *Financial volatility*—7 percent
- Financial volatility* and *Liability regimes and regulatory framework*—5 percent
- Chinese economic hard landing* and *Asset price collapse*—3 percent

There are 253 possible two-risk combinations from the 23 risks. The distribution of results was the most concentrated it has been since 2011. The period immediately following the financial crisis is likely 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/median), 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. Respondents seem to have an increased focus on a potential crisis. 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.

Emerging Opportunities

Best practice risk management is evolving toward a form of strategic risk management, and the respondents shared instances where emerging opportunities are being monitored. In addition to opportunistic trading examples, respondents looked at demographic shifts, the Internet of things (IOT), velocity of money and autonomous cars. Driverless cars and drones have a strong likelihood of impacting the casualty insurance business.

Leading Indicators

As formal risk appetite policies and regulatory processes are implemented, an increasing number of firms are formally identifying emerging risks (62 percent). Most respondents who identify emerging risks also have criteria for action based on leading indicators (79 percent). Results are more nuanced compared to previous surveys, with respondents talking about separating risks between those they feel comfortable quantifying and using surveys and other qualitative measures to analyze the rest. It is becoming a multi-tier process. Some risks have even been taken off a monitor list. This is driven by heat maps (e.g., analyzing red and yellow risks in more depth than green risks) or whether respondents feel the risk has been mitigated. Given the increased counterparty risk, it would be interesting to know whether firms are creating heat maps before and after

mitigation or whether they are making decisions based entirely on the net risk they assume has been accepted. In times of crisis, net becomes gross as counterparties fail.

Risks versus Returns

Most respondents (72 percent) said that ERM has had a positive effect on their company/industry. Some gave transparency, awareness and alignment as reasons for this, while others noted the longer time horizon and combination of quantitative and qualitative methodologies. Those who disagreed with this view (3 percent) found that the processes impeded decision making with overly optimistic assumptions and a box-checking culture. Some had a neutral response (20 percent), citing bureaucracy and silo effects as mitigating factors. One respondent referred to the mixed nature of ERM at his firm, with a broader focus on risk overall but at times feeling like a modeling exercise that is not challenged.

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

Even if quantification is not precise, relative impact of risk enables better ability to articulate trade-offs when making decisions.

Increased requirements to at least think about risk has led to better feedback loop.

Risk managers were also asked to share their experience with future risk managers—what works and what doesn't. Comments included taking one step at a time rather than trying to do it all at once, making sure the risk team has a diverse set of skills, having a long time horizon, focusing on the forest rather than the trees and not overthinking. This section of Appendix II should be excellent reading material for both new and experienced risk managers.

Predictions

Risk managers continue to identify risks and perform scenario analysis across a range of outcomes to detect vulnerabilities, but there remain interesting nuances in the responses received that show how difficult it is to look at the “right” risks proactively. Here are two comments received on the topic:

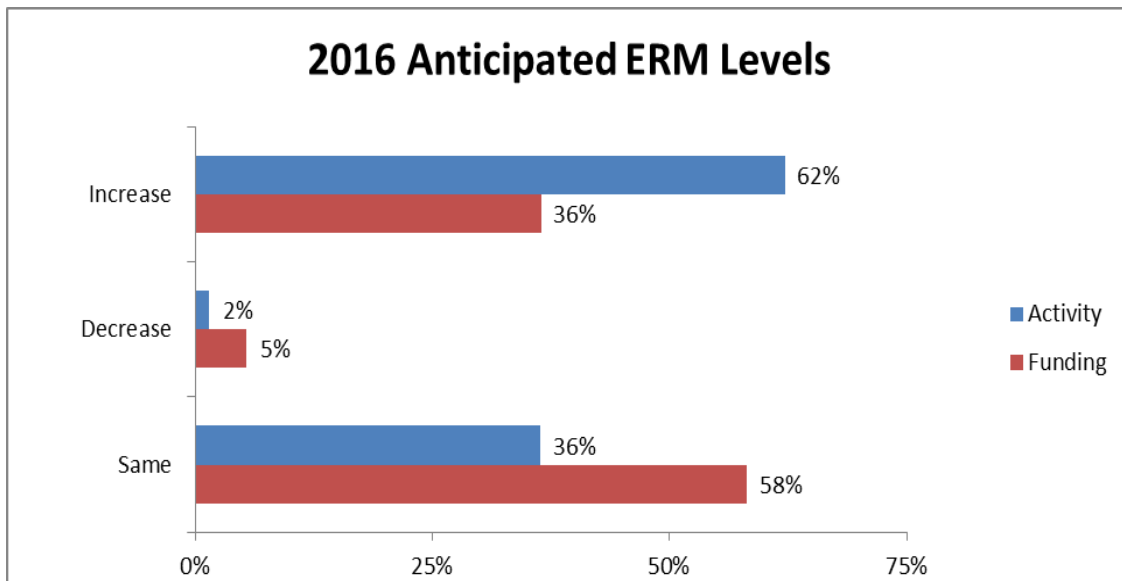
- *Anticipate and predict are, in my view, quite different. Anticipate allows you to prepare to mitigate a crisis without predicting that it will happen—just that it may happen.*
- *Prediction actually distracts from risk imagination.*

It is important to understand this second comment. The researcher's interpretation is that it suggests that prediction as a single scenario will discourage consideration of other

potential outcomes. Since the next risk is rarely the same as the last big risk driver, this “imagination” is a key component to a successful risk culture.

Risk Activities

Risk managers report that risk tools are being used more frequently to add value and make firms more resilient. Many activities related to ERM continued to grow in 2015, with 62 percent expecting activity growth in 2016 but only 36 percent anticipating an increase in funding. Increased ERM regulatory requirements related to corporate governance are expected to lead to higher activity levels.



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. The following bullets provide interesting revelations that may prompt you to read further. Reviewers will come up with different lists based on their background and experience.

What Risk Managers Are Thinking

- Cyber risks continue to emerge (sixth consecutive year of increases).
- Geopolitical category risks are lower than in 2014.
- Economic and Environmental category risks have bounced back.
- *Liability regimes/regulatory framework* and *Chinese economic hard landing* are ranked higher when considering the top emerging risk than the current risk, top five emerging risks or risk combinations.

Leading-Edge Actionable Practices

- More risk managers are using leading indicators with action triggers.

- Risk management is moving toward strategic planning in best practice companies.
- The comments note the importance of a champion-supported risk culture.
- As companies evolve, they are prioritizing their analysis using heat maps so that “green” risks have some analysis but the focus is on “red” and “yellow” risks.
- The specific comments shared by the respondents are fascinating! Culture drives successful risk management.

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 the reach of 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 you to overcome internal cognitive biases and build a more resilient process.

An evolving set of new risks is gaining a foothold in the consciousness of risk managers. Climate change, demographics and technology are replacing geopolitical and pandemic risks as risk managers reprioritize their efforts. Geopolitical risks decreased in importance this year but still remain among the risks considered most often. This survey completes the triumvirate for cyber risk as it leads in all the primary questions; current, emerging and top emerging risk. The Chinese economy remains a concern but seems to be more worrisome in combination with other risks. Trends across surveys reveal risk managers’ awareness of emerging risks prior to their mainstream acceptance, showing some predictive qualities as risks increase or decrease in ranking.

As this report is being written in 2016, we continue to get regular reports of extreme climate events. The financial world is unsure of its next direction, with central banks manipulating rates and a currency war heating up. Regional tensions are growing. Cyber risk is regularly in the news. 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?

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 using the International Network of Actuarial Risk Managers (INARM) Listserv and LinkedIn groups related to risk management. The North American-based CRO Council was also invited to participate. A total of 248 responses were received. This represents more than 5 percent of completed surveys relative to the number distributed (more than 2,500 to JRMS). This is the ninth 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, October 2013 and October 2014. This year's survey was conducted in November 2015. 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>

* This section has been updated with new information but is otherwise consistent with prior surveys.

- 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>

October 2014—Eighth survey

- Research report <https://www.soa.org/Research/Research-Projects/Risk-Management/2014-emerging-risks-survey.aspx>
- Article: pages 5–6 of *Risk Management* April 2016 issue
<http://www.soa.org/Library/Newsletters/Risk-Management-Newsletter/2016/april/rm-2016-iss-35-rudolph.aspx>

Rather than developing a unique set of emerging risks for consideration, the research team chose one originally developed by the World Economic Forum for the initial survey. The WEF reports, starting in 2007, can be found at www.weforum.org. The 23 risks used in this survey are described in detail in Appendix I. They differ slightly from those in previous years, as *Currency shock* replaced *Currency trend*, and *Terrorism* replaced *International terrorism* since the word *international* was deemed redundant. In addition, a conscious decision was made to move space weather, such as electromagnetic storms, from the Technological category to Environmental under *Climate change* (includes space weather), since cyclical variations in climate are due at least in part to solar cycles. It appears that space weather was originally included as a Technological risk due to the impact of space weather on technology rather than as a technological driver. Each risk has been categorized as either Economic (5 risks), Environmental (5), Geopolitical (7), Societal (4) or Technological (2). The current survey continues this evolution, adding and subtracting a few questions while leaving the core of the survey intact. Responses to open-ended questions have minimal editing.

Note that individual results have generally been rounded to the nearest 1 percent so totals may not add up to exactly 100 percent (although the charts will reflect the actual splits).

Research reports do not create themselves in isolation, and the researcher thanks Dave Ingram, Steve Hodges, Victor Chen, Jan Schuh and Ronora Stryker 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 Ninth 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, with complete results found in Appendix II. A total of 248 surveys were completed (electronically). The survey asks for individual responses, not company responses, so using an anonymous electronic format encourages the expression of opinions. Many multiple-choice format questions are followed up with “why” or “provide examples,” allowing expansion of the concept and additional learning for readers. In some cases, the written responses have been sorted based on the answer to the corresponding multiple-choice question. You are encouraged to review the comments for perspectives that are different from your own. It is likely that this will stimulate additional questions for you to ponder.

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 typically excluded from percentages but were included when these responses were meaningful. Analysis of this year’s trends was very thought-provoking for the researcher, as occurs each year, and hopefully you will agree.

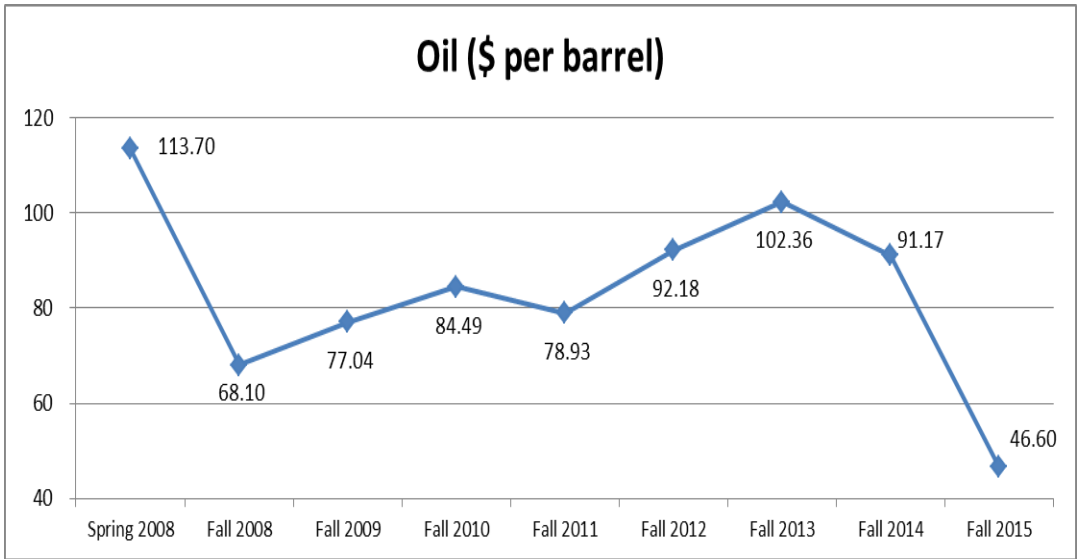
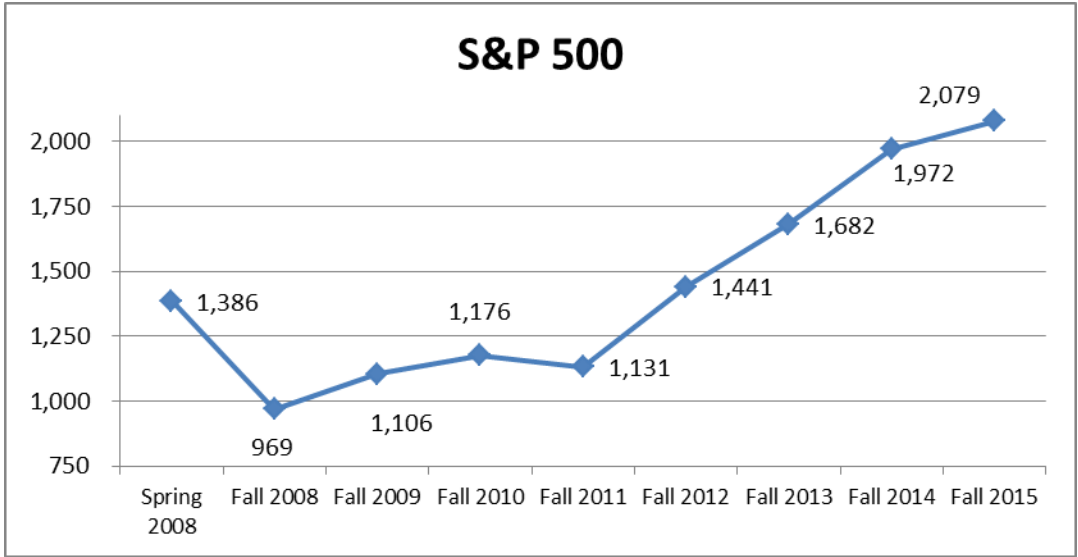
What Changes in Responses Mean

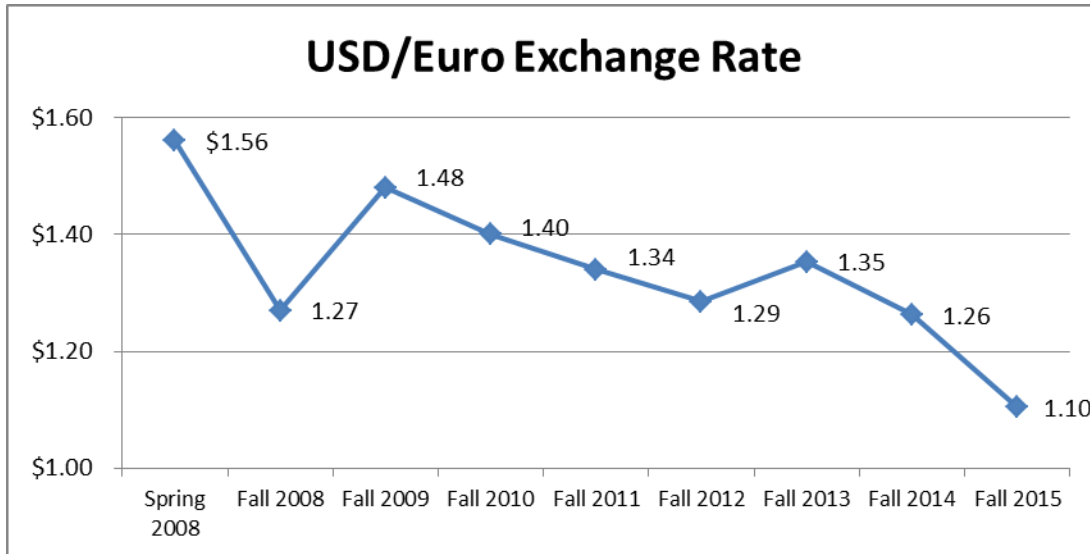
Note that each survey is taken at a different point in time, so the same risk managers do not necessarily respond. Increases and decreases reflect the respondents’ perception of the risk, not actual changes in assessment of the risk itself. A perceived risk may not have changed at all, but another risk is perceived to be higher or lower and impacts all of the other risks.

History

As in previous reports, the survey results show that current values of the Standard & Poor’s 500 (S&P 500) index, a barrel of oil and the U.S. dollar relative to the euro seem to anchor perceptions of risk. Results have evolved over time, often led by current news topics. Only economic factors are shown here, and the researcher would be interested in suggestions of other metrics that are considered drivers of emerging risks.*

* The source for the S&P 500 was Yahoo Finance; for the price of oil, it was the Energy Information Administration at <http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=RWTC&f=D>; and for the dollar/euro exchange rate, it was http://www.federalreserve.gov/releases/h10/Hist/dat00_eu.htm.





World events that transpire while surveys are open significantly influence data points.. While markets were volatile in late 2015 and early 2016 (e.g., oil below \$30 per barrel), these changes occurred after the survey closed and are not reflected here. The following information provides context to the previous surveys.

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 in the initial survey. 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 as follows:

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 were 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 continued to come from the Economic category. *International terrorism* and *Failed and failing states* made their first appearance.

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 were 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 risks were updated for the 2011 survey. One risk was moved to a different category, two were combined and one added. (These changes, along with others since then, are described in Appendix I. Comparisons have been adjusted for trending purposes.) 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 and the final time (to date) that *Oil price shock* (or *Energy price shock*) has appeared.

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 upward trend 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 the price of oil had started to go 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)

The big news in fall 2015 was the strengthening of the dollar relative to the euro, which also drove the price of oil down since it is primarily transacted in dollars. The U.S. stock

market was still rising at that point, but warning signs were building for several risks. The Paris climate summit, a strong earthquake in Nepal, the ISIS/Syrian conflicts, a strong dollar and falling oil prices likely impacted the survey results.* For the first time, the top five risks remained the same as in the previous survey.

Survey 9 (November 2015)

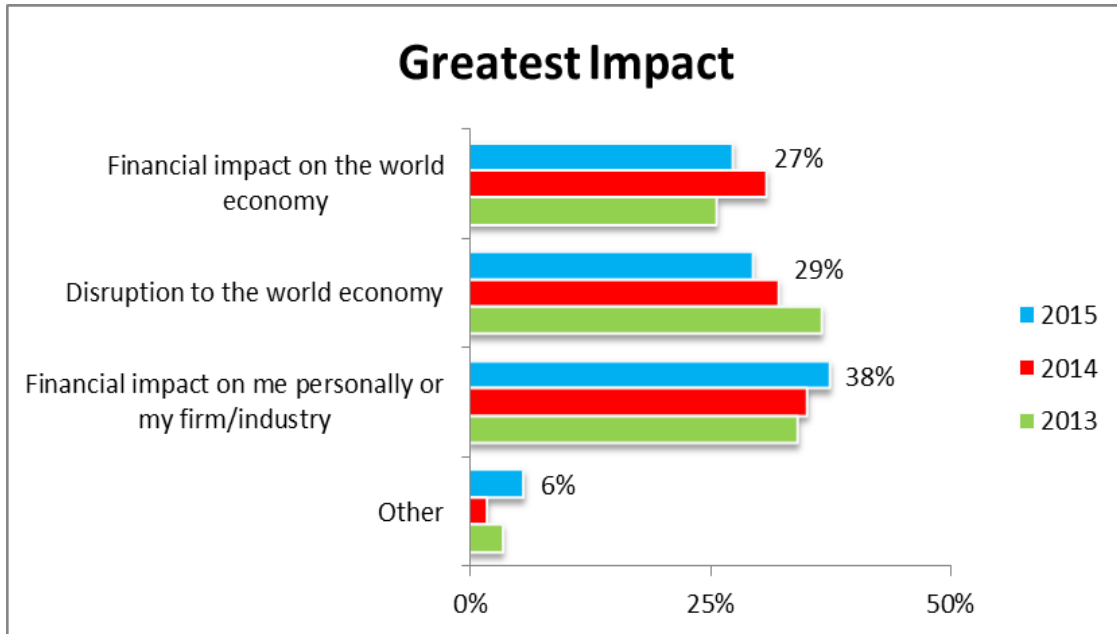
1. *Cybersecurity/interconnectedness of infrastructure* (65 percent)
2. *Financial volatility* (45 percent)
3. *Terrorism* (37 percent)
4. *Asset price collapse* (31 percent)
5. *Regional instability* (26 percent)

Introductory Questions

In late 2014, cyber risk was gaining momentum, while events in Ukraine and the Middle East, along with the Ebola outbreak in Africa, had catapulted Geopolitical and Societal risks to the forefront. The Ebola outbreak was mostly contained by the time the 2015 survey opened, but the conflict in Syria heated up as Russia entered the fray and ISIS continued to battle for territory. Also, Cuba and the United States restored diplomatic relations, easing restrictions between the two countries.

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* (38 percent), with *Disruption to the world economy* (29 percent) and *Financial impact on the world economy* (27 percent) also receiving material support. In the *Other* category, several respondents noted the need to consider more than financial risk.

* A good source of information about catastrophes is Swiss Re. Their report on 2015 events notes that top insured losses were due to a Chinese port explosion and winter storms in the United States.
http://www.swissre.com/media/news_releases/Preliminary_sigma_estimates_for_2015.html .



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

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

Environmental Risks

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

Geopolitical Risks

11. 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 Risks

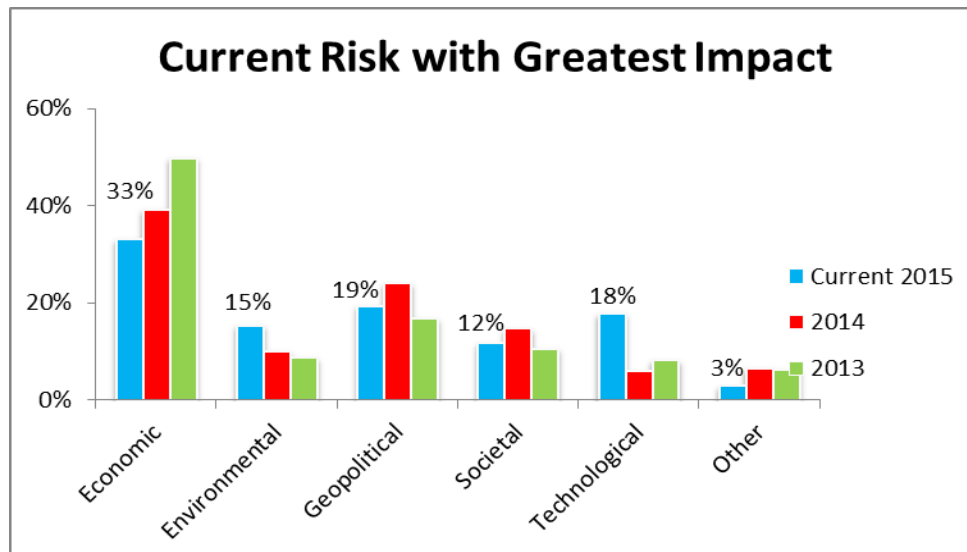
- 18. Pandemics/infectious diseases
- 19. Chronic diseases
- 20. Demographic shift
- 21. Liability regimes/regulatory framework

Technological Risks

- 22. Cybersecurity/interconnectedness of infrastructure
- 23. Technology

Current Risk

Changes to risk classifications since the original WEF-defined risks are documented in Appendix I. The 23 emerging risks used in this iteration of the survey were reviewed, and four were updated. *Currency trend* was changed to *Currency shock* to incorporate rate of change to relative currency values. The impact of space weather, such as solar flares and geomagnetic storms, was moved from *Technology/space weather* to *Climate change (includes space weather)*. *International terrorism* was shortened to *Terrorism* as it was felt that *international* was redundant for a global survey.



- Economic 33%/39%/50% (2015/2014/2013 surveys)
- Environmental 15%/10%/9%
- Geopolitical 19%/24%/17%
- Societal 12%/15%/11%

- Technological 18%/6%/8%
- Other 3%/6%/6%

The Economic category continued as respondents' top choice for the risk currently having the greatest impact. However, this category gave up 6 percent from last year, and Geopolitical gave up 5 percent. The gainers were Technological (12 percent) and Environmental (up 5 percent). *Cybersecurity/interconnectedness of infrastructure* jumped to 15 percent to beat out *Financial volatility* for the first time; it was not previously one of the top five risks chosen. *Asset price collapse* (7 percent drop) and *Pandemics/infectious diseases* (5 percent drop) were the risks that decreased the most. Several of the *Other* responses referred to the low interest rate environment, which is covered by *Financial volatility*.

For the first time, every one of the 23 risks was chosen as the top current risk by at least one respondent.

The top five current risks chosen were

1. *Cybersecurity/interconnectedness of infrastructure* (15 percent)
2. *Financial volatility* (12 percent)
3. *Asset price collapse* (10 percent)
4. *Climate change (includes space weather)* (8 percent)
5. *Terrorism* (6 percent)

One risk increased materially (more than 5 percent or doubled from a non-minimal amount in the previous survey of at least 2%):

- *Cybersecurity/interconnectedness of infrastructure* (from 6 percent to 15 percent)

The risks that decreased materially (more than 5 percent or reduced by half) were

- *Asset price collapse* (from 17 percent to 10 percent)
- *Pandemics/infectious diseases* (from 8 percent to 3 percent)

The Economic category results continued to drop, from 39 percent to 33 percent, mainly driven by a reduction in *Asset price collapse*. The Geopolitical category results are very interesting again this year. It continues to be more volatile than the other categories, and this was an "off" year. The Societal category saw a decrease from 15 to 12 percent, led entirely by *Pandemics/infectious diseases* and the reduced Ebola threat. The story behind the changes from previous responses to this question is the Technological category tripling in value from 6 to 18 percent. *Cybersecurity/interconnectedness of infrastructure* and *Technology* (from 0 to 3 percent) each increased materially.

Section 1: Emerging Risks

Top Five: Economic Category Rebounds in Tight Race

After choosing which risk has the greatest current 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 had a time horizon of 10 years in mind when it developed its 23 risks, but that is not required here. The data are compared across surveys and consider recent events as part of the analysis. Each survey has come at a unique time in history.

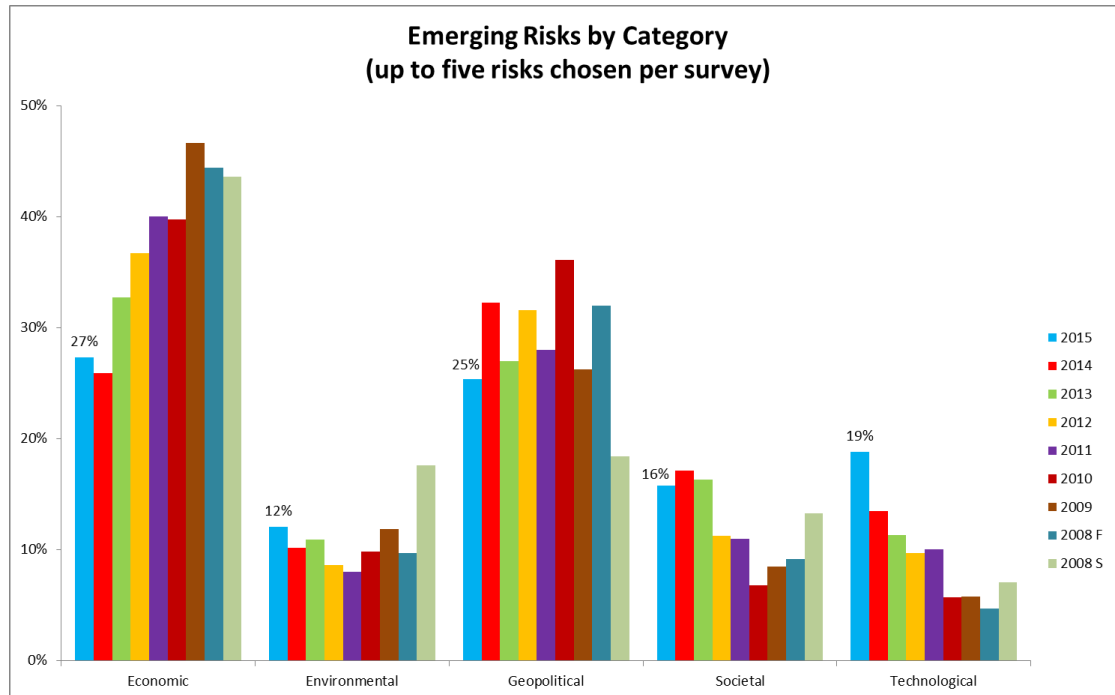
- May 2008: The market was showing signs of weakness, but the real concern was the high cost of energy.
- Fall 2008: The stock markets had fallen precipitously, and the price of oil had dropped from record highs. This was the height of the global financial crisis.
- December 2009: Systemic risk was beyond the worst point, but unemployment remained high. The Copenhagen climate conference had just been held, and earlier in the year the world had dealt with the mild H1N1 pandemic.
- 2010: Political tensions on the Korean peninsula and the European debt crisis were hot topics.
- 2011: Events included the Japanese tsunami and nuclear disaster, the Arab Spring and the evolving European debt crisis.
- 2012: Tensions in the Middle East (Syria, Iran) were front and center.
- 2013: Hurricane Sandy and Typhoon Haiyan led a torrent of natural disasters around the world.
- 2014: There was instability in Ukraine and the Middle East, along with continuing economic uncertainty in Europe and the Ebola outbreak.
- In hindsight, the 2015 survey may be considered a period of calm, with Ebola fears receding and geopolitical concerns present but not necessarily top of mind. Cyber hacking was regularly in the news, and the complex world of oil prices led to generational lows. A large earthquake struck Nepal, Cuba and the United States worked to improve relations, and Russian involvement in the Syrian crisis raised tensions in that region.

While 83 percent of respondents chose the full complement of five risks, the average of 4.72 matched the previous survey. 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.

The Economic category surpassed the Geopolitical category to retake the top position. The results distributed by category (using percentages of total responses) are

1. Economic 27%/26%/33% (2015/2014/2013 surveys)
2. Geopolitical 25%/32%/27%
3. Technological 19%/13%/11%
4. Societal 16%/17%/16%
5. Environmental 12%/10%/11%

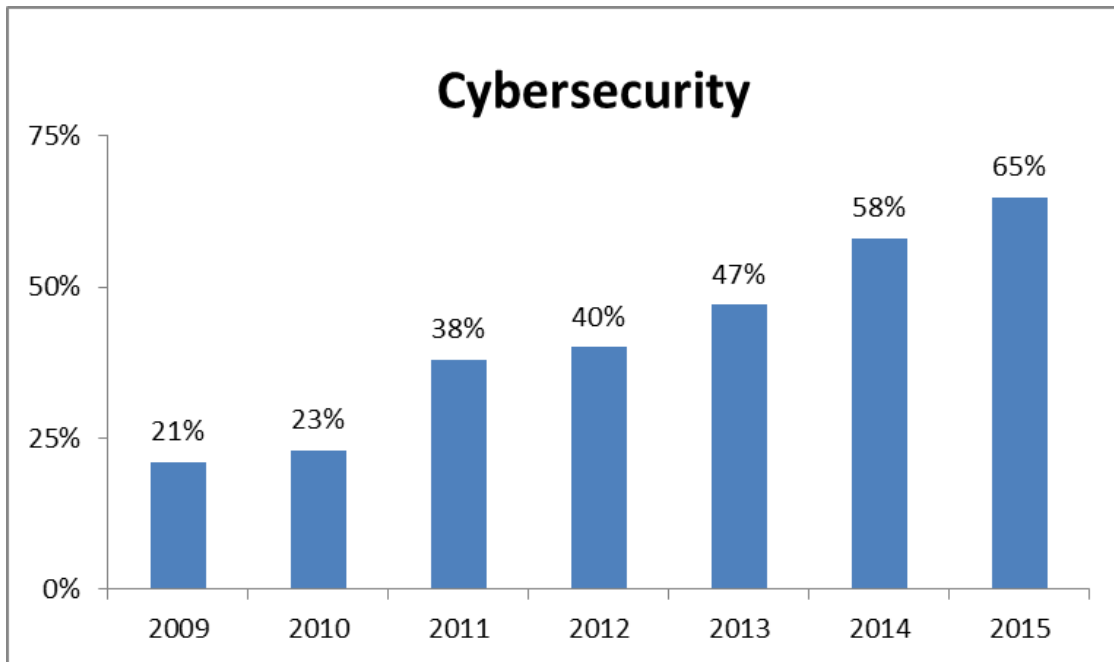
The Technological (up 6 percent) and Environmental (up 2 percent) categories gained, while Geopolitical saw a 7 percent decrease.



There were material increases in several categories. In the Economic group, *Currency shock* increased from 7 percent to 14 percent (prior to the two most recent surveys, this risk was consistently more than 20 percent). In the Environmental category, *Climate change* rose (from 19 to 26 percent). Both *Cybersecurity/interconnectedness of infrastructure* (increase from 58 percent to 65 percent, the highest recorded in this survey) and *Technology* (increase from 5 to 24 percent) easily beat their previous records.

The Geopolitical category had three separate risks that decreased by 5 percent or more. *Failed and failing states* (from 28 to 18 percent), *Transnational crime and corruption* (from 10 to 5 percent) and *Regional instability* (from 37 to 26 percent) each had material decreases. The only other risk to show a large drop was *Pandemics/infectious diseases* (from 30% to 17%), following a spike last year during the Ebola outbreak. This risk is likely to become more volatile as Zika, Middle East Respiratory Syndrome (MERS), influenza and other diseases potentially become active in the future.

The top five risks, measured as a percentage of survey respondents, were the same as in the 2014 survey. The overall leader was *Cybersecurity/interconnectedness of infrastructure*, which continued its persistent increases.



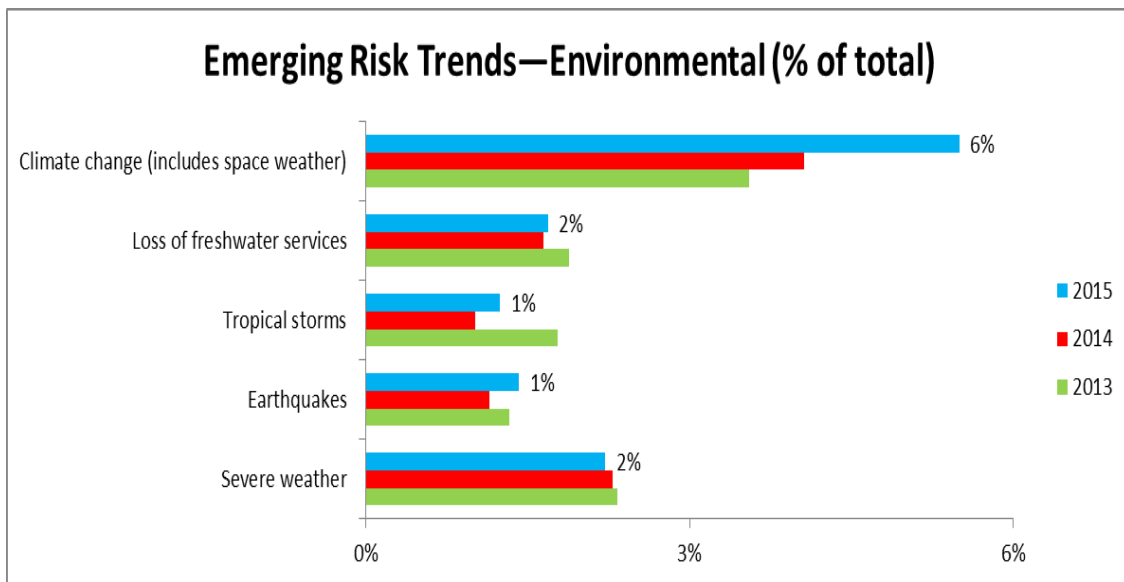
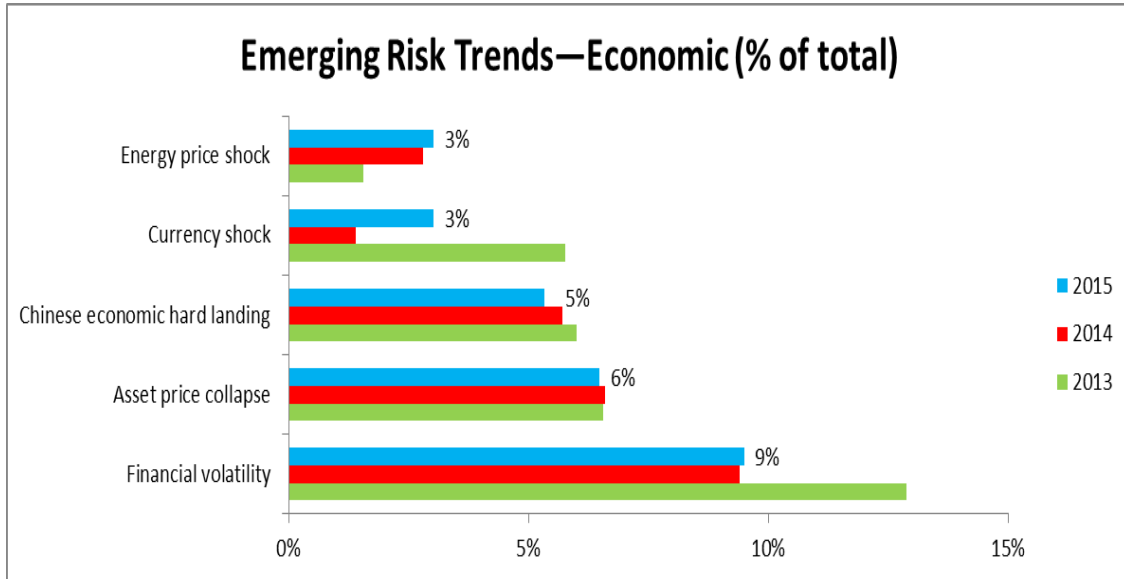
Trends of at least two consecutive years may act as a leading indicator. Increasing trends include *Energy price shock*, *Climate change (includes space weather)*, *Chronic diseases* and *Cybersecurity/interconnectedness of infrastructure* (six years). Decreasing trends include *Chinese economic hard landing* (five years), *Failed and failing states* (four years) and *Retrenchment from globalization*. One risk, *Currency shock*, rebounded materially after falling in the previous survey. Several fell after a spike in the 2014 survey. These included *Terrorism*, *Regional instability* and *Pandemics/infectious diseases*.

Chronic diseases may be one of the most interesting leading indicators in this year's survey. After years in a range of two to four percent, the last two surveys have shown a breakout to 5 percent last year and 8 percent this year. It will be interesting to track this to see if it is a leading indicator.

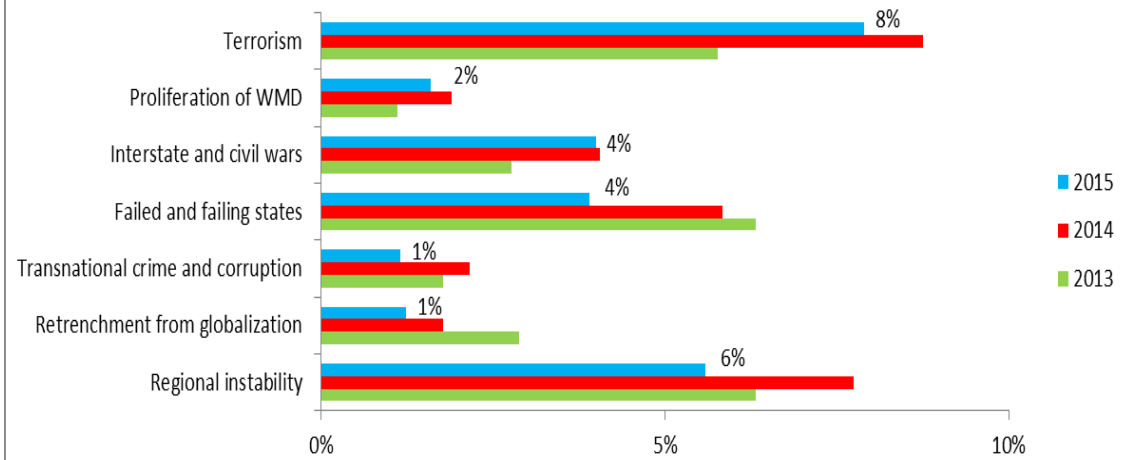
A somewhat confusing result in this year's survey is at least partly due to a definitional change. Space weather is in large part due to the cycles in geomagnetic storms that impact the earth's temperature, so the subcategory was moved from *Technology* to *Climate change*. We would thus expect to see a decrease in the *Technology* risk, which was already small, but both risks increased materially. It is not obvious why this occurred, but it could be due to a cognitive bias that makes it easier to choose an uncluttered option, along with additional exposure to *Climate change* as the earth set

records for high temperatures during 2015. The Paris climate change conference was scheduled for shortly after the survey closed.

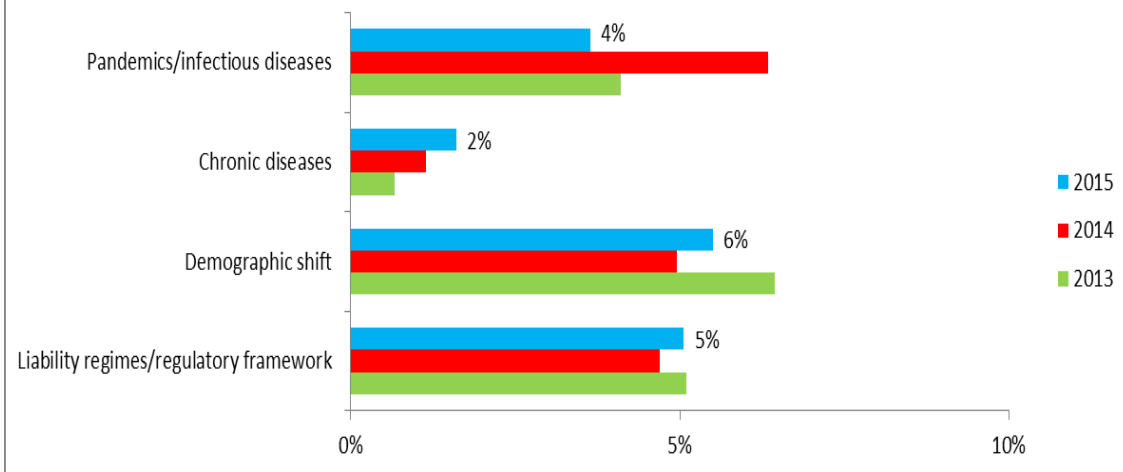
The following charts show recent trends for individual risks when five emerging risks are chosen.

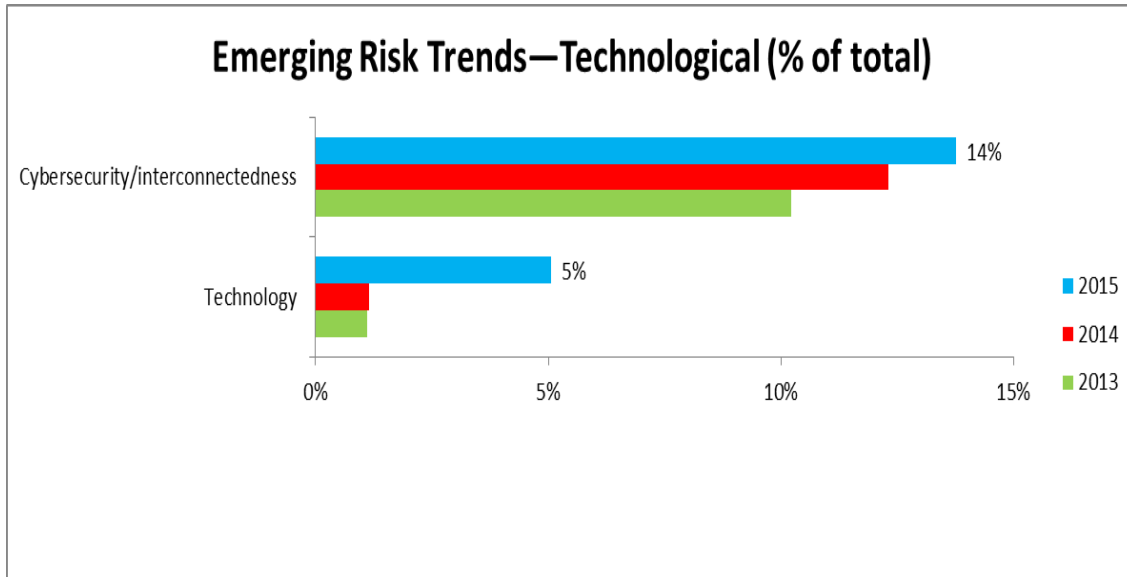


Emerging Risk Trends—Geopolitical (% of total)



Emerging Risk Trends—Societal (% of total)





The top five specific responses to “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 are much greater than 100 percent.

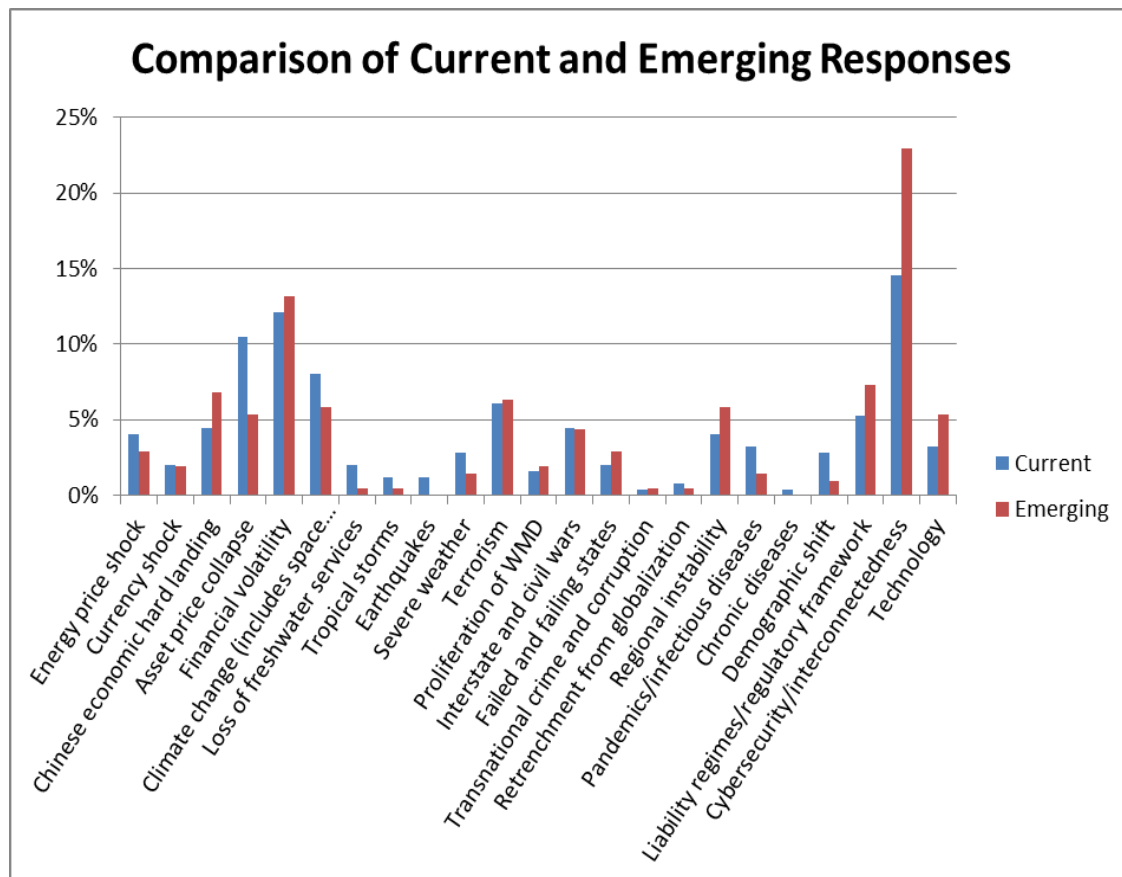
- | | |
|------------------------|---|
| 1. 65%/58% (2015/2014) | <i>Cybersecurity/interconnectedness of infrastructure</i> |
| 2. 45%/44% | <i>Financial volatility</i> |
| 3. 37%/41% | <i>Terrorism</i> |
| 4. 31%/31% | <i>Asset price collapse</i> |
| 5. 26%/37% | <i>Regional instability</i> |

One method for analyzing this data over time is to highlight those risks reported in the current survey that are 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 nine survey cycles. Environmental (12 percent vs. 11 percent average), Societal (16 percent vs. 12 percent average) and Technological (19 percent vs. 10 percent average) each satisfied this criterion, while Economic (27 percent vs. 37 percent average) and Geopolitical (25 percent vs. 29 percent average) were lower. Among individual risks, eight of the 23 had above-average results. The greatest positive differential was 6 percent for *Cybersecurity/interconnectedness of infrastructure*. Several other risks were above average by at least 2 percent, with *Technology* higher by 3 percent. Both *Liability regimes/regulatory framework* and *Terrorism* topped their average by 2 percent. Ten trended below average, led by 4 percent for *Currency shock* and *Energy price shock*. All five risks in the Economic category were below their long-term average, while the Geopolitical category had four out of seven below their longer-term average.

Top Emerging Risk: *Cybersecurity/Interconnectedness of Infrastructure*

Respondents were asked to state the single emerging risk they expected to have the greatest impact. The responses to this question tend to be volatile and likely represent an anchoring bias. Overall the Economic category led with 30 percent, but right behind was a fast-charging Technological, due mostly to *Cybersecurity/interconnectedness of infrastructure*. Geopolitical and Societal fell, and *Climate change (includes space weather)* led Environmental risks to the second highest increase.

1. 30%/31%/44% * Economic
2. 28%/15%/15% Technological
3. 22%/31%/17% Geopolitical
4. 10%/16%/13% Societal
5. 8%/5%/6% Environmental

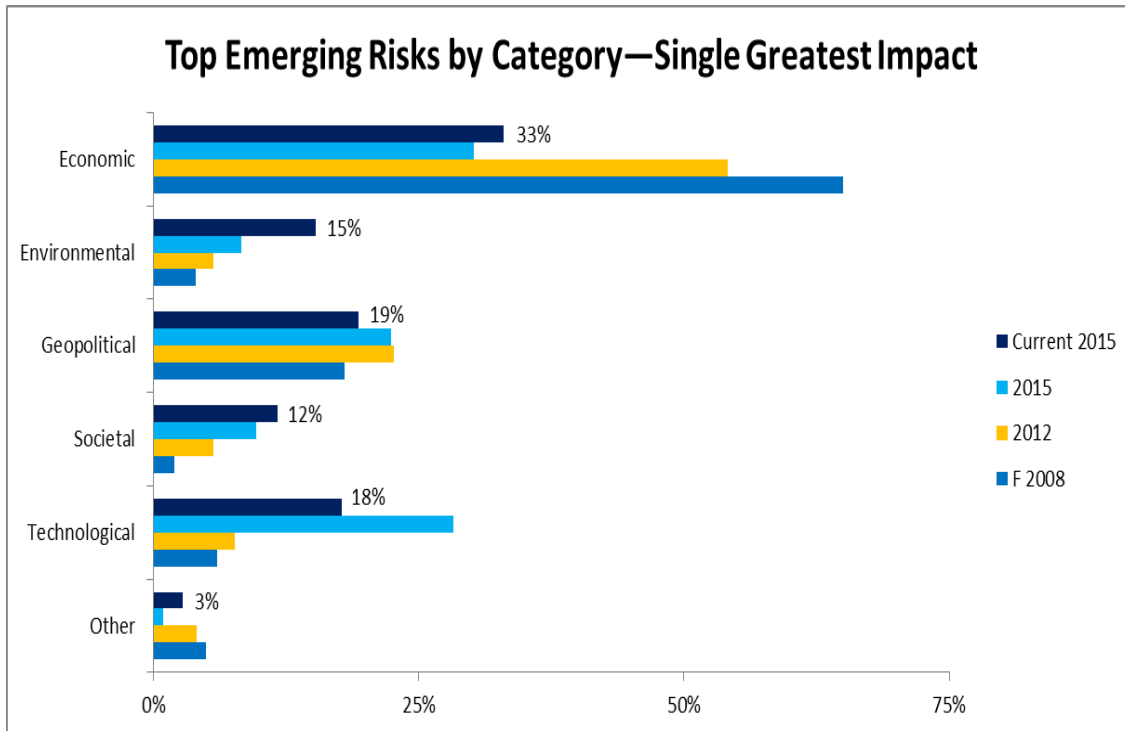


Interestingly, some risks polled higher or lower as a top emerging risk than in the current risk category. *Asset price collapse* was 5 percent higher as a current risk, whereas *Cybersecurity/interconnectedness of infrastructure* was ranked 8 percent higher and

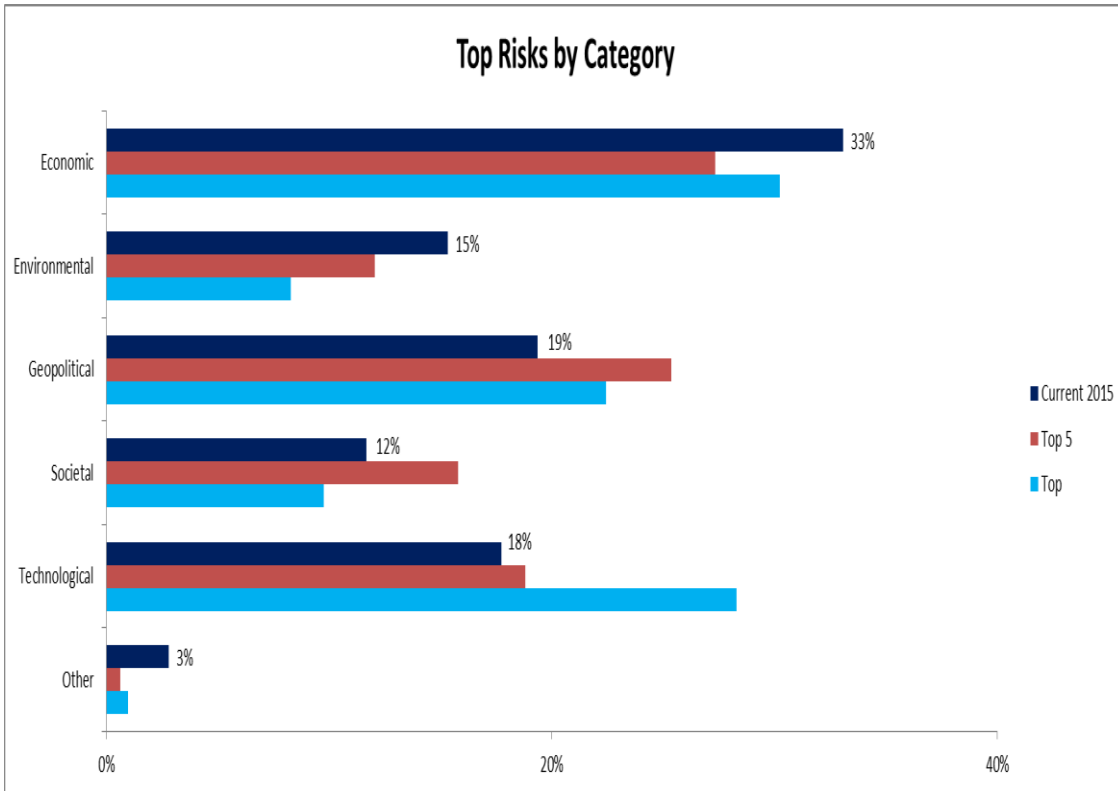
* All groupings of percentages start with the most current year and go backwards. In this case the responses reflect the surveys in 2015, 2014 and 2013.

Chinese economic hard landing 3 percent higher as emerging risks. These risks are likely to be leading indicators and merit follow-up analysis.

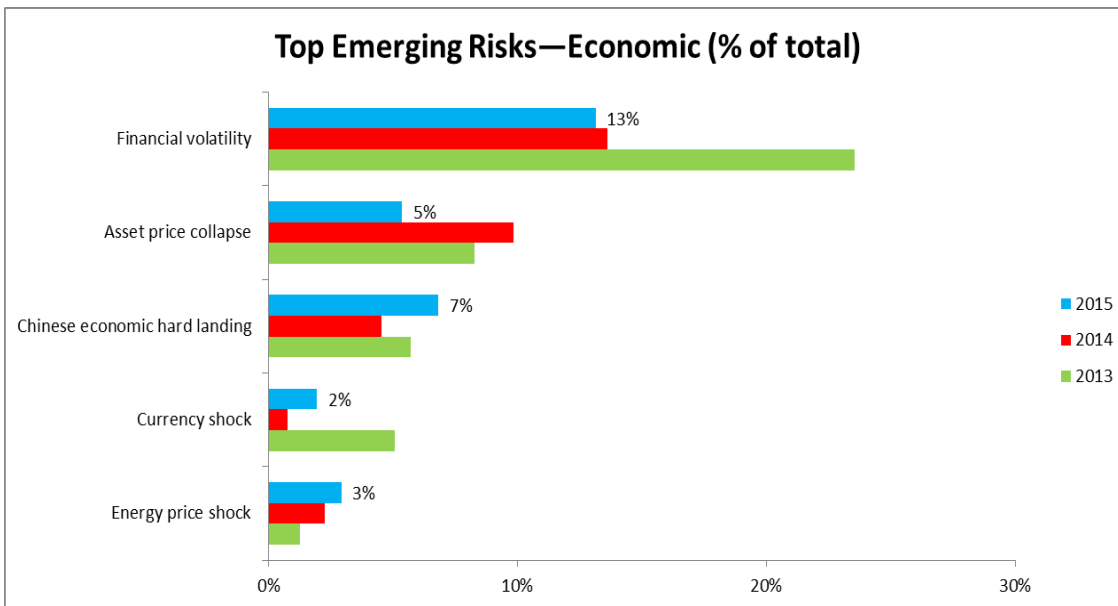
In the following chart, the current risk with greatest impact has been included with the emerging risk choices from fall 2008, 2012 and 2015 for comparison with results during the financial crisis. Current 2015 results reflect the current risks chosen by respondents. The chart shows all categories in selected years and includes the results for this survey's top current risk.



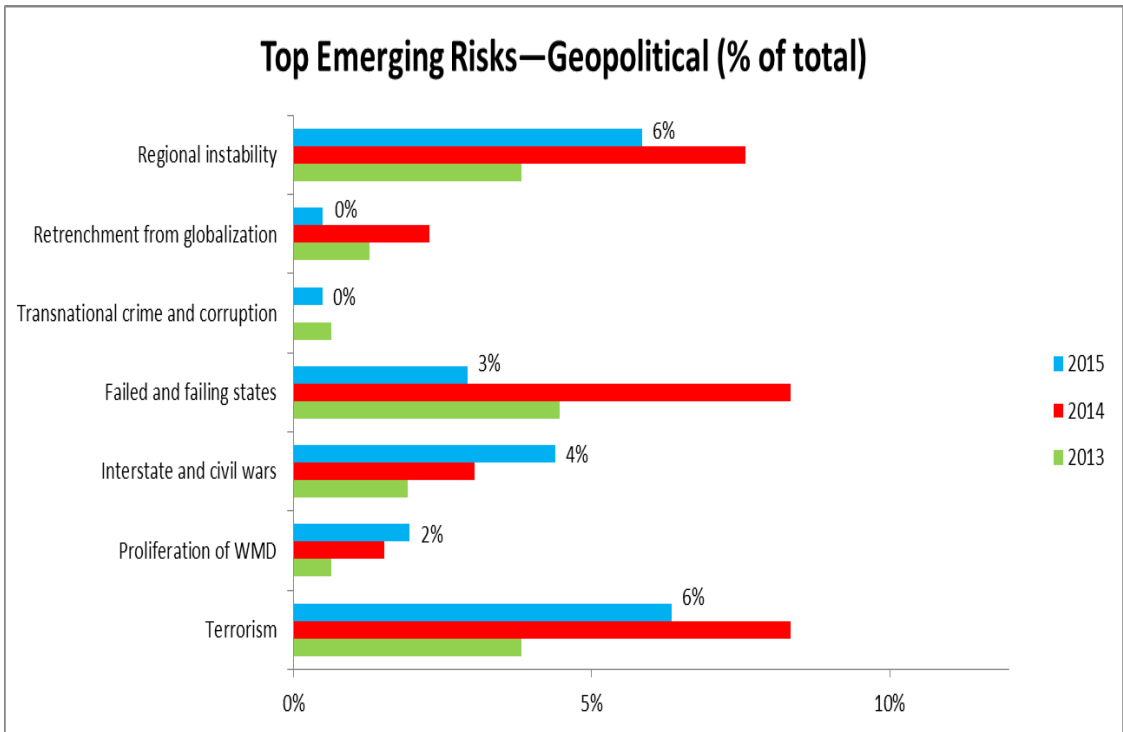
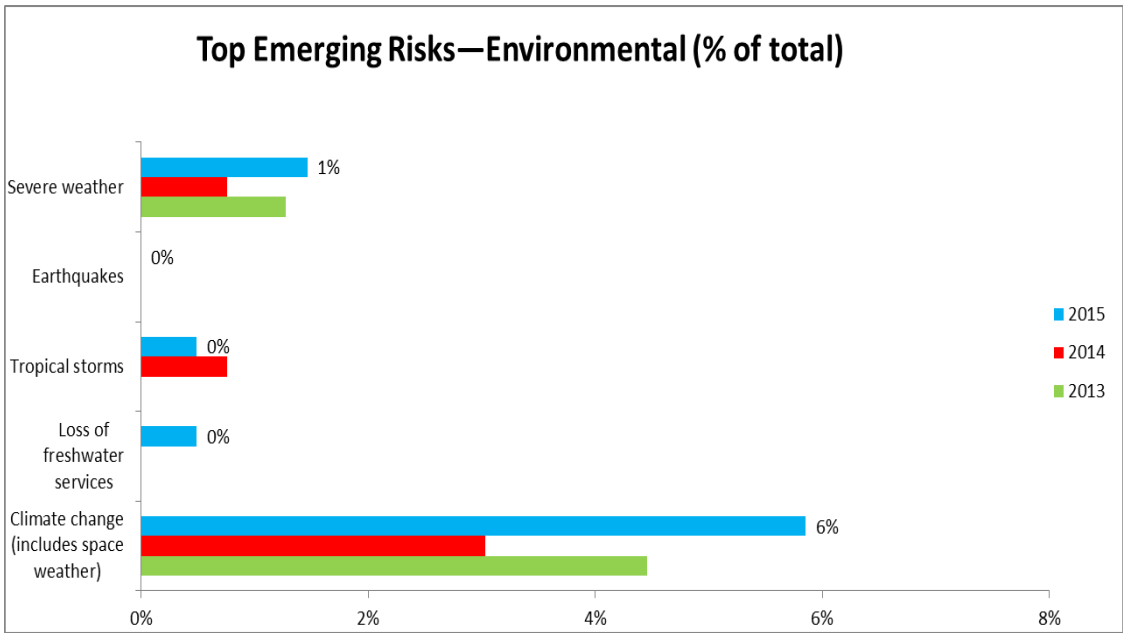
An interesting comparison is to look at the highest of the three metrics for each category; current risk, top five emerging risks and top emerging risk. Economic and Environmental current risks are highest, Societal and Geopolitical have the highest percentage for top five risks, and Technological has the top emerging risk. The results show a mixed pattern of the current risk preferences pulling the emerging risk results up or down.

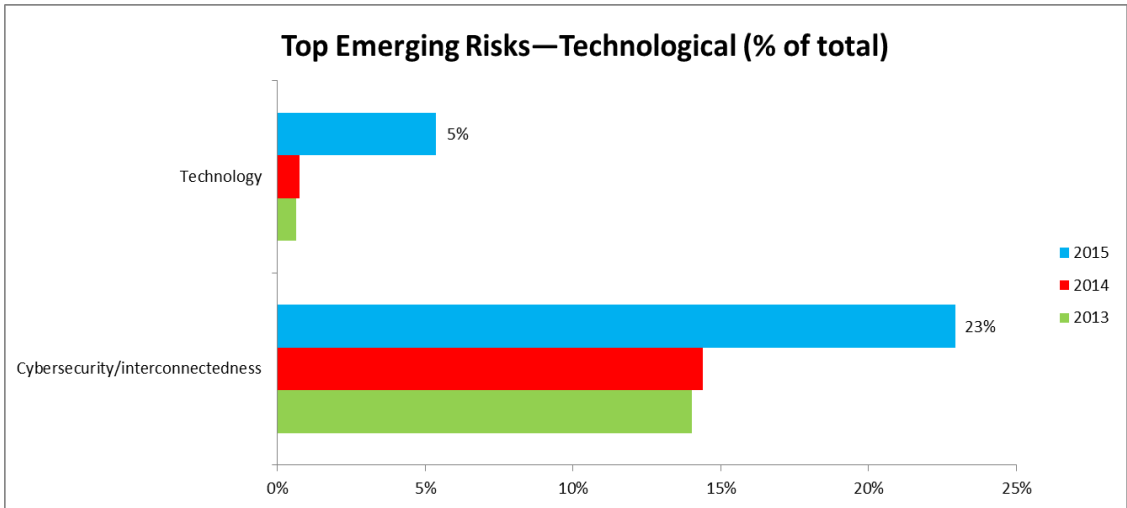
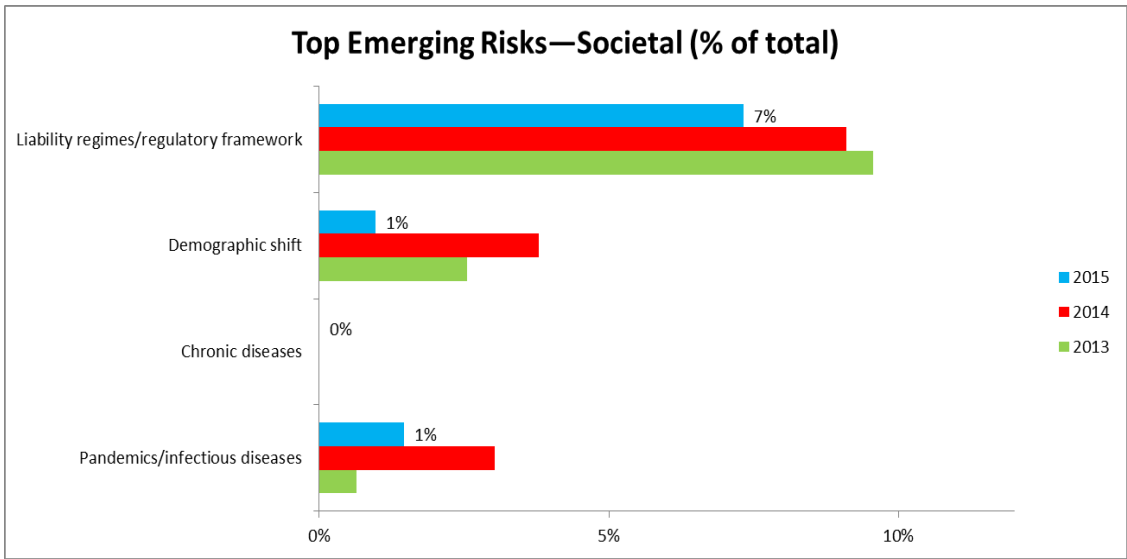


The following charts show each emerging risk within its category for the most recent three surveys in response to the question for the top emerging risk. Note that the x-axis for each chart is chosen to match the data and is not consistent between categories.*



* Data labels are rounded to the near percentage point, and are generally shown for the most recent survey.





For the top emerging risk, *Cybersecurity/interconnectedness of infrastructure* now has nearly one-quarter of the responses. The Economic category has two risks in the top five. The major risk increases are dominated by *Cybersecurity/interconnectedness of infrastructure*, with *Asset price collapse* and *Failed and failing states* having material drops and no longer in the top five.

- | | |
|----------------|---|
| 1. 23%/14%/14% | <i>Cybersecurity/interconnectedness of infrastructure</i> |
| 2. 13%/14%/24% | <i>Financial volatility</i> |
| 3. 7%/9%/10% | <i>Liability regimes/regulatory framework</i> |
| 4. 7%/5%/6% | <i>Chinese economic hard landing</i> |
| 5. 6%/8%/4% | <i>Terrorism</i> |

Risk Combinations

Risks do not occur in a vacuum. A drop in oil prices results in higher uncertainty in countries such as Venezuela and Saudi Arabia where the economy is dominated by energy. Other risks interact in less obvious ways that are not always apparent in advance and often have unintended consequences. As central banks influence financial markets and debt remains high, impacts on economic risks may seem obvious, but indirect impacts will also be felt by Societal and Geopolitical risks.

Combinations of emerging risks interact in ways that often are not fully understood. Risk combinations can happen simultaneously or sequentially. For example, the Geopolitical risk *Loss of freshwater services* could sequentially drive *Interstate and civil wars*. Concurrent emerging risks could exacerbate a scenario, as in 2011 when the Japanese earthquake and tsunami, followed by the Fukushima Daiichi nuclear disaster, led to a scenario that stressed the supply chain.

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 the combinations chosen.

Even though the question is about combinations of risks, it is helpful to look first at the risks in isolation. Economic and Geopolitical remain the most frequent response categories when identified in isolation, but Technological doubled its response rate to move into third place.

- | | |
|----------------|---------------|
| 1. 33%/35%/40% | Economic |
| 2. 28%/35%/32% | Geopolitical |
| 3. 17%/8%/9% | Technological |
| 4. 12%/10%/11% | Environmental |
| 5. 10%/12%/9% | Societal |

Individual risks were led, as in other questions, by *Cybersecurity/interconnectedness of infrastructure*, with 12 percent, just beating out *Financial volatility* as the top response (although tied to the near percentage point).

- | | |
|----------------|---|
| 1. 12%/7%/7% | <i>Cybersecurity/interconnectedness of infrastructure</i> |
| 2. 12%/13%/16% | <i>Financial volatility</i> |
| 3T. 8%/10%/7% | <i>Asset price collapse</i> |
| 3T. 8%/9%/6% | <i>Terrorism</i> |
| 5. 5%/7%/6% | <i>Regional instability</i> |

The top risk combinations chosen continue to show a broad dispersion. After the top four responses, there was not much difference between the order of the next eight risks based on percentages.

Leading combinations among the 634 responses were (top five are listed—T reflects a tie in the prior survey) as follows:

1. 9%, No. 2T in prior survey
Terrorism
Cybersecurity/interconnectedness of infrastructure
2. 9%, not ranked in prior survey
Cybersecurity/interconnectedness of infrastructure
Technology
3. 7%, No. 1
Asset price collapse
Financial volatility
4. 5%, No. 8
Financial volatility
Liability regimes and regulatory framework
5. 3%, No. 3T
Chinese economic hard landing
Asset price collapse

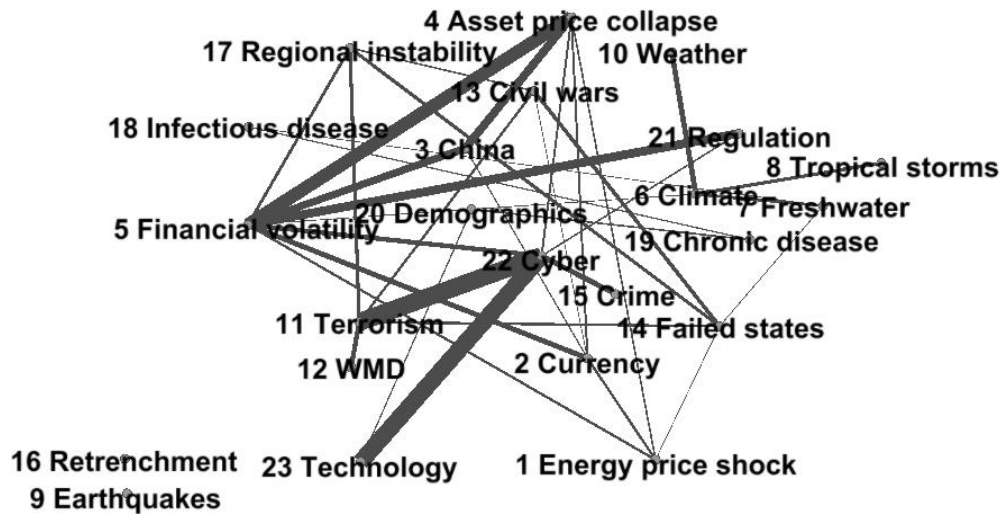
The major category combinations were

21%	Economic–Economic
15%	Geopolitical–Geopolitical
12%	Geopolitical–Technological
10%	Economic–Geopolitical
8%	Environmental–Environmental
7%	Economic–Societal
7%	Technological–Technological
5%	Economic–Technological
3%	Environmental–Geopolitical
3%	Societal–Societal
3%	Societal–Technological
3%	Environmental–Societal
2%	Economic–Environmental
2%	Geopolitical–Societal
1%	Environmental–Technological

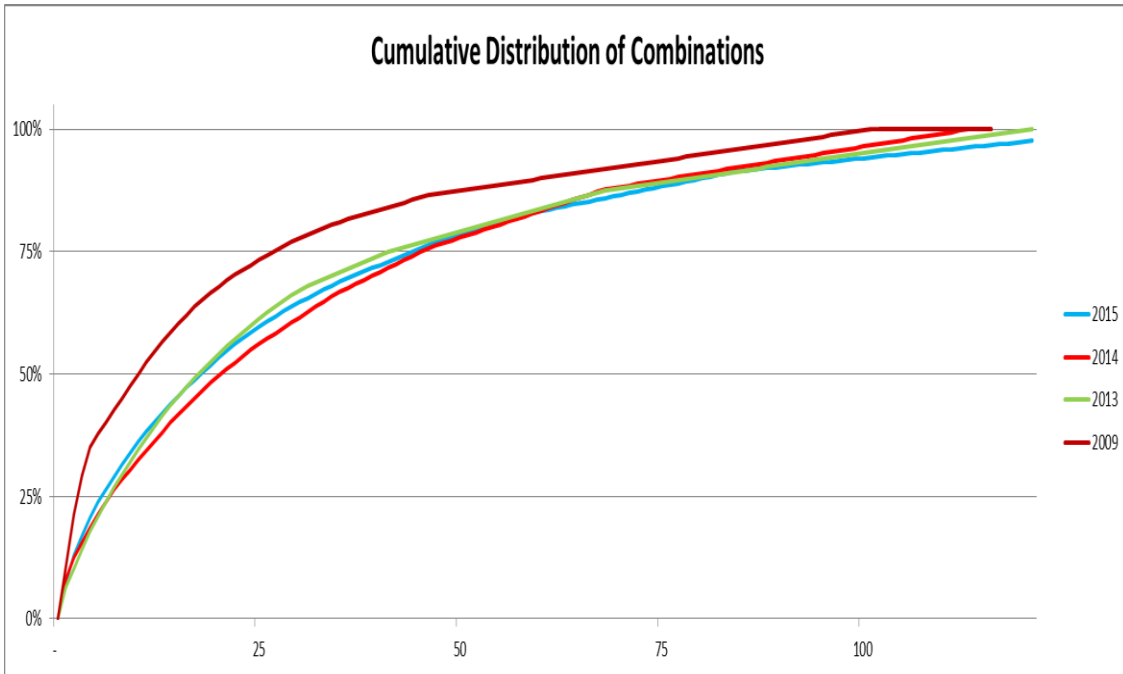
The pure-play combinations of the Economic and Geopolitical categories retained the top two positions, and combinations including Technological risks moved up.

Risk combinations can be viewed graphically using the open-source Gephi software 0.8.2 package, as seen in the next figure. The thickness of the line shows the strength between risks (edge). Combinations of four and fewer are ignored in this graph for clarity. For those who think visually, this can make the analytical process easier than reviewing the

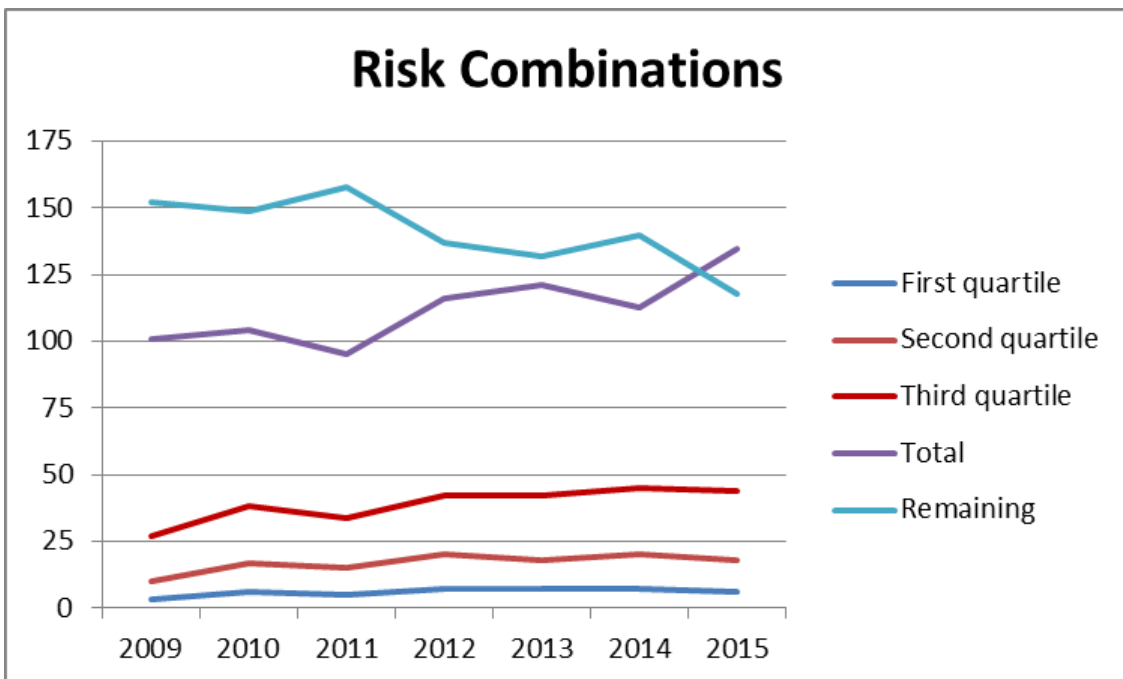
details. Interestingly, all of the risks (nodes) except *Retrenchment from globalization* and *Natural catastrophe: earthquakes* had at least one risk combination of at least five.



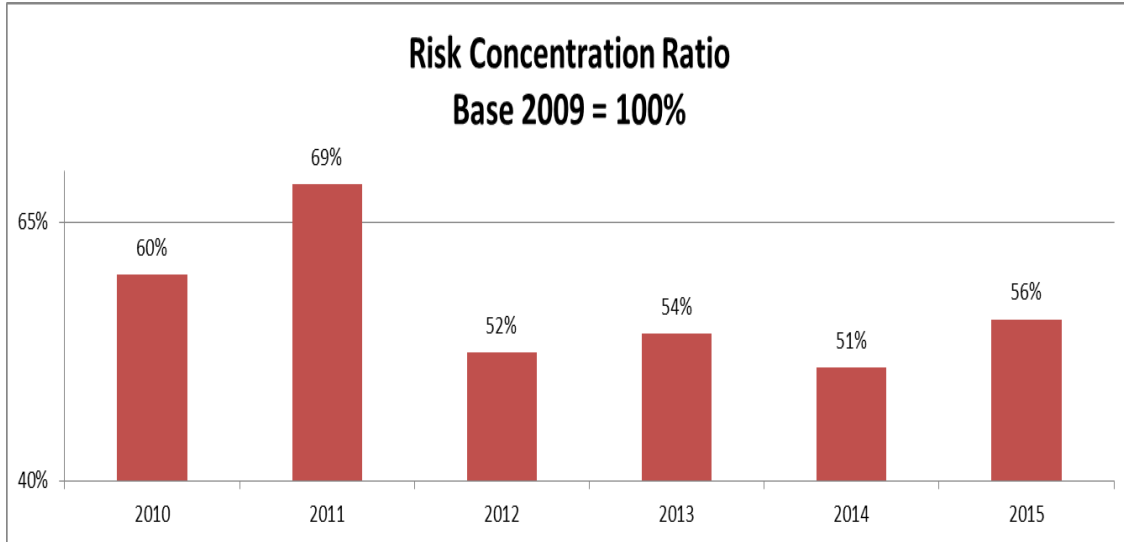
There are 253 possible risk combinations. Following the financial crisis in 2008–2009, the results moved toward reduced concentration. That trend continued during this survey, as shown in the next chart.



With data listed cumulatively and the first quartile representing the most frequent responses, results are presented in the following graph. A changing trend is present, especially in the third and fourth quartile results, which will continue to be monitored and analyzed. This year's results reflect a greater number of combinations than any previous survey.



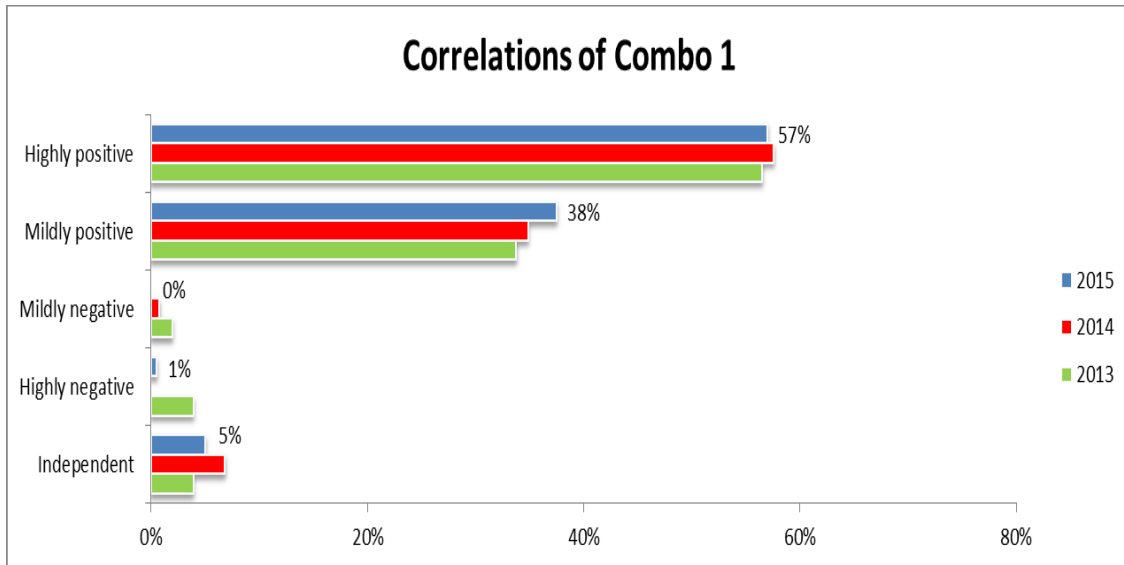
The broad representation may be an indicator of the current risk environment, with each quartile being considered against the extreme example of 2009. This year's risk concentration ratio of 56 percent is slightly higher than in the previous three surveys, and the highest recorded since 2011.



The following table shows the responses in the order they were chosen. A follow-up question referred to Combination 1, so it is reasonable to assume that it is the risk manager's top combination choice. The Economic category is more commonly included in the first option.

Combination splits by category		Combo 1	Combo 2/3	Overall
Economic	Economic	22%	20%	21%
Economic	Environmental	2%	2%	2%
Economic	Geopolitical	12%	10%	10%
Economic	Societal	6%	7%	7%
Economic	Technological	8%	3%	5%
Environmental	Environmental	5%	9%	8%
Environmental	Geopolitical	2%	3%	3%
Environmental	Societal	1%	4%	3%
Environmental	Technological	0%	1%	1%
Geopolitical	Geopolitical	15%	14%	15%
Geopolitical	Societal	0%	3%	2%
Geopolitical	Technological	13%	11%	12%
Societal	Societal	2%	3%	3%
Societal	Technological	3%	2%	3%
Technological	Technological	8%	6%	7%
		100%	100%	100%

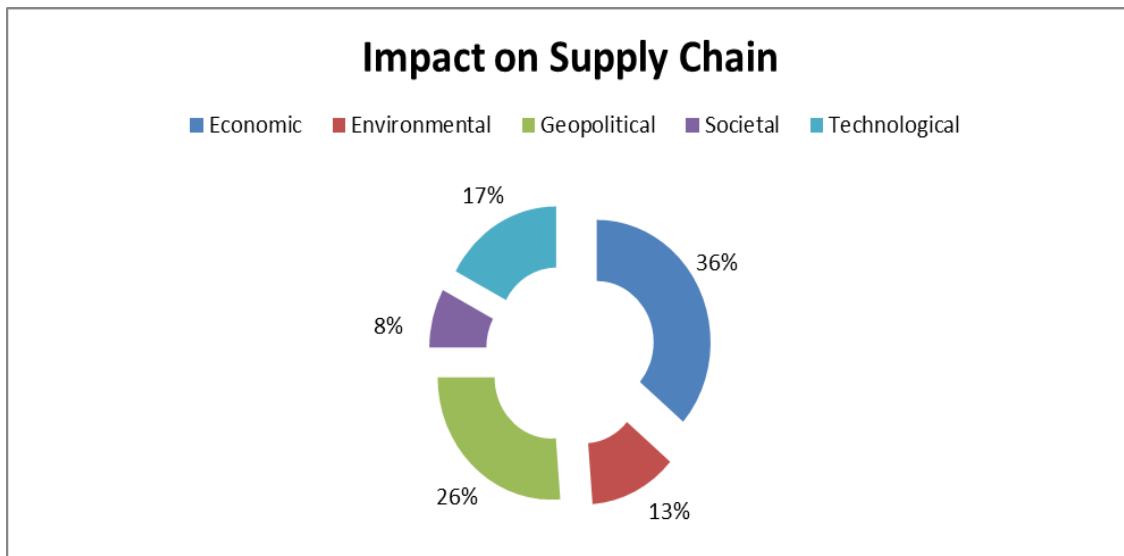
Respondents were asked to describe the type and level of correlation for the two risks in Combination 1. As shown in the next figure, nearly all (95 percent reported either a highly or a mildly positive correlation (up from 93 percent in 2014). These results continue to be intriguing as the risk community evolves its thinking about this issue. A highly positive correlation does not infer causality, but the risk manager may consider the first of correlated risks that are sequential to be a leading indicator.



It is very hard to anticipate unintended consequences when multiple risks are stressed concurrently or in rapid succession. This survey includes a question allowing a choice of up to three risks that fit the criteria. In this survey, respondents were asked, “Which risks do you expect to have the greatest impact on the supply chain?” Not surprisingly, many of the top results came from the Economic and Geopolitical categories. Although the top response was *Cybersecurity/interconnectedness of infrastructure* (13%), the next four responses were from the Economic category. The five leading responses comprise 45 percent of the total.

1. 36% Economic
2. 26% Geopolitical
3. 17% Technological
4. 13% Environmental
5. 8% Societal

The 2011 Japanese earthquake and tsunami, along with flooding in Thailand, impacted the global supply chain for technology and auto products. Emerging risks are primary threats to the supply chain, and the rotating question asked what three risks the respondents worried about most with respect to the supply chain. Not surprisingly, Economic and Geopolitical risks were chosen most frequently, but all five categories received material consideration, as illustrated in the following figure.



Risk as Opportunity

Many risk managers view risk as two-sided, with opportunities drawn from the same tools and datasets used for risk mitigation. Identifying trends and leading indicators before your competitors can provide an advantage. The survey asked which emerging “opportunities” are being monitored. In this survey, responses evolved beyond seeking out asset class opportunities based on volatility or assuming reversion to the mean. Here are some specific examples*:

- *Precious metals as a form of currency insurance.*
- *Demographic shifts, regulatory changes, asset price collapse.*
- *Autonomous cars, GMOs, drones, the Internet of things.*
- *Supply chain disruption, space weather, dislocation caused by emerging technologies.*
- *Investments in industries that do well during chaos, such as war-related industries (not my favorite thought) and companies providing security and cybersecurity services.*
- *Velocity of money is a leading indicator for currency shock and other risks.*
- *New technologies to manage climate change and to create new energy sources.*

The last bullet, detailing the two-sided nature of climate change and alternative energy, 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.

* Direct comments from respondents have been slightly edited throughout the paper.

One response challenged the use of risk management to go beyond risk mitigation techniques to look for opportunities, terming it a form of arbitrage. *Arbitrage* generally refers to actions that take advantage of multiple markets when some are mispriced, often using derivatives. While the researcher can't be fully confident of the respondent's meaning, the interpretation here is that risk management is defined by downside risk (and perhaps volatility risk) and tries to minimize them. Others take a broader view that risk management—especially enterprise risk management—is two-sided and provides information on both the downside and the upside of risks so that management can make informed decisions. That more respondents did not take this view may be an indicator that enterprise risk management as a core part of strategic planning is becoming more common.

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

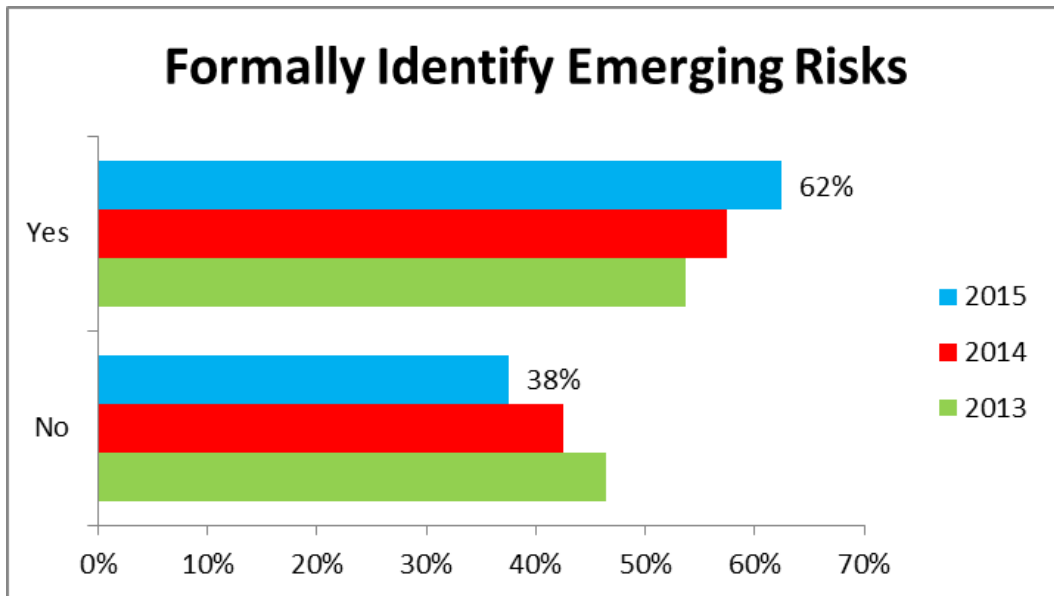
- *DNA changes*
- *M society*
- *Sports-related brain injury*
- *Affordable Care Act long-term effects on the health of the nation*
- *Hydraulic fracturing*
- *Aging infrastructure*
- *Unsustainable government debt and low interest rates*
- *Commodity exhaustion*
- *Mass migration (war, climate change)*
- *Model risk*
- *Endocrine disruptors*
- *Genetic manipulation*
- *Food supply disruptions/disappearances*
- *Microfinance*
- *Disruptive competitors—use of big data to crush the current insurance industry*
- *Inflation risk*
- *Drug-resistant bacteria*
- *Increased frequency of “manmade” earthquakes*

Section 2: Leading Indicators

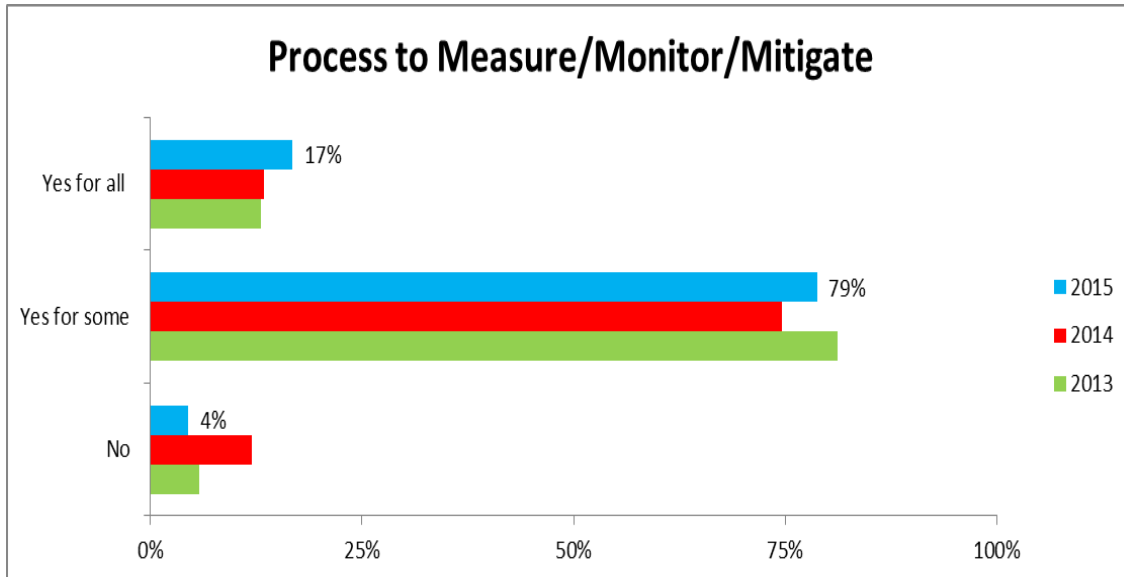
Leading indicators of emerging risks are metrics, or events, that can indicate a higher likelihood that an emerging risk may be materializing. This information is used to make decisions earlier than they might be otherwise. Key risk indicators (KRIs) provide information about a specific risk. They do 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 historical

results and are lagging indicators. 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 an on/off indicator. An example might be the signing of a star athlete that leads to higher attendance and additional revenues from jersey sales. The survey asked about the use of leading indicators that provide a firm with actionable information.

As shown in the next figure, respondents formally identified emerging risks 62 percent of the time, increasing 4 percent from the previous survey. This continues the upward trend.



For those with a formal process (those without one did not answer the remaining questions in this section), the survey asked about measuring, monitoring and mitigating an emerging risk once it has been identified. The following figure shows that nearly all (96 percent) responded that they did this for some or all of their identified emerging risks. Only 4 percent reported having no process in place, compared to 12 percent in the prior survey. Developing KRIs is challenging and expected to be a source of improvement as risk management evolves.



Most of the comments about actual processes talked more about identifying the emerging risk than having a game plan to measure, monitor, and mitigate the risk. Here are a few of the risks being followed:

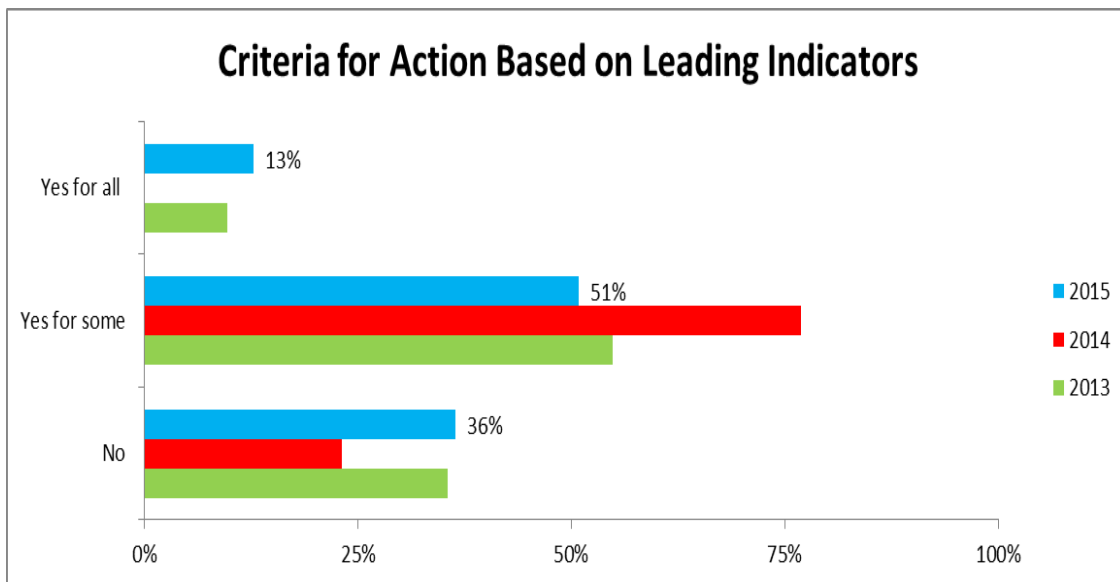
- *Monitoring China, Brazil and commodities movement and potential impact to emerging market portfolio*
- *KRIs for financial risks, surveys for non-quantifiable*
- *Regulatory—actively monitor activity by all applicable regulatory bodies, participate in industry committees*
- *Demographic shifts—monitor macro statistics versus industry trends versus company trends*
- *Dislocation of refugees*
- *Climate change—arctic ice cover, methane release*
- *Pandemic—risk identified, potential results modeled, mitigation efforts integrated into business recovery planning*
- *Cybersecurity—risk identified, outside audit conducted, recommendations turned into mitigation strategies, all of which are now in flight*

In a follow-up question—“Once an emerging risk is identified, do you select leading indicators to measure changing likelihoods?”—7 percent of respondents noted that they had leading indicators for all identified emerging risks, and 57 percent had them for some. Only 35 percent stated that they had no emerging risk leading indicators.

The examples shared about specific leading indicators being collected and monitored are interesting. Standard by-products of the financial reporting process or economic metrics tend to be lagging indicators and are not included here. Here are a few of the responses:

- *Articles written on topic—tone of articles (positive/negative), proposed legislation or stance taken by regulators.*
- *During pandemic alerts, monitoring Internet traffic has provided advance warning compared to WHO or other organizations’ official statements.*
- *Change in tax law affecting our not-for-profit tax status. We keep a close eye on the federal government and proposed tax code changes. We monitor legislation.*
[Editor’s note: This is assumed to be a fraternal insurer.]

The survey asked whether these leading indicators included criteria that would lead to an action to mitigate or accept the risk. Almost two-thirds (64 percent) stated that criteria exist for some or all of their emerging risks, as seen in the following figure. This is an evolving practice, and the volatility of results is not surprising.



When asked for examples, respondents started to share a more formalized process with more specific actions and triggers than in previous surveys. Some good examples are as follows:

- *Actions are based on severity and likelihood and the potential impact and current and planned mitigation. The Risk Committee assesses and decides on the level of action and when risks should be accepted.*
- *DEFCON type levels are assigned, and action steps are triggered as you approach the red zones.*
- *Using the KRIs created for monitoring, we determine whether the action is to reconvene and determine next steps. In the past, we’ve updated business continuity plans to take into account climate change, for example.*

A new question in this survey asked about emerging risks where monitoring had consciously ceased. More than half of respondents (62 percent said they had done this. There were a variety of reasons stated for doing so. These included

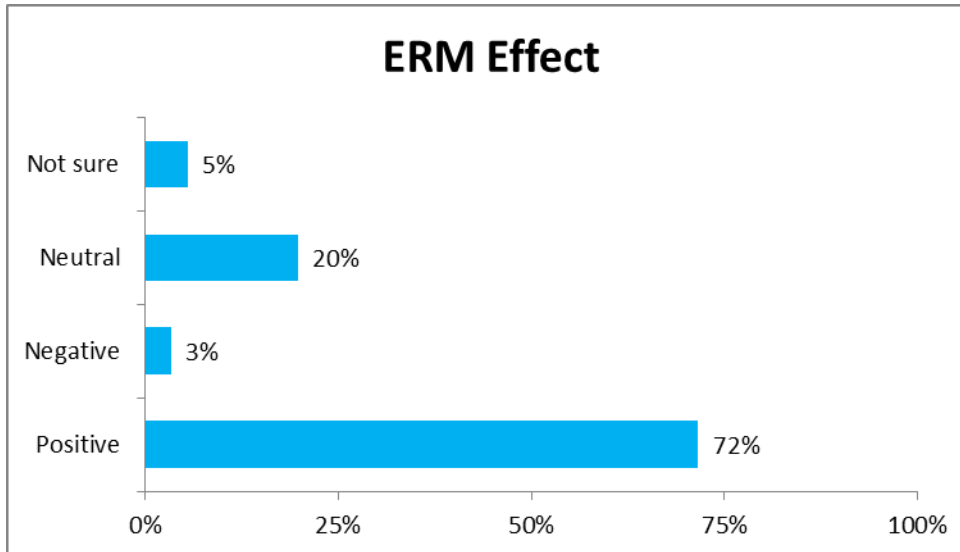
- *Those that are not “yellow” or “red” on our heat map.*
- *When an emerging risk has become emerged, it goes on the emerged or “top” risk list. Cybersecurity may be considered emerged, and cyber terror is emerging.*
- *If the risk has been determined to be mitigated or removed.*
- *If position in frequency/severity heat map moves to lower left quadrant (low/low).*

Hopefully, sharing this thought process will advance this topic. It may be that emerging risks have a formalized multitier analysis, driven by a heat map and time horizon. Another evolving concept could lead velocity to join impact/severity and likelihood/probability as a key factor in this type of analysis. How fast a risk can move from benign to critical impacts how it should be managed. Seismic activity can happen quickly, allowing little time to plan, whereas a demographic shift may occur slowly over many years.

Section 3: Methodology

This section was reworked for the current survey, asking questions about ERM and what works rather than the impact of managing emerging risks. Prior surveys were confusing to interpret since many respondents answered as if they were referring to the ERM question. The results this year were fascinating, and it was hard to highlight only a few of the responses. As each risk manager—and each risk management program—is at a unique point on a maturity scale, it would be useful for you to take time to read all of the responses in Appendix II. They are that good, but they will also give you an idea of where you are at personally and what comes next as you review the comments.

The first question in this section asked respondents whether “enterprise risk management had a positive, negative or neutral effect in your company/industry.” As the next figure shows, very few (3 percent) said it had a negative effect, and a majority (72 percent) responded that the effect was positive.



Not surprisingly, there were a lot of comments supporting the responses. For those who said ERM had a positive effect, some of the comments included such common topics and thought-provoking insights as the following:

- *Brings light to previously non-transparent topics and issues.*
- *Increased awareness and formality of risk management.*
- *We are less siloed as a company.*
- *Better alignment of strategy with risk taking.*
- *Requires us to take a holistic view and to incorporate multiple perspectives.*
- *Allocates time and resources to thinking about risks beyond just day-to-day issues and has facilitated the study of significant macroeconomic events on the enterprise as a whole rather than just its independent businesses.*
- *Development of tools and models to understand the interdependence of risks.*
- *Quantification efforts are just one piece of the puzzle. Especially with emerging risks, often the qualitative scanning, assessment and monitoring are more important, with quantification to follow, influencing decision making. Knowing when and how to balance speed and precision is key to quantification. Clear communication and appropriate governance are key to qualitative assessments.*
- *Slightly positive, as many large companies are applying it, but I am not sure how conscientiously. I do not think small companies are embracing it at this time.*
- *Better strategies up front mean less problems later on.*
- *Allows for more objective decision making. Quantification allows the company to determine the magnitude of the risk, not just that it exists.*

Those who reported that the effect was negative (3 percent) tended to describe cultural issues and lack of buy-in at the top of the list of reasons:

- *Shifted focus from using reasonable assumptions to using overly optimistic assumptions. Much more focus on “governance” at the expense of accurate risk analysis.*
- *More “box checking” activities than value-added activities were added.*
- *ERM approaches too costly and misused for political purposes.*

Those who reported neutral (20%) or uncertain (5%) effects so far tended to be too early in the process to know, were part of a strong risk culture where ERM either did not add new practices (strong) or became bureaucratic (weak), or have assumed that certain scenarios won't happen.

- *ERM hasn't come up with enough viable, actionable solutions to managing the company's risk. As it is implemented here, it mostly serves to add more bureaucracy and slows down development time.*
- *Too many scenarios and too much emphasis that today is bad as opposed to today is the new norm and things could improve or go to hell in a handbasket.*
- *Area operates in isolation within our company.*
- *Actually both positive and negative. Positive impact in understanding risks internal and external to industry and broader focus on risk overall. However, some risk models are extremely complex, and at times, I feel it is more a modeling exercise than something truly insightful, and there is a lack of individuals within senior management to challenge some of the assumptions/models.*

In one of the most interesting parts of the survey, respondents were asked to share instances where quantitative, qualitative and combined efforts have enabled better decision making.

The quantitative responses included some common themes. Many reflected modeling improvements that led to actionable responses. Some reflected tactical plans that had been implemented for specific risks, while others talked about extending the time horizon to engage in the strategic planning process. In addition, some specific uses of quantitative methods were shared, and the comments are illustrative:

- *Two circumstances: (1) threats perceived to be significant were shown to have negligible impacts; (2) quantification efforts highlighted the cumulative long-term effects of threats that involved comparatively small short-term incremental impacts.*
- *Even if quantification is not precise, relative impact of risk enables better ability to articulate trade-offs when making decisions.*
- *We all respond better when there are metrics measuring what we do.*

Qualitative analysis reflected the importance of brainstorming with more collaboration across business units. As risks (e.g., cyber terrorism, drones) move from emerging risks to something that needs to be managed, and although historical data are lacking, this gets

the risks on the radar screen. Sometimes qualitative analysis is a stopgap while model strategy is developed, and it often provides a baseline for more complex methods, allowing experience to be part of the process. The following comments stand on their own:

- *Increased requirements to at least think about risk has led to better feedback loop.*
- *The more diverse the population of the group, the better the opinions of the members helps to hone in on the proper decisions.*
- *Separating emotion from decision making.*

Respondents also shared instances where a combination of qualitative and quantitative analysis had enabled better decision-making. The responses reflected best-case ERM and included examples where experienced risk managers could critique models and provide initial analysis for new products, emerging risks and other risks with limited data available. Stress tests incorporate the best of quantitative and qualitative methods.

In a returning question, the survey asked, “Does implementing ERM improve company returns relative to the amount of risk?” The results varied from the previous survey, with *Not sure* responses (41 percent) taking votes from both *Yes* (50 percent) and *No* (9 percent) responses. This will be interesting to trend in future surveys to see if the responses to the two questions stabilize.

Among those stating that ERM does improve returns relative to risk, comments included having a better discussion about risk taking, better collaboration, and a focus on holistic analysis. While there is a continuum of risk, as one respondent noted, *luck favors the well-prepared.*

- *A more deliberate allocation of capital occurs when an ERM department can act as an independent, trusted advisor to the senior-most management.*
- *Risk could only be felt in the past, but it can be counted now.*

Cultural issues drove the comments of those who said ERM does not improve returns relative to risk or who were not sure. Comments also reflected skepticism about cost relative to benefit and the long time horizon necessary to determine success. Putting the right people in the right roles and making sure those accepting the risk continue to manage it going forward were viewed as important. A product area should not be able to walk away from a risk and pass it on to the corporate risk team. Many who wondered how to measure the success of ERM made comments similar to

- *It's difficult to measure things that don't happen.*

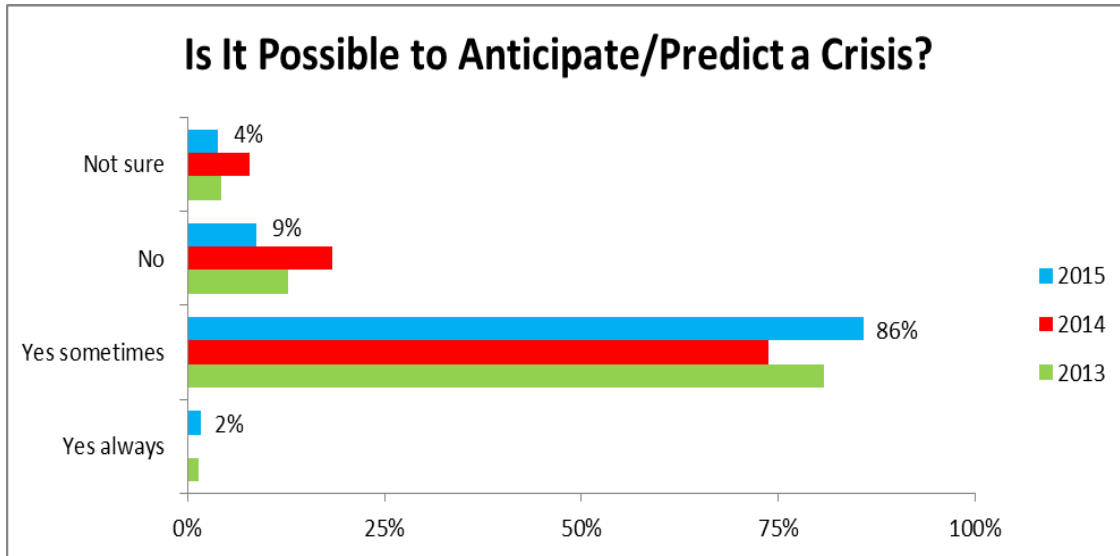
The final question of this section is extremely open-ended, asking what the respondents would like to share with future risk managers. You are encouraged to review all the responses found in Appendix II, Section 3, Question 8. Many of them refer to the

importance of culture, communications, getting buy-in from at least one champion, iteratively moving forward in a prioritized fashion rather than trying to do everything at once and involving the business units. Companies should design an ERM process that works for their specific needs and try not to be too exact. These comments reflect some of the best ideas shared:

- *It is not easy to design an ERM framework; therefore, the best advice I could give is to give plenty of room for improvements and to have a well-diversified team—not only actuaries, but involve other professionals with different backgrounds.*
- *Awareness results in actions. In the words of Dave Ingram, “Risks grow in the dark.” As most companies have a small ERM team, the best thing you can do is turn on some more flashlights—communicate what risk is and how to escalate it, and the company will be better.*
- *The insurance industry tends to suffer from institutional amnesia—when considering what can go wrong, it’s important to also think about Spanish flu, the Great Depression, asbestos, country debt defaults, the hyperinflation of the 1970s and what their current equivalents might be.*
- *Carveth Read—1898—“It is better to be vaguely right than exactly wrong.” Far more important to consider all aspects of a risk and have a total impact in a +/- 20% range than to be “precisely” right on only one aspect of that risk.*
- *Don’t overthink the situation. Simple models combined with qualitative information and informed judgement usually work best.*
- *Embed in performance compensation.*

Section 4: Predictions

The capabilities of the risk manager, at least as the respondents characterized 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. A challenge for risk managers is to avoid becoming paralyzed by risk. A lot more things could happen than will happen. When asked whether it is possible to anticipate/predict a crisis, most respondents (86 percent) stated that it was possible at least sometimes, as seen in the following chart. Comments reflected the benefits of identifying vulnerabilities and being proactive.



This question, like others in the survey, is designed to make the respondent think and tends to elicit well-thought-out comments. Even *Not sure* produced comments like, *Anticipate and predict are, in my view, quite different. Anticipate allows you to prepare to mitigate a crisis without predicting that it will happen—just that it may happen.*

A majority (75 percent) felt it was part of their job to predict a range of outcomes, with 4 percent saying they were asked to predict specific outcomes. One comment from those answering *Yes—range of outcomes* included this:

- *Perhaps “identifying possible and probable outcomes” is a better description than “predicting.”*

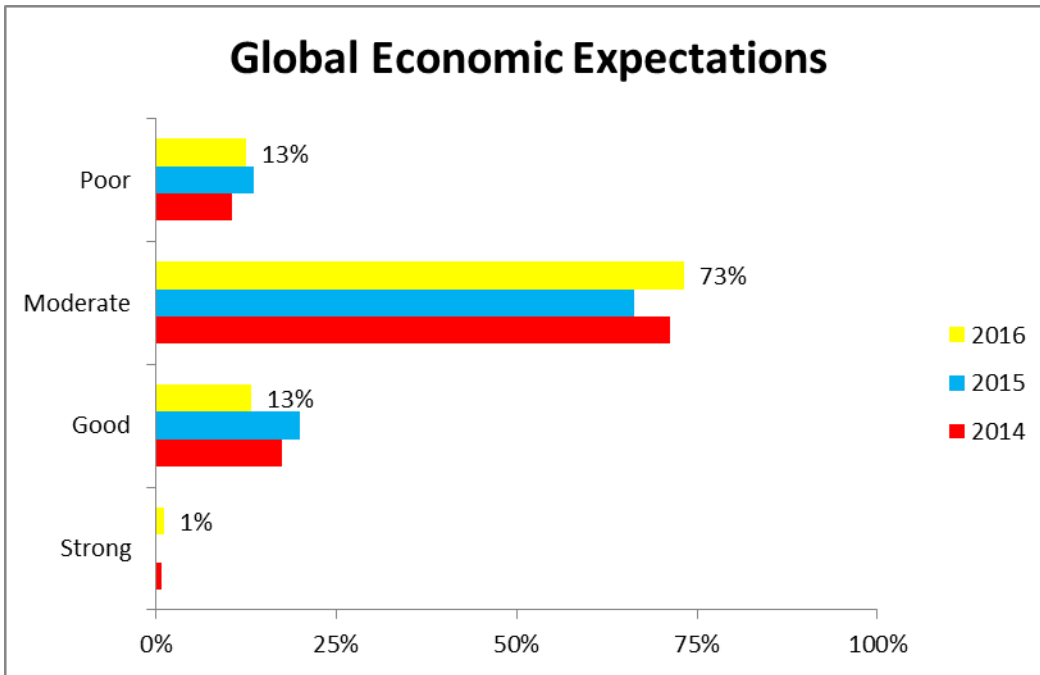
Each person has a unique read on questions. Comments from those who answered *No* to this question are no different. The comments show the deep thinking that occurs on both sides of this topic; for example,

- *Prediction actually distracts from risk imagination.*

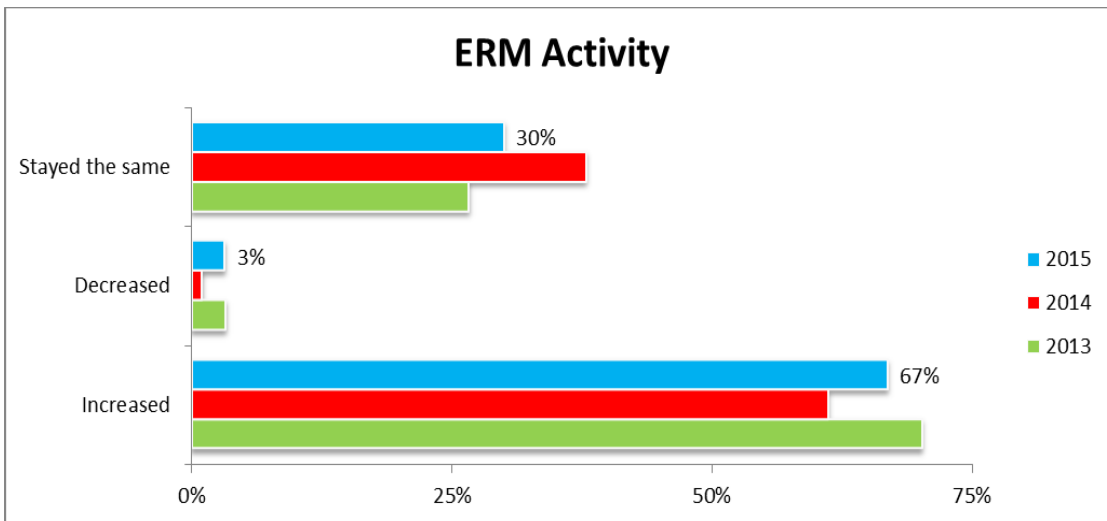
Section 5: Current Topics

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 whether the responses could be used as leading indicators and thus be predictive.

Global economic expectations have been volatile during past surveys, and this year was no different. Respondents had a middle-of-the-road outlook for 2016, with 73 percent having a moderate and 13 percent a good outlook (1 percent had strong economic expectations). Another 13 percent had poor expectations. These results have been comparable across recent surveys as shown in the figure.



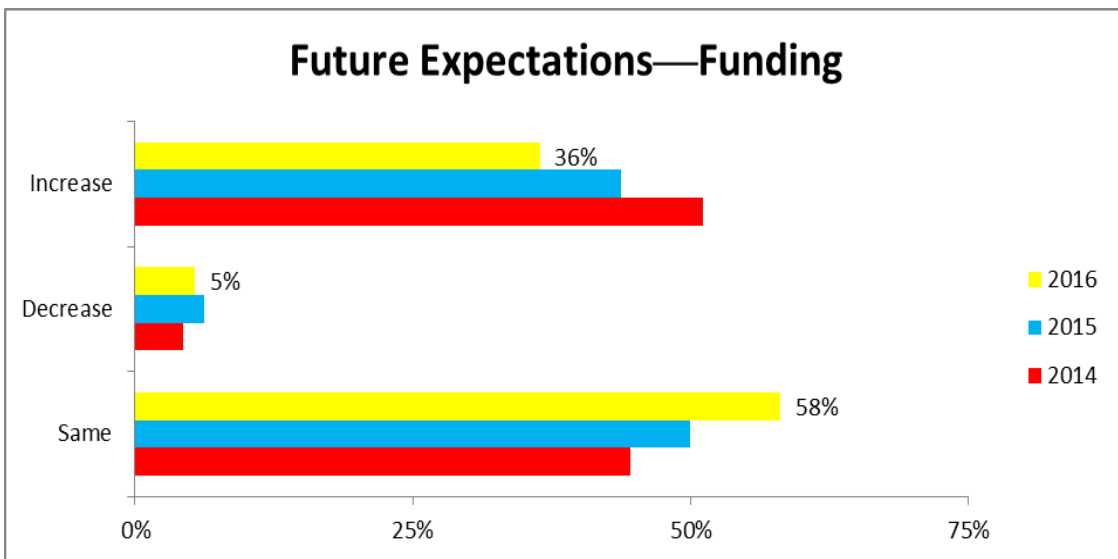
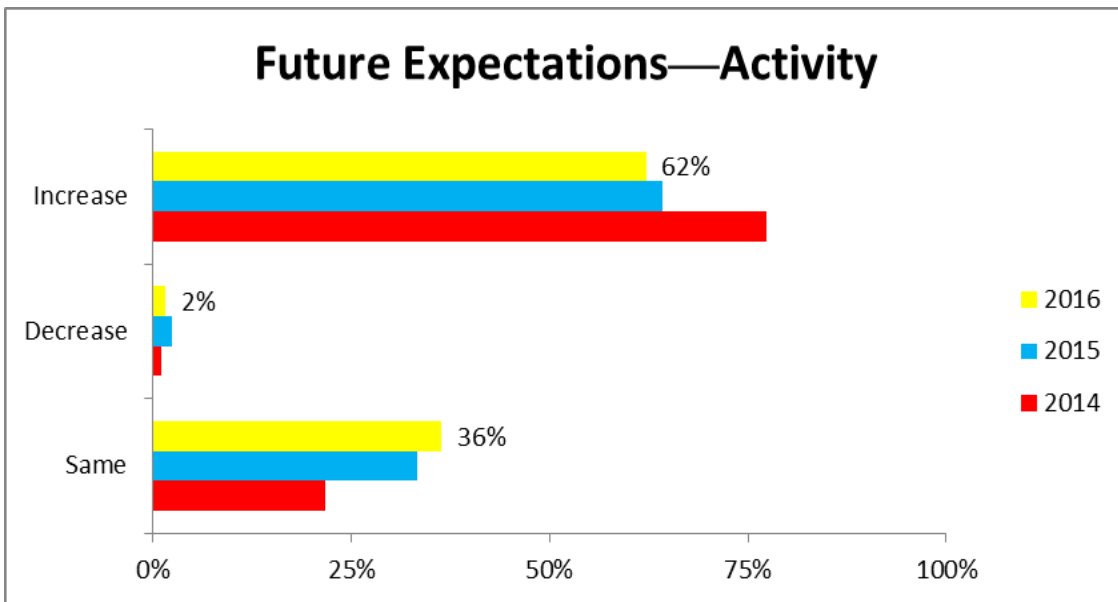
Risk managers continued to see increased ERM activity (67 percent) in 2015, while 3 percent (up from 1 percent) saw decreased activity, as illustrated in the following chart. That is a figure to watch to see whether it continues to trend higher. Risk activities are sometimes considered to be costly if there have been no recent events.



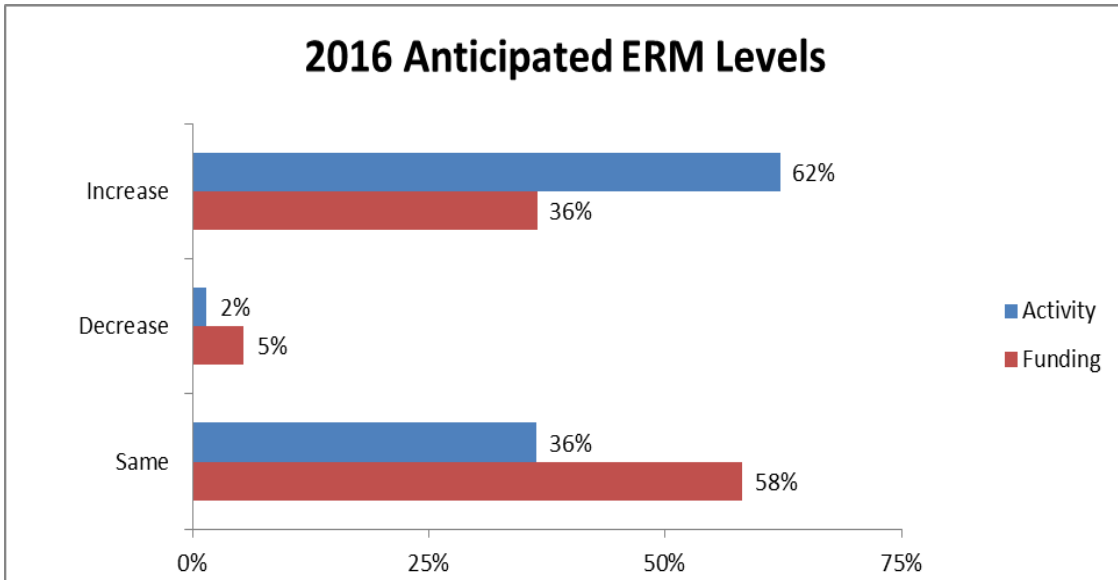
Higher ERM activity led to internal staff growth for half the respondents in 2015.

The three-year trends in the next two figures show expectations of activity stabilizing, with 36 percent of respondents expecting the same activity level and 58 percent the same

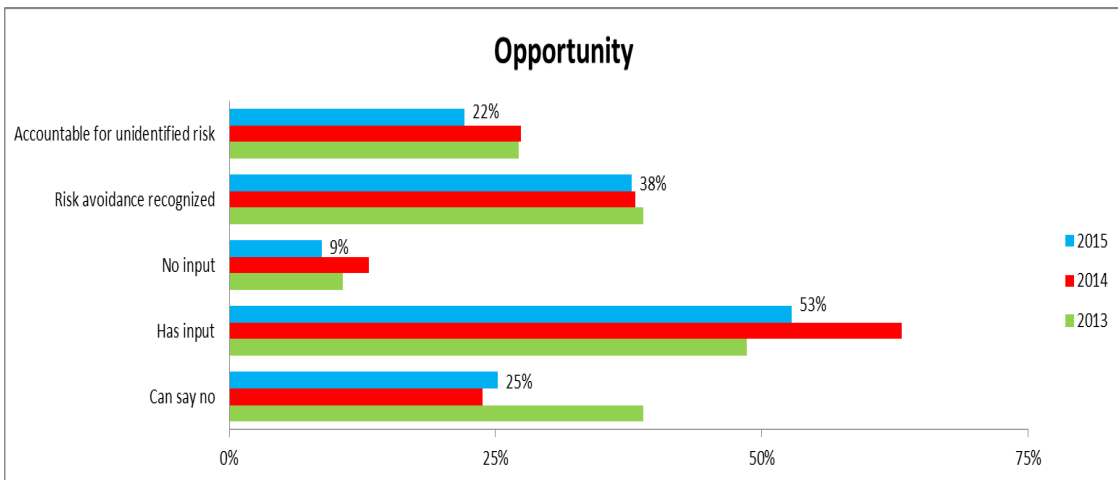
funding in 2016. This likely reflects larger companies' completion of their first capital assessment reports (e.g., ORSA, Solvency II).



The next figure combines the activity and funding responses for the next year.



The survey asked how the ERM team is used when a strategic opportunity is presented to a firm. As illustrated in the following chart, while 77 percent (there was some overlap) of respondents could either say no to a strategic opportunity (25 percent) and/or had input but no vote (53 percent, down from 63 percent), 9 percent still had no input (down from 13 percent). Companies are still trying to figure out the proper role of the risk manager, and it will vary based on the manager’s skill set and management’s expectations. Similar to prior years, 38 percent of respondents expected to be recognized for avoiding a risk, and 22 percent (down from prior surveys) said they would be held accountable if they failed to identify a risk that materialized.

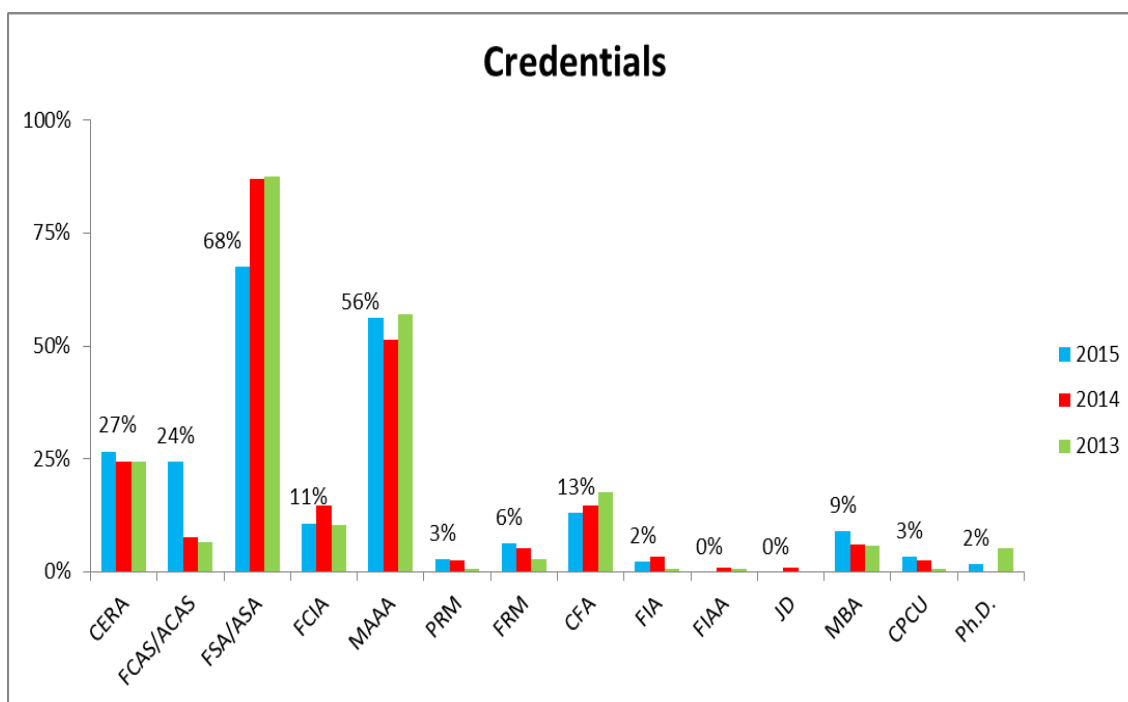


Asked to expand on these answers, respondents noted that an input and vote option was missing from the options. This needs to be addressed in future surveys for completeness. Other comments are difficult to summarize, but two examples are reproduced here:

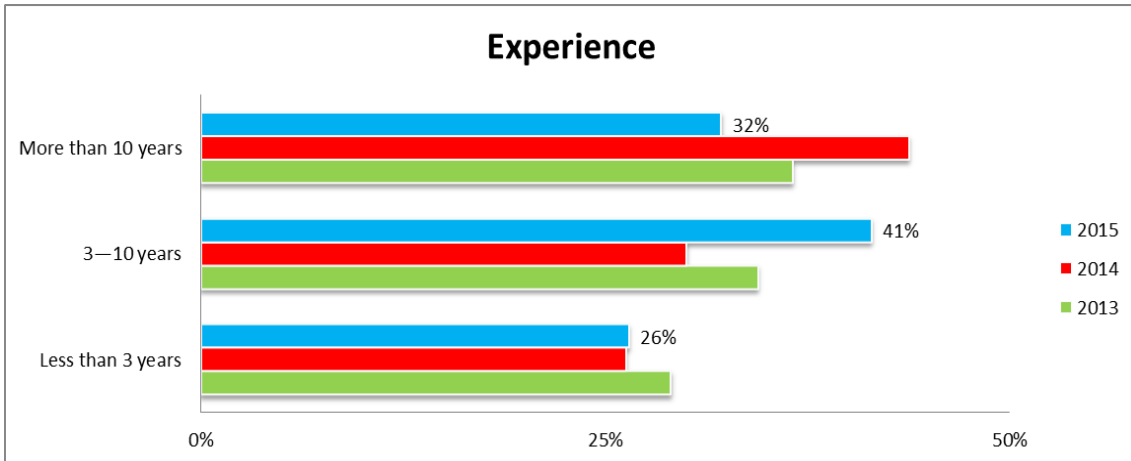
- *Disagree—true measure is the way in which members of the organization reflect ERM in executing their responsibilities.*
- *ERM has not changed our management structure nor where responsibility lies for business decisions.*

Section 6: Demographics

Each year the Survey of Emerging Risks is distributed using targeted emails and social media. For this survey, 39 percent reported filling out the survey in the past, which is likely lower than the previous survey’s 45 percent due to an increase in the number of CAS credentialed respondents. The sponsoring organization, the Joint Risk Management Section, was well represented in the survey, with 68 percent of respondents holding a credential from the Society of Actuaries, 24 percent from the Casualty Actuarial Society, and 11 percent from the Canadian Institute of Actuaries. Other groups strongly represented were CFA charter holders (13 percent) and those with master’s degrees in business administration (9 percent). Many respondents held multiple credentials, as shown in the following figure.

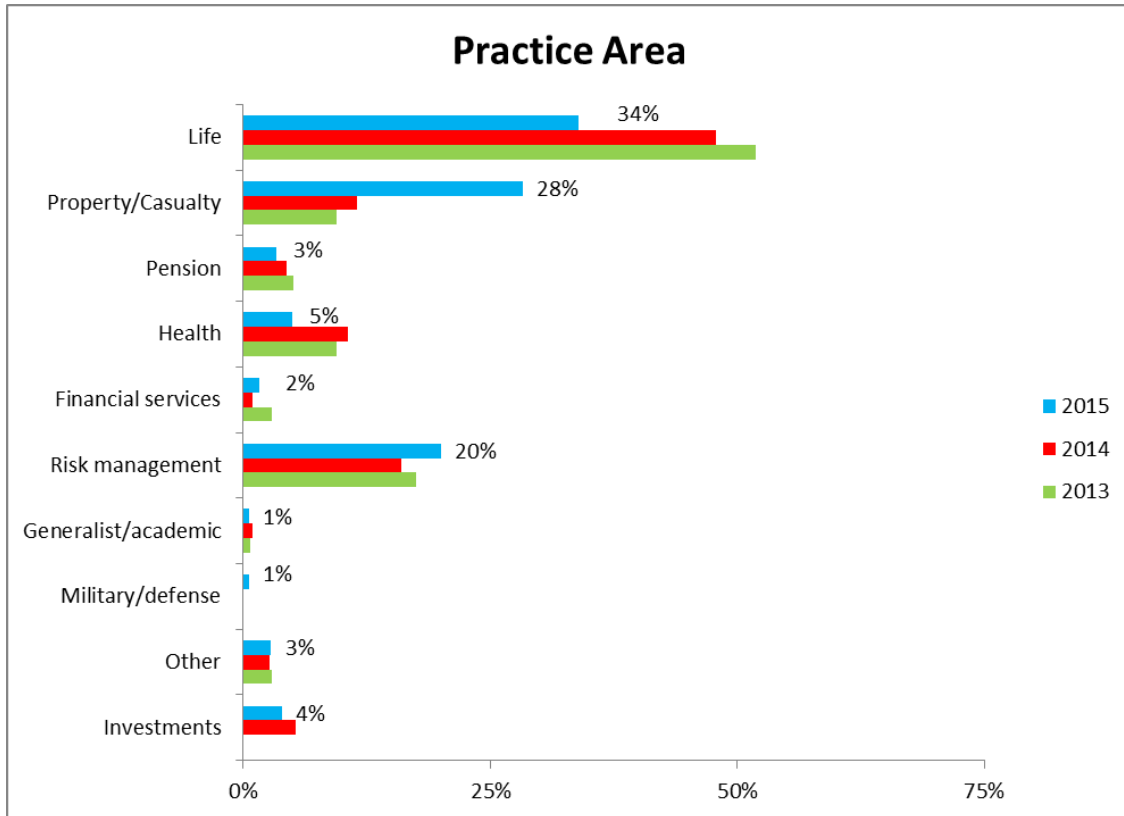


The change in background was reflected in the experience level of the respondents, with 41 percent having three to 10 years of experience as risk managers, as illustrated in the next figure. The researcher again is in the debt to respondents who have shared their experience with fellow risk managers.



The survey continued to be dominated by North Americans (88 percent), with a significant minority coming from Asia. This year surveys were also completed by risk managers in the Middle East, Europe, Africa and Caribbean/Bermuda regions.

As illustrated in the next figure, the primary areas of practice this year provided better balance than in previous years, with life insurance (34 percent) and property/casualty insurance (28 percent) followed by risk management (20 percent), health (5 percent), investments (4 percent) and pension (3 percent) practitioners.



The survey was sent directly to all JRMS and INARM members, as well as some targeted social media groups on LinkedIn and Twitter. A final survey question asked for sources used to scan for emerging risks. While you are encouraged to read all of the responses for personal interest, many of them shared business newspapers/magazines, reinsurer and consultant publications, rating agency reports, seminars, blogs, professional actuarial organizations (e.g., CAS, SOA, CIA) and the Risk Management Society (RIMS). Some of the most interesting comments reflected simply listening to people they come in contact with that have differing perspectives.

WEF Global Risks 2016

Numerous emerging risk surveys are being published. Many are sponsored by organizations with an objective in mind, often consulting firms, and seem to focus on a relatively short time horizon. The WEF survey states a 10-year time horizon, focuses on the business impact of risks (this changes periodically) and provides no review of current risk sentiment. It is a thought-provoking survey and provides potential solutions and scenarios but does not trend results, so it meets a different need than this survey.

The Global Risks 2016 paper provides several highlights that are useful for risk managers to think about and perhaps elaborate on. Here are a few:

- The WEF survey shows geopolitical risk remaining stable at high levels, while this survey reported a reduction from the prior survey. This likely reflects a difference in respondent population, with this survey being more focused on financial risk managers and WEF on those interested in the topics covered at its annual Davos seminar.
- There were several mentions of prevention, preparedness and resilience rather than compliance and reaction (much like a strong risk culture), and were proactively planning scenarios to develop the necessary skills.
- Interesting discussion of the Amazon dieback scenario, where volatility in the climate has the potential to reach a tipping point at which the forests will cease to absorb carbon emissions.
- Recent technological advances may lead to medium-term winners in science, technology, engineering and mathematics (STEM) skills and longer-term needs for skills like creativity, problem solving and social intelligence.
- A World Resources Institute chart is reproduced showing the impact on crop yields of a 3°C increase in temperature. Canada, Russia and parts of China are the primary winners, with nearly everyone else a loser.
- The WEF survey is broken down by country, and it varies quite a bit by region as to the top risk category being economic, technological, geopolitical, environmental or societal—each category is the leading risk somewhere. The results of the present survey were similar to those of the WEF’s North American region, where Cyberattacks, Asset bubble, Energy price shock, Fiscal crises and Failure of critical infrastructure are the top five.

The WEF report is broken into four major sections: survey results, security outlook 2030, risks in focus and risks for doing business at a glance. It is an excellent companion piece to this report, as it dives into some of the risks in detail.

Future Recommendations

This survey should continue to use open-ended questions to learn from practitioners. Using the experience of the Project Oversight Group (POG) has worked well to develop questions and should continue. The survey should expand distribution beyond North America and outside the insurance industry. Partnerships with U.K. and Australian actuarial risk managers, along with risk organizations, should be sought out. Here are specific suggestions made by respondents:

- *Does an emerging risk leading indicator ever get dropped? Why?*
- *In Section 5, ask what activities are being added.*
- *Risk to consider—wealth concentration*
- *Section 5—what drives activity growth?*
- *Section 5 reword responses, say no and can shut it down, has input, last 2.*
- *Reword Section 1, Question 1 to add response about disruption to people's lives, habitat and safety.*
- *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).*
- *Try mapping against specific risk by year (oil, currency, S&P 500).*
- *Can we make it so all of the 23 risks appear on one screen? Can we show a progress bar?*
- *Investigate ways that rating agencies and government agencies are incorporating emerging risks in their analysis.*
- *What do you measure? Likelihood/severity/velocity.*
- *Add ACIA to credential list.*
- *Change Earthquake to Seismic?*
- *Define migration as demographic shift.*
- *When asking about risks not included, reference the glossary—many of the suggestions are already a list they can choose.*

From a reviewer:

- *Add a section where you compare experience for the year against the top risks from the prior year. Need to develop a KRI for each top risk to do that.*
- *Use Gini coefficient for concentration risk of risk combinations.*
- *Consider using word tables rather than copying a picture from excel.*

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, while still maintaining consistency for trending.

Appendix I—Glossary of Risks

Initially 23 core risks were defined in *Global Risks 2007: A Global Risk Network Report*. An active link for the report can be found at <https://www.mcombs.utexas.edu/~media/Files/MSB/Centers/CRMI/GlobalRisks2007.pdf>. What follows is an updated version for the 2015 survey with a description of the 23 risks.

Economic Risks

- Energy price shock—Energy prices change abruptly.
- Currency shock—Material disruptions to currency equilibrium.
- 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 assets such as housing and equities collapses.
- Financial volatility—Price instability of sectors, including commodities, equities or interest rates.

Environmental Risks

- Climate change (includes space weather)—Climate change generates both extreme events and gradual changes, impacting infrastructure, agricultural yields and human lives. (Drivers are unspecified; examples could be space weather or human influence.)
- Loss of freshwater services—Water shortages impact agriculture, businesses and human lives.
- Natural catastrophe: tropical storms—A 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) occurs in heavily populated areas.
- Natural catastrophe: severe weather (except tropical storms)—Meteorological phenomena with the 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

- Terrorism—Attacks disrupt economic activity, causing major human and economic losses.
- Proliferation of weapons of mass destruction (WMD)—Treaty on the Nonproliferation of Nuclear Weapons is no longer effective, leading to the spread of nuclear technologies.
- Interstate and civil wars—Major interstate or civil wars erupt.

- Failed and failing states—The trend of a 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 nationalistic and state-oriented.
- Regional instability—Certain unstable areas may cause widespread political and other crises.

Societal Risks

- Pandemics/infectious diseases—A pandemic emerges with high mortality/incidence of diseases such as HIV/AIDS, Ebola or influenza.
- 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/regulatory framework—Costs increase faster than GDP, with the spread of litigiousness and regulatory revisions.

Technological Risks

- Cybersecurity/interconnectedness of infrastructure—A major disruption of the availability, reliability and resilience of a critical information infrastructure caused by cybercrime, terrorist attack or technical failure. Results are felt in the major infrastructure: power distribution, water supply, transportation, telecommunication, emergency services and finance.
- Technology—Health is impaired due to exposure to nanoparticles or unintended consequences of technology.

Evolution of Risks

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

Spring 2008—23 risks generated by the WEF'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 make *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 *Cybersecurity/interconnectedness of infrastructure*
- Changed *Nanotechnology* (Studies indicate health impairment due to unregulated exposure to a class of commonly used nanoparticles—used in paint, nanocoated clothing, cosmetics or health care—exhibiting unexpected, novel properties and easily entering the human body.) to *Technology/space weather* (Health is impaired 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 “U.S. 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 the spread of litigiousness.”

2012—No changes

2013—Changes to two definitions

- Changed *Natural catastrophe: inland flooding* to *Natural catastrophe: severe weather (except tropical storms)* and the definition to “Meteorological

- phenomena with the 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.”
- Changed *Liability regimes* to *Liability regime and regulatory framework*, and the definition to “Costs rise by multiples of GDP growth, with the 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*

2015—Changes to the names of four risks

- Changed *Currency trend* to *Currency shock*
- Changed *Climate change* to *Climate change (includes space weather)*
- Changed *International terrorism* to *Terrorism*
- Changed *Technology/space weather* to *Technology* to reflect that space weather is a cause of cyclical climatic variations

Appendix II—Survey Results 2015

This appendix includes the survey as well as the responses. There were 248 respondents. Not all respondents answered every question. The percentages given 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 mildly edited, 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 24, 2015.

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.

Macroeconomic trends

	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
Fall 2015	2,079.36	46.60	1.10

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. The table had been set for the financial crisis that was soon to follow.

Default Question Block

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

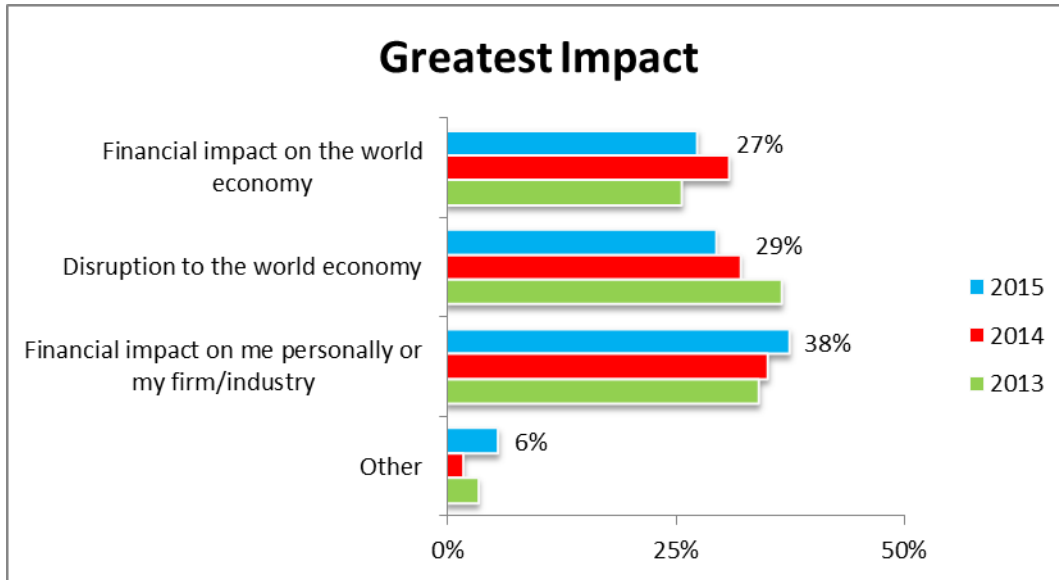
The original list of risks was developed by the World Economic Forum (WEF) for their annual Global Risks Survey. There is a balance required between keeping the list current and being able to show trends. The WEF has aggressively updated its list of risks, even with a stated time horizon of 10 years. The Emerging Risks Survey has tried to maintain stability for trending purposes, although the list has evolved over time.

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

248 total responses

- 68 responses 27% (31%/26%/28%/29% in 2015/2014/2013/2012/2011 surveys)* Financial impact on the world economy
- 73 responses 29% (32%/37%/28%/28%) Disruption to the world economy
- 93 responses 38% (35%/34%/38%/39%) Financial impact on me personally or my firm/industry
- 14 responses 6% (2%/3%/5%/4%) Other
 - Loss of people (lives and property; current and future) affected
 - All of the above are good definitions—to me, the specific answer depends upon the context of the discussion
 - Impact on world or country lifestyles/societal norms
 - Impact on me and my business, including but not confined to financial impacts
 - Disruption to the insurance industry
 - Short-term insurance industry impact; medium and long term; world economy impact
 - Creates social and/or environmental chaos and destruction
 - Disruption to the world economy
 - Combo of the various risks
 - Disturbances or unforeseen changes in the world’s political, economic or military systems, or natural disasters
 - Financial and nonfinancial impacts on firms, people and the economy
 - Actual disruption to people’s lives, habitat and safety. It is beyond simply financial risk.
 - Disruption due to cyber activities.

* In Appendix II results are often provided for past surveys as well as the current one. They consistently show the 2015 survey first, and then in parentheses they are listed with most recent first.



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. [Editor’s note: Detailed definitions of these risks can be found in Appendix I, along with how the definitions have evolved over time.]*

248 total responses

Economic—82 responses 33% (39%/50%)

- 10 responses (4%/4%/1%) Energy price shock
- 5 responses (2%/1%/6%) Currency shock
- 11 responses (4%/4%/4%) Chinese economic hard landing
- 26 responses (10%/17%/12%) 3 *Asset price collapse*
- 30 responses (12%/14%/27%) 2 Financial volatility

Environmental—38 responses 15% (10%/9%)

- 20 responses (8%/6%/4%) 4 Climate change (includes space weather)
- 5 responses (2%/1%/2%) Loss of freshwater services
- 3 responses (1%/1%/1%) Natural catastrophe: tropical storms
- 3 responses (1%/1%/0%) Natural catastrophe: earthquakes
- 7 responses (3%/2%/1%) Natural catastrophe: severe weather

Geopolitical—48 responses 19% (24%/17%)

- 15 responses (6%/8%/4%) 5 Terrorism
- 4 responses (2%/1%/1%) Proliferation of weapons of mass destruction

* When previous results are above 2 percent, bold corresponds to a 5 percent increase or doubling, italics indicate a 5 percent decrease or halving. The leading responses are identified in a column prior to listing the risks.

- **11 responses (4%/2%/3%)**
- 5 responses (2%/5%/4%)
- 1 response (0%/0%/0%)
- 2 response (1%/1%/1%)
- 10 responses (4%/7%/3%)

Interstate and civil wars

- Failed and failing states*
- Transnational crime and corruption
- Retrenchment from globalization
- Regional instability

Societal—29 responses 12% (15%/11%)

- 8 responses (3%/8%/2%)
- 1 responses (0%/0%/0%)
- 7 responses (3%/2%/3%)
- 13 responses (5%/5%/5%)

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

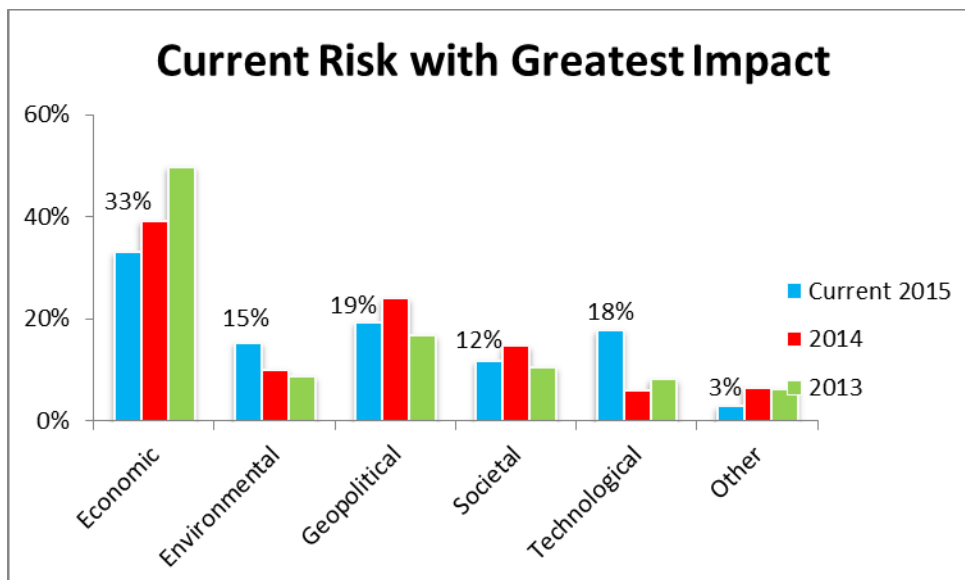
Technological—44 responses 18% (6%/8%)

- **36 responses (15%/6%/8%)** 1
- **8 responses (3%/0%/0%)**

- Cybersecurity/interconnectedness of infrastructure**
- Technology**

Other—7 responses (3% (6%/6%))

- Continued low interest rates
- Central banker decision making
- Weak economy/low interest rates
- Slow real and nominal GDP growth—now and in future
- Short term: cyber; medium term: demographic shifts and food/water distribution; long term: climate change
- Low interest rate environment
- Fundamentalism of all kinds



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

- Economic 33%/39%/50% in 2015/2014/2013
- Environmental 15%/10%/9%
- Geopolitical 19%/24%/17%
- Societal 12%/15%/11%
- Technological 18%/6%/8%
- Other 3%/6%/6%

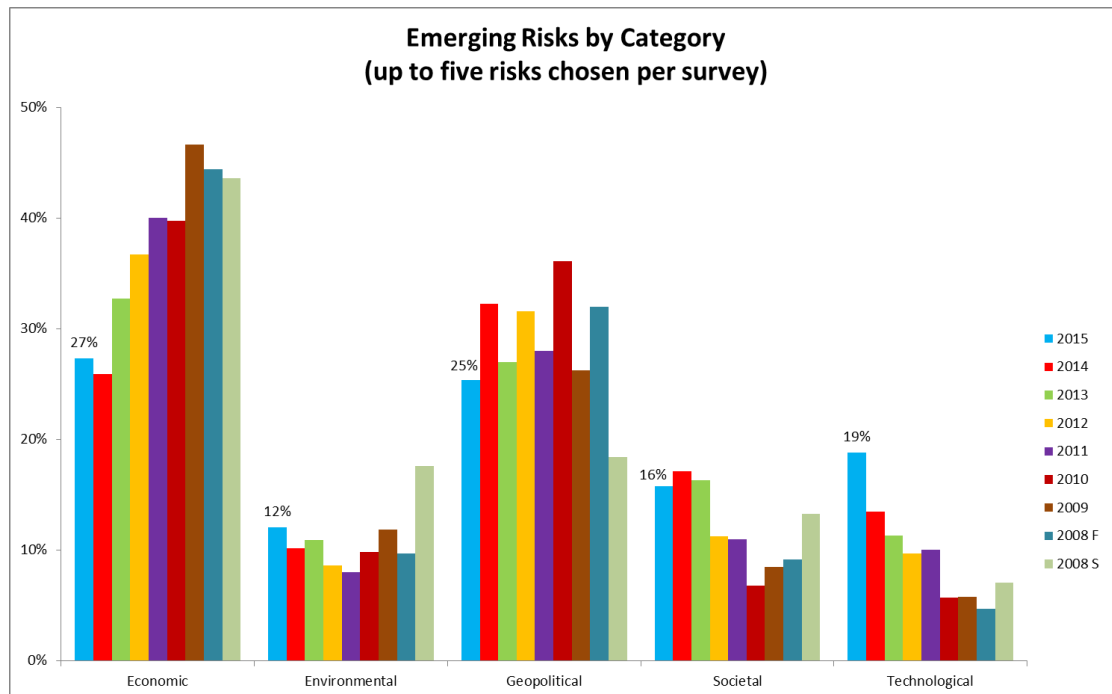
Section 1: Emerging Risks

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

1,127 total responses from 239 surveys—average 4.72 (also 4.72 in 2014)

Divisor in percentages for major categories is 1,127—for individual risks it is 239.

- 1–4 surveys 2%
- 2–1 survey 0%
- 3–13 surveys 5%
- 4–23 surveys 10%
- 5–198 surveys 83%



Economic—308 responses 27% (26%/33%/37%/40%/40%/47%/44%/44% in 2015/2014/2013/2012/2011/2010/2009/F2008/S2008)

- 34 responses (14%/13%/7%/31%/32%/40%/45%) Energy price shock
- **34 responses (14%/7%/27%/26%/25%/49%/66%)** **Currency shock**
- 60 responses (25%/27%/28%/31%/32%/41%/33%) Chinese economic
- hard landing
- 73 responses (31%/31%/30%/24%/22%/31%/49%) 4 Asset price collapse
- 107 responses (45%/44%/59%/62%/68%) 2 Financial volatility

Environmental—136 responses 12% (10%/11%/9%/8%/10%/12%/10%/18%)

- **62 responses(26%/19%/16%/20%/14%/25%/27%)** **Climate change**
(includes space weather)
- 19 responses (8%/8%/9%/11%/6%/9%/10%) Loss of freshwater services
- 14 responses (6%/5%/8%/6%/5%/4%/8%) Natural catastrophe: tropical storms
- 16 responses (7%/5%/6%/2%/6%/5%/7%) Natural catastrophe: earthquakes
- 25 responses (10%/11%/11%/1%/4%/2%/5%) Natural catastrophe: severe weather

Geopolitical—286 responses 25% (32%/27%/32%/28%/36%/26%/32%/18%)

- 89 responses (37%/41%/27%/28%/20%/43%/30%) 3 Terrorism
- 18 responses (8%/9%/5%/14%/9%/18%/14%) Proliferation of weapons of mass destruction
- 45 responses (19%/19%/13%/14%/10%/10%/9%) Interstate and civil wars
- *44 responses (18%/28%/29%/33%/42%/38%/18%)* *Failed and failing states*
- *13 responses (5%/10%/8%/5%/3%/12%/7%)* *Transnational crime and corruption*
- 14 responses (6%/8%/13%/13%/11%/25%/18%) Retrenchment from globalization
- *63 responses (26%/37%/29%/42%/32%/25%/28%)* 5 *Regional instability*

Societal—178 responses 16% (17%/16%/11%/11%/7%/8%/9%/13%)

- *41 responses (17%/30%/19%/12%/13%/22%/30%)* *Pandemics/infectious diseases*
- 18 responses (8%/5%/3%/3%/2%/4%/4%) Chronic diseases
- 62 responses (26%/23%/30%/30%/30%/26%/27%) Demographic shift
- 57 responses (24%/22%/23%/8%/7%/6%/6%) Liability regimes/regulatory framework

Technological—212 responses 19% (14%/11%/10%/10%/6%/6%/5%/7%)
 • 155 responses (65%/58%/47%/40%/38%/23%/21%) **1 Cybersecurity/interconnectedness of infrastructure Technology**
 • 57 responses(24%/5%/5%/6%/5%/4%/7%)

Other—7 responses 1% (1%/2%/2%/3%/2%/1%/4%/4%)

- Conservative economic policy accelerating concentration of wealth and reduction in worldwide demand, genetically engineered foods
- Central banker decision making
- Immigration pressure on Europe
- Sharing Economy
- Serious and long-term damage to electrical grid
- Fukushima
- Fundamentalism

Another way to review this data is as a percentage of the total responses. For example, *Climate change* had 62 responses in this survey. In the previous analysis just shared, $62/239 = 26\%$. In the next section we will look at $62/1,127 = 6\%$ and compare the results with the average from previous surveys. Boldface signifies higher than the average in the current survey and italics signifies lower than the average.

Economic (37% average—27%/26%/33%/37%/40%/40%/47%/43%/42% in November 2015, October 2014, October 2013, October 2012, October 2011, November 2010, December 2009, November 2008, April 2008)

• 7%—3%/3%/2%/6%/7%/9%/10%/8%/13%	<i>Energy price shock</i>
• 7%—3%/1%/6%/5%/6%/10%/14%/10%/9%	<i>Currency shock</i>
• 7%—5%/6%/6%/7%/7%/9%/7%/6%/9%	<i>Chinese economic hard landing</i>
• 7%—6%/7%/7%/5%/5%/6%/10%/14%/5%	<i>Asset price collapse</i>
• 12%—9%/9%/13%/13%/15%	<i>Financial volatility</i>

Environmental (11%—12%/10%/11%/9%/8%/10%/12%/9%/17%)

• 5%—6%/4%/4%/4%/3%/5%/6%/5%/9%	Climate change (includes space weather)
• 2%—2%/2%/2%/2%/1%/2%/2%/2%/3%	<i>Loss of freshwater services</i>
• 1%—1%/1%/2%/1%/1%/1%/2%/1%/2%	<i>Natural catastrophe: tropical storms</i>
• 1%—1%/1%/1%/0%/1%/1%/1%/1%/2%	<i>Natural catastrophe: earthquakes</i>
• 1%—2%/2%/2%/0%/1%/0%/1%/0%/1%	Natural catastrophe: severe weather

Geopolitical (29%—25%/32%/27%/32%/28%/36%/26%/31%/18%)

• 6%—8%/9%/6%/6%/4%/9%/6%/6%/4%	Terrorism
• 3%—2%/2%/1%/3%/2%/4%/3%/3%/4%	<i>Proliferation of weapons of mass destruction</i>
• 3%—4%/4%/3%/3%/2%/2%/2%/2%/3%	Interstate and civil wars
• 6%—4%/6%/6%/7%/9%/8%/4%/6%/2%	<i>Failed and failing states</i>

- 2%—1%/2%/2%/1%/1%/3%/2%/2%/2%
- 3%—1%/2%/3%/3%/2%/5%/4%/5%/2%
- 6%—6%/8%/6%/9%/7%/5%/6%/7%/1%

Transnational crime and corruption
Retrenchment from globalization
 Regional instability

Societal (12%—16%/17%/16%/11%/11%/7%/8%/9%/12%)

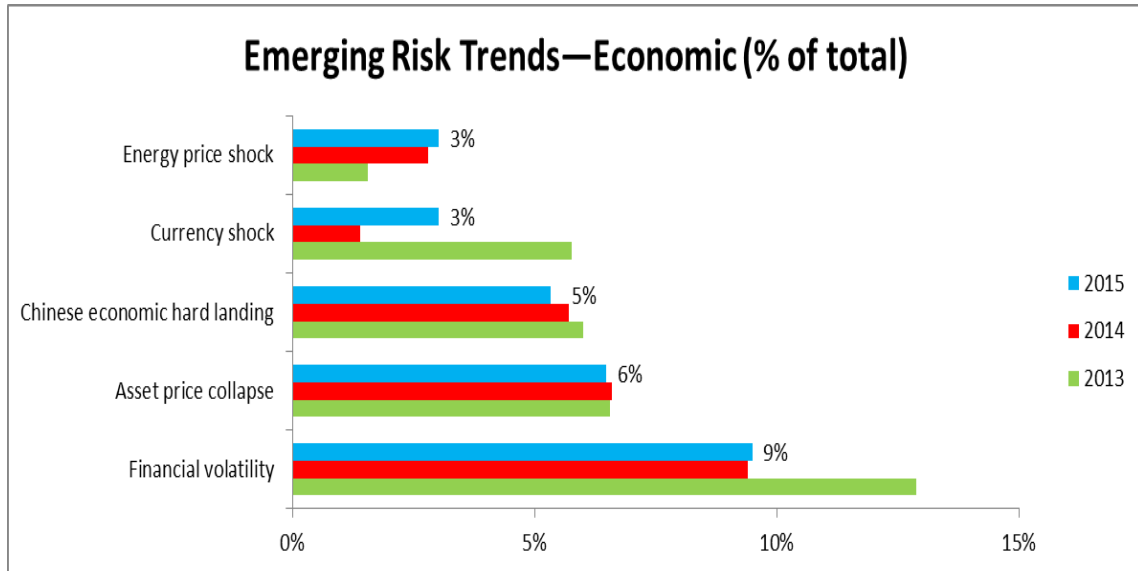
- 5%—4%/6%/4%/3%/3%/5%/6%/7%/8%
- 1%—2%/1%/1%/1%/2%/1%/1%/1%/2%
- 6%—6%/5%/6%/6%/7%/6%/6%/5%/6%
- 3%—5%/5%/5%/2%/2%/1%/1%/1%/2%

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

framework

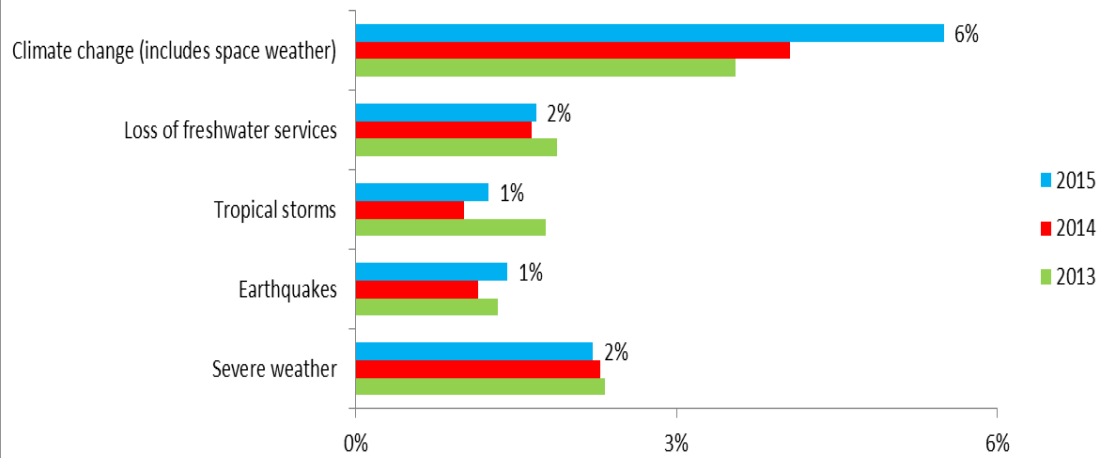
Technological (10%—19%/3%/11%/10%/10%/6%/5%/4%/7%)

- 8%—14%/12%/10%/8%/8%/5%/4%/3%/5% **Cybersecurity/interconnectedness of infrastructure**
- 2%—5%/1%/1%/1%/1%/1%/1%/1%/2% **Technology**

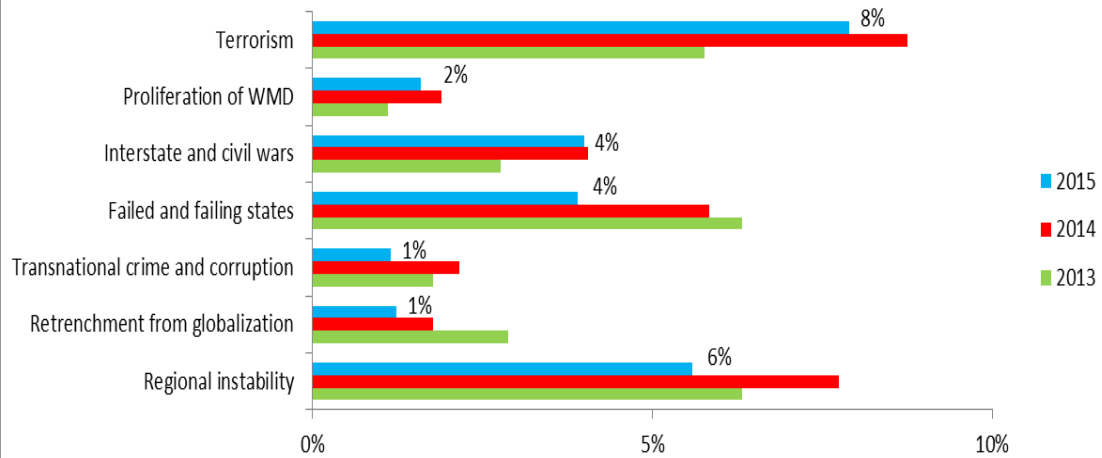


* Note that charts show actual results while labels are rounded to the near percentage point. In some instances the bar in the graph has length but the label says 0%.

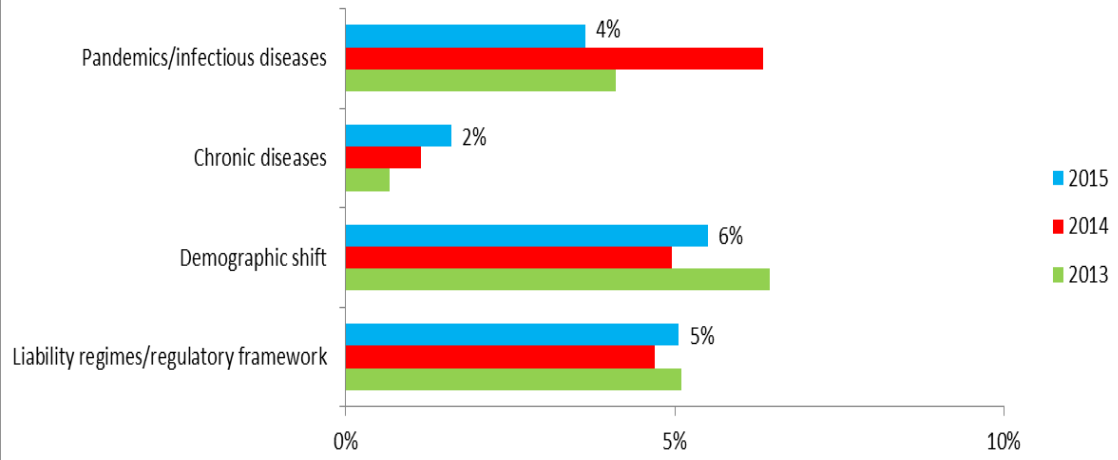
Emerging Risk Trends—Environmental (% of total)



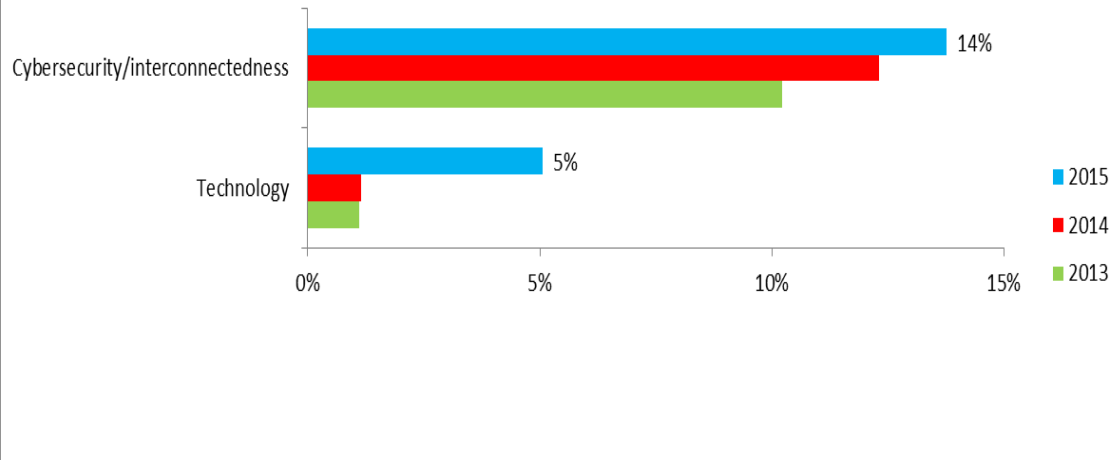
Emerging Risk Trends—Geopolitical (% of total)



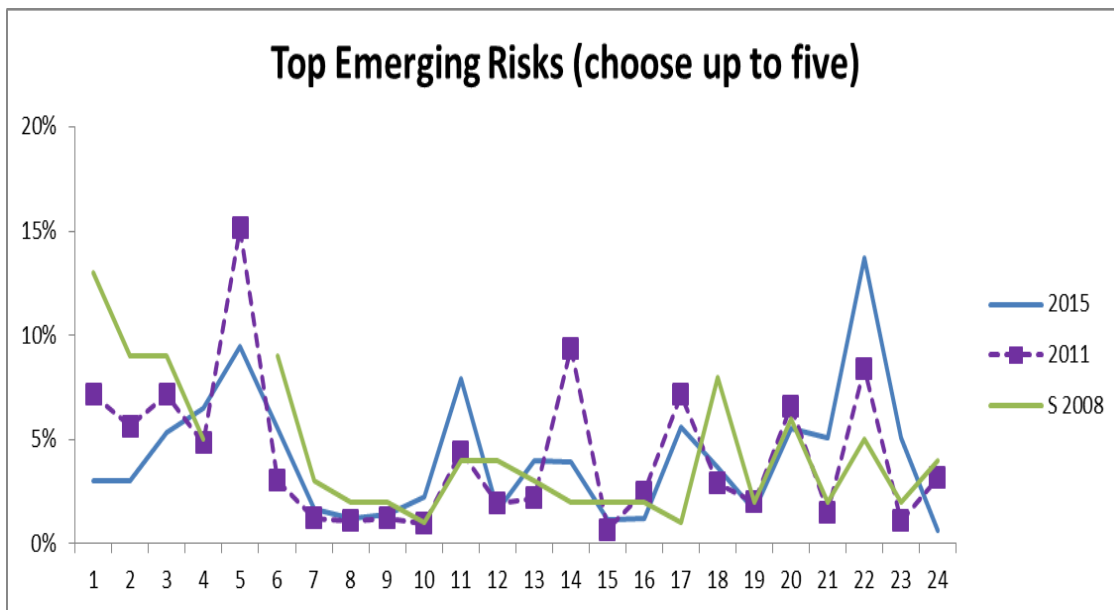
Emerging Risk Trends—Societal (% of total)



Emerging Risk Trends—Technological (% of total)



Five Top Emerging Risks as percentage of total (not by number of surveys)		2015	2014	2013	2012	2011	2010	2009	F 2008	S 2008	Average
1	Energy price shock	3%	3%	2%	6%	7%	9%	10%	8%	13%	7%
2	Currency shock	3%	1%	6%	5%	6%	10%	14%	10%	9%	7%
3	Chinese economic hard landing	5%	6%	6%	7%	7%	9%	7%	6%	9%	7%
4	Asset price collapse	6%	7%	7%	5%	5%	6%	10%	14%	5%	7%
5	Financial volatility	9%	9%	13%	13%	15%					12%
6	Climate change (includes space weather)	6%	4%	4%	4%	3%	5%	6%	5%	9%	5%
7	Loss of freshwater services	2%	2%	2%	2%	1%	2%	2%	2%	3%	2%
8	Tropical storms	1%	1%	2%	1%	1%	1%	2%	1%	2%	1%
9	Earthquakes	1%	1%	1%	0%	1%	1%	1%	1%	2%	1%
10	Severe weather	2%	2%	2%	0%	1%	0%	1%	0%	1%	1%
11	Terrorism	8%	9%	6%	6%	4%	9%	6%	6%	4%	6%
12	Proliferation of WMD	2%	2%	1%	3%	2%	4%	3%	3%	4%	3%
13	Interstate and civil wars	4%	4%	3%	3%	2%	2%	2%	2%	3%	3%
14	Failed and failing states	4%	6%	6%	7%	9%	8%	4%	6%	2%	6%
15	Transnational crime and corruption	1%	2%	2%	1%	1%	3%	2%	2%	2%	2%
16	Retrenchment from globalization	1%	2%	3%	3%	2%	5%	4%	5%	2%	3%
17	Regional instability	6%	8%	6%	9%	7%	5%	6%	7%	1%	6%
18	Pandemics/infectious diseases	4%	6%	4%	3%	3%	5%	6%	7%	8%	5%
19	Chronic diseases	2%	1%	1%	1%	2%	1%	1%	1%	2%	1%
20	Demographic shift	6%	5%	6%	6%	7%	6%	6%	5%	6%	6%
21	Liability regimes/regulatory framework	5%	5%	5%	2%	2%	1%	1%	1%	2%	3%
22	Cybersecurity/interconnectedness	14%	12%	10%	8%	8%	5%	4%	3%	5%	8%
23	Technology	5%	1%	1%	1%	1%	1%	1%	1%	2%	2%
24	Other	1%	1%	2%	2%	3%	2%	1%	4%	4%	2%



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

205 total responses

Economic—62 responses 30% (31%/44%/54%/56%/48%/63%/65%)

- 6 responses 3% (2%/1%/5%) Energy price shock
- 4 response 2% (1%/5%/7%) Currency shock
- 14 responses 7% (5%/6%/5%) 4 Chinese economic hard landing
- 11 responses 5% (10%/8%/9%) *Asset price collapse*
- 27 responses 13% (14%/24%/28%) 2 Financial volatility

Environmental—17 responses 8% (5%/6%/6%/4%/7%/12%/4%)

- 12 responses 6% (3%/4%/5%) **Climate change (includes space weather)**
- 1 responses 0% (0%/0%/0%) Loss of freshwater services
- 1 response 0% (1%/0%/1%) Natural catastrophe: tropical storms
- 0 responses 0% (0%/0%/0%) Natural catastrophe: earthquakes
- 3 response 1% (1%/1%/0%) Natural catastrophe: severe weather

Geopolitical—46 responses 22% (31%/17%/23%/22%/28%/14%/18%)

- 13 responses 6% (8%/4%/1%) 5 Terrorism
- 4 responses 2% (2%/1%/1%) Proliferation of weapons of mass destruction
- 9 responses 4% (3%/2%/3%) Interstate and civil wars
- 6 responses 3% (8%/4%/8%) *Failed and failing states*
- 1 responses 0% (0%/1%/0%) Transnational crime and corruption
- 1 responses 0% (2%/1%/3%) Retrenchment from globalization
- 12 responses 6% (8%/4%/7%) Regional instability

Societal—20 responses 10% (16%/13%/6%/5%/4%/2%/2%)

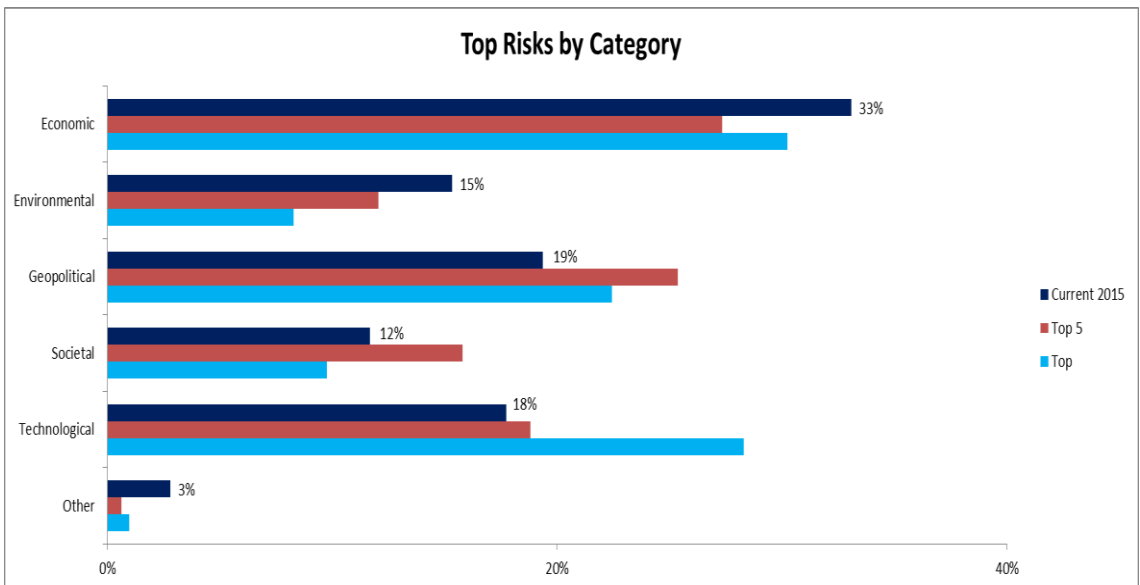
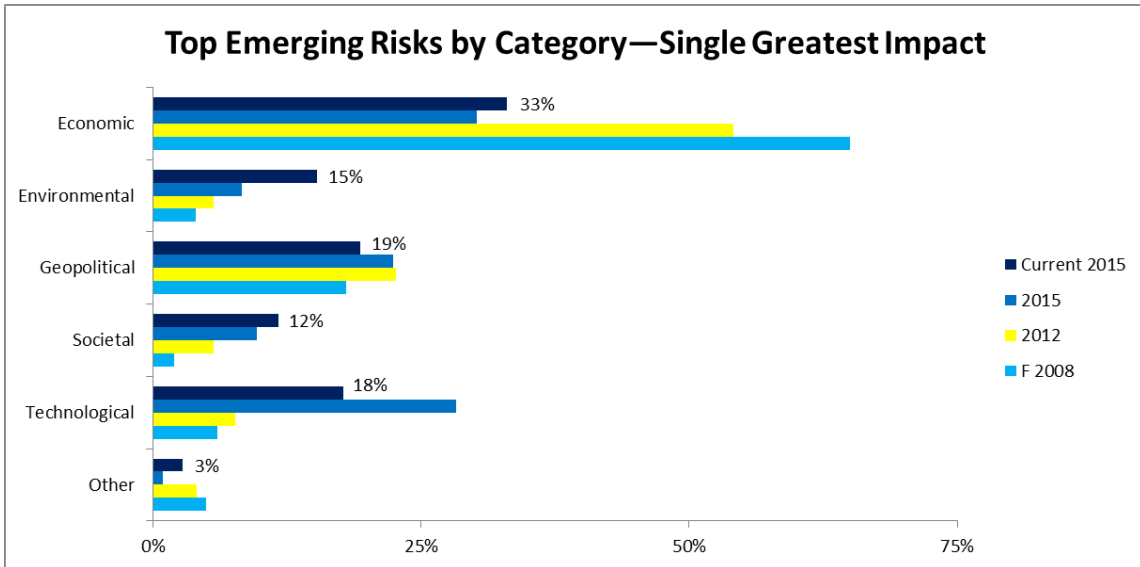
- 3 responses 1% (3%/1%/1%) *Pandemics/infectious diseases*
- 0 responses 0% (0%/0%/1%) Chronic diseases
- 2 responses 1% (4%/3%/2%) Demographic shift
- 15 responses 7% (9%/10%/2%) 3 Liability regimes/regulatory framework

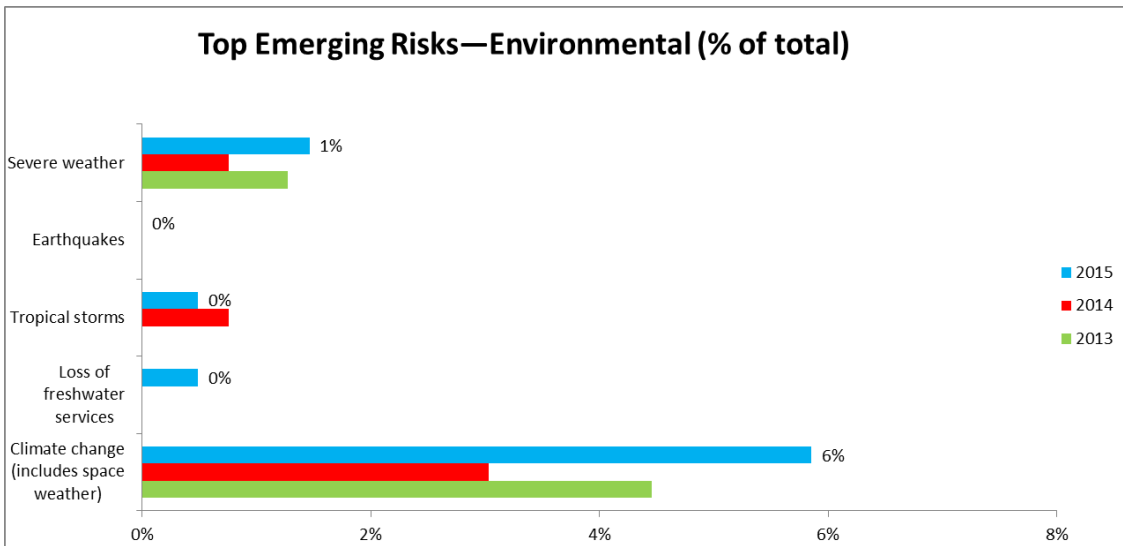
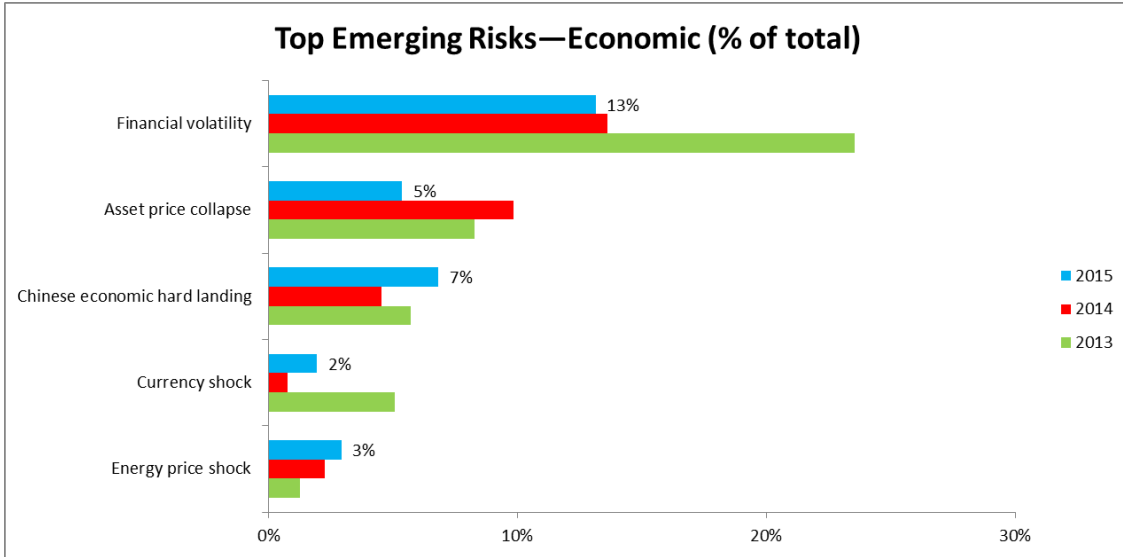
Technological—58 responses 28% (15%/15%/8%/8%/9%/6%/6%)

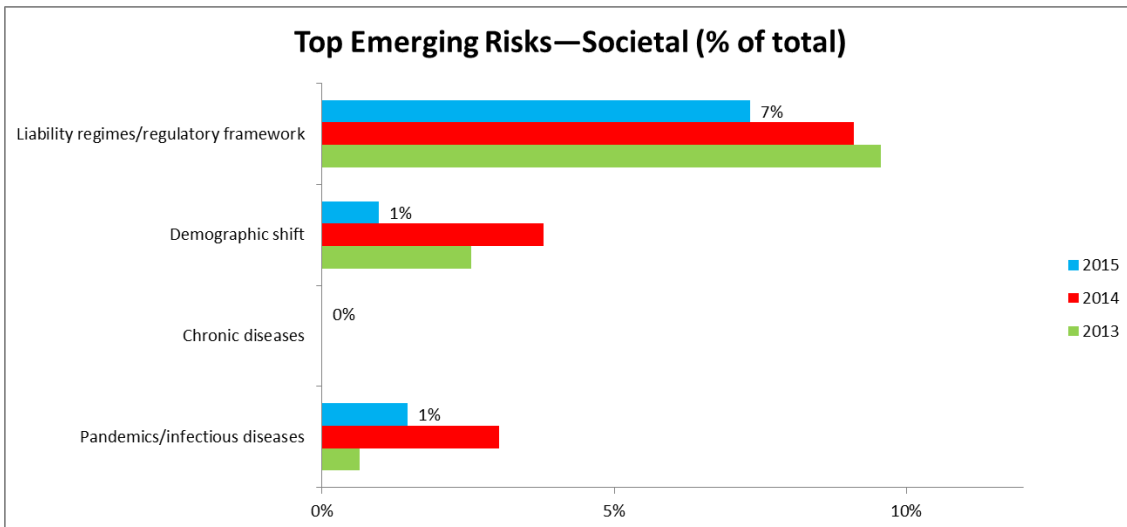
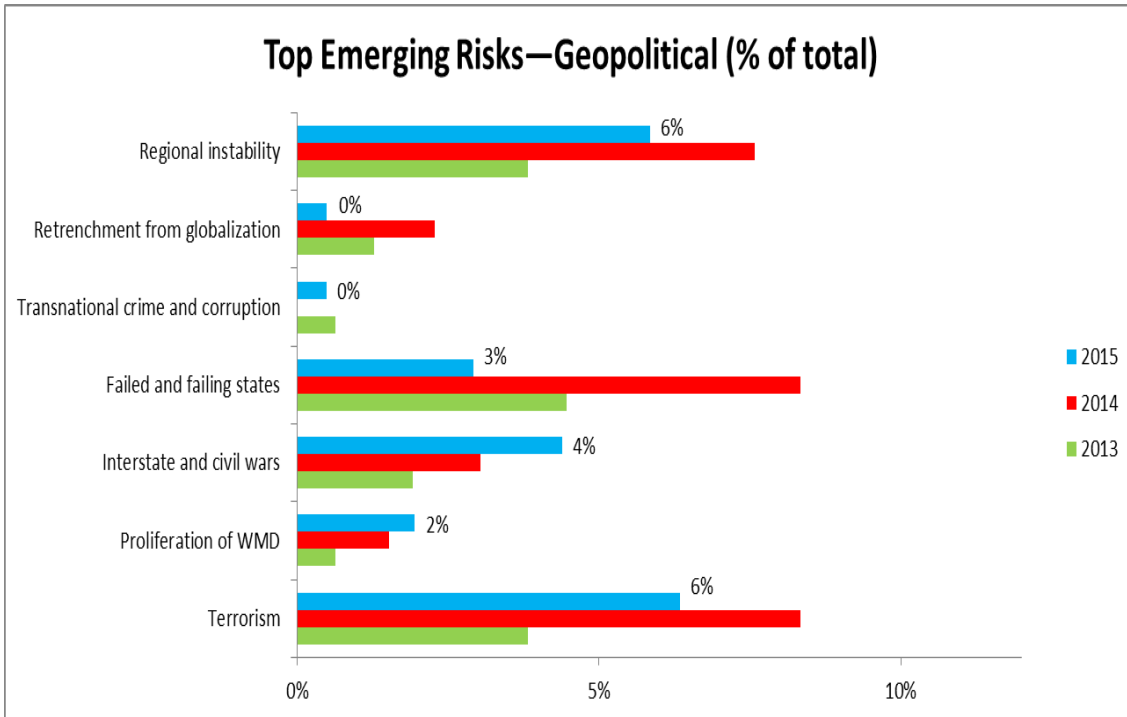
- 47 responses 23% (14%/14%/7%) 1 Cybersecurity/interconnectedness of infrastructure
- 11 response 5% (1%/1%/1%) Technology

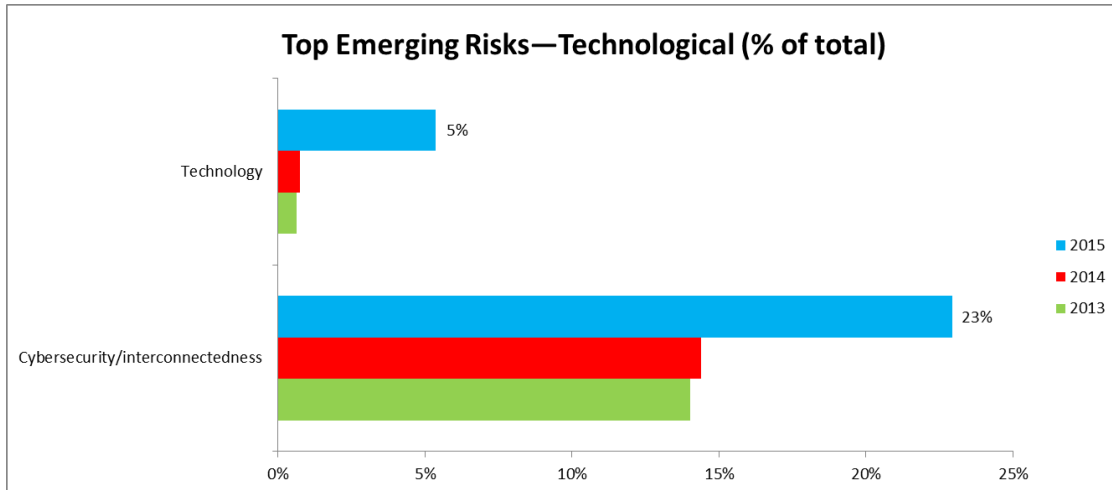
Other—2 responses 1% (2%/6%/4%/5%/3%/3%/3%)

- Economic policies increasing poverty
- Central banker decision making









Questions 3, 4, and 5. 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.

Two risk combinations—634 total responses

Economic—33% (35%/40%/46%/48%/45%/53%/49% in previous surveys)

- 4% (4%/3%/9%) 1 Energy price shock
- **4% (2%/8%/6%)** 2 **Currency shock**
- 5% (5%/6%/7%) 3 Chinese economic hard landing
- 8% (10%/7%/8%) 4 (3T) Asset price collapse
- 12% (13%/16%/15%) 5 (2) Financial volatility

Environmental—12% (10%/11%/9%/7%/11%/13%/9%)

- 4% (4%/4%/4%) 6 Climate change (includes space weather)
- 2% (2%/2%/2%) 7 Loss of freshwater services
- 2% (1%/2%/1%) 8 Natural catastrophe: tropical storms
- 1% (0.4%/0.2%/1%) 9 Natural catastrophe: earthquakes
- 2% (2%/3%/1%) 10 Natural catastrophe: severe weather

Geopolitical—28% (35%/32%/32%/32%/35%/25%/32%)

- 8% (9%/6%/6%) 11 (3T) Terrorism
- 2% (2%/4%/4%) 12 Proliferation of weapons of mass destruction
- 4% (4%/4%/4%) 13 Interstate and civil wars
- 5% (7%/6%/8%) 14 Failed and failing states
- 2% (2%/4%/1%) 15 Transnational crime and corruption
- 1% (3%/3%/3%) 16 *Retrenchment from globalization*
- 5% (7%/6%/7%) 17 (5) Regional instability

Societal—10% (12%/9%/7%/6%/5%/5%/8%)

- 3% (4%/2%/2%) 18 Pandemics/infectious diseases
- 1% (1%/0.4%/1%) 19 Chronic disease
- 3% (4%/3%/3%) 20 Demographic shift
- 3% (3%4%/1%) 21 Liability regimes/regulatory framework

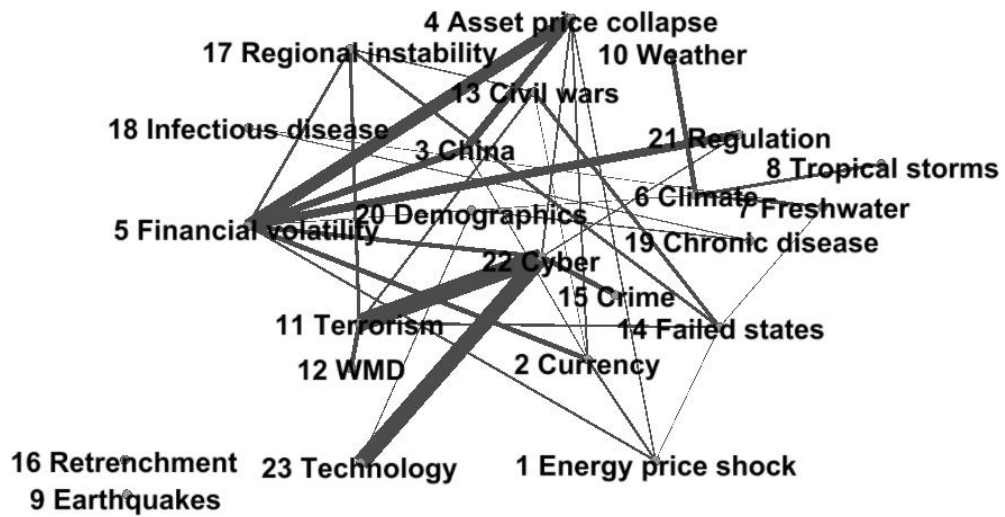
Technological—17% (8%/9%/5%/7%/4%/3%/2%)

- 12% (7%/7%/5%) 22 (1) Cybersecurity/interconnectedness of infrastructure
- 5% (1%/1%/1%) 23 Technology

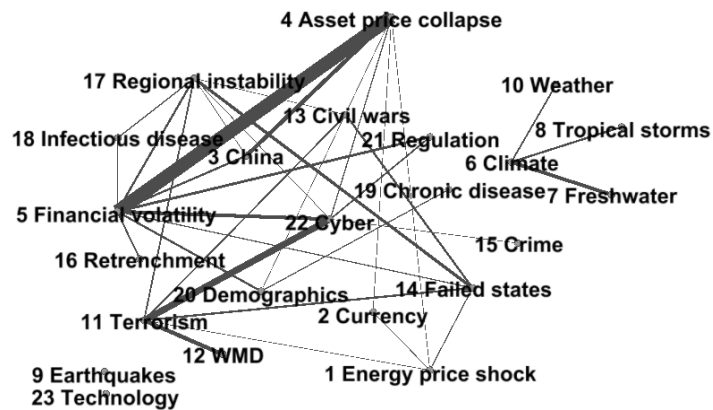
Combinations

	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	9	3	7	9	3	1	1	0	1	3	0	4	5	0	0	1	0	0	0	0	2	0	49
2	0	0	6	8	15	0	0	0	0	1	0	1	5	2	1	1	1	1	0	0	1	0	0	43
3	0	0	0	22	20	1	0	0	0	0	0	0	2	1	0	2	4	0	0	1	0	2	1	56
4	0	0	0	0	33	0	1	1	1	0	2	1	1	2	1	2	4	4	0	4	3	8	0	68
5	0	0	0	0	0	0	0	1	2	0	3	0	1	2	1	3	10	1	0	5	23	14	3	69
6						0	10	11	1	15	0	0	2	1	0	1	3	2	0	5	0	2	0	53
7						0	0	0	2	0	1	0	1	5	0	0	1	5	0	2	0	0	0	17
8						0	0	0	4	4	0	0	0	0	1	0	0	0	0	0	0	1	0	10
9						0	0	0	0	4	1	0	0	0	0	0	0	0	0	0	0	1	0	6
10						0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	1	1	6
11											0	14	9	9	2	0	11	3	0	0	0	44	3	95
12											0	0	4	1	0	0	4	0	0	1	0	4	0	14
13											0	0	0	12	0	1	7	1	0	0	0	2	0	23
14											0	0	0	0	2	2	11	1	0	1	1	2	0	20
15											0	0	0	0	0	0	1	0	0	0	1	15	1	18
16											0	0	0	0	0	0	2	0	0	1	1	0	0	4
17											0	0	0	0	0	0	0	2	0	2	0	3	1	8
18																		0	6	2	0	0	0	8
19																		0	0	7	0	0	1	8
20																		0	0	0	2	0	6	8
21																		0	0	0	0	7	2	9
22																						0	42	42
23																						0	0	0
	0	9	9	37	77	4	12	14	10	25	10	16	29	40	8	12	60	24	6	31	32	108	61	

The following graphical representation, created with the open-source Gephi 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.



Here is the comparable chart from the prior survey. The primary change is the strength of the *Technology* risk.



This type of analysis is not as sophisticated as one might guess from the result, but it provides a useful visual representation of the results.

Leading combinations were

- 44 responses (9%/4%/4%), No. 2 in previous survey
 - Terrorism*
 - Cybersecurity/interconnectedness of infrastructure*
- 42 responses (9%/1%/1%), NR
 - Cybersecurity/interconnectedness of infrastructure*
 - Technology*
- 33 responses (7%/8%/7%), No. 1
 - Asset price collapse*
 - Financial volatility*
- 23 responses (5%/2%/4%), No. 8
 - Financial volatility*
 - Liability regimes and regulatory framework*
- 22 responses (5%/3%/3%), No. 3T
 - Chinese economic hard landing*
 - Asset price collapse*
- 20 responses (4%/2%/4%), No. 9T
 - Chinese economic hard landing*
 - Financial volatility*
- 15 responses (3%/%), NR
 - Currency shock*
 - Financial volatility*
- 15 responses (3%/), NR
 - Climate change (includes space weather)*
 - Natural catastrophe: severe weather*
- 14 responses (3%/3%/3%), No. 3T
 - Terrorism*
 - Proliferation of weapons of mass destruction (WMD)*
- 14 responses (3%/3%/3%), No. 5T
 - Financial volatility*
 - Cybersecurity/interconnectedness of infrastructure*

Leading combinations in 2014 not in the top 10 in the current survey were

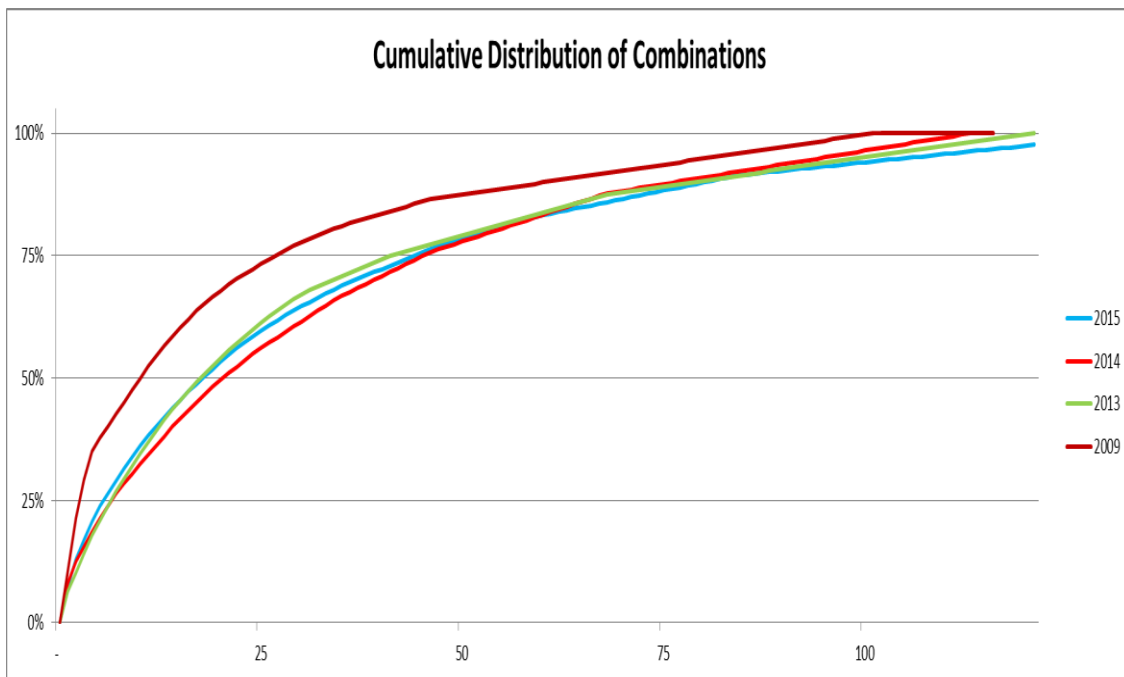
- 10 responses (2%/3%/1%), No. 5T
 - Climate change (includes space weather)*
 - Loss of freshwater services*
- 11 responses (2%/2%/3%), No. 7
 - Failed and failing states*
 - Regional instability*

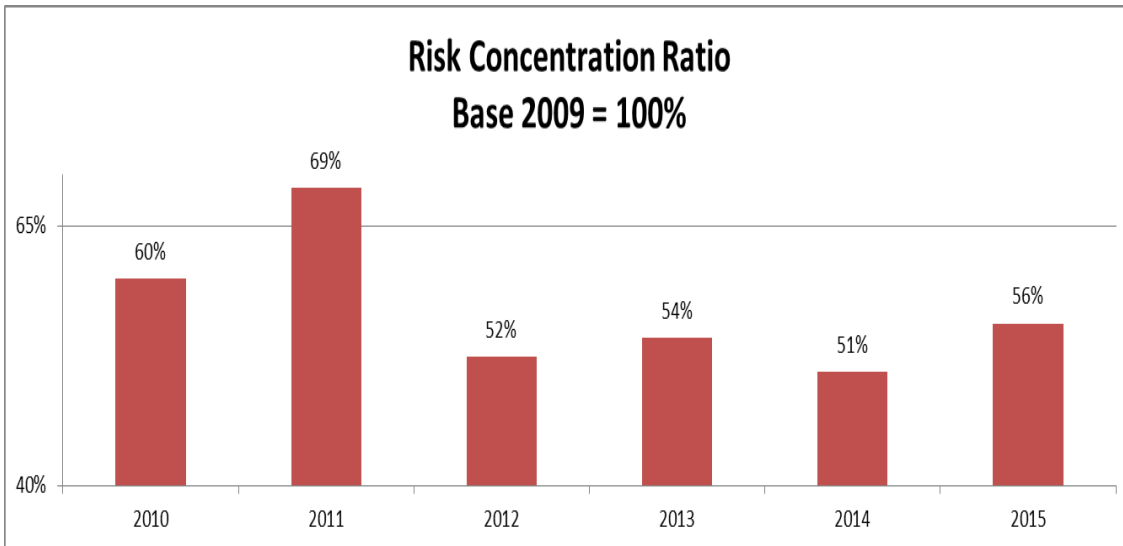
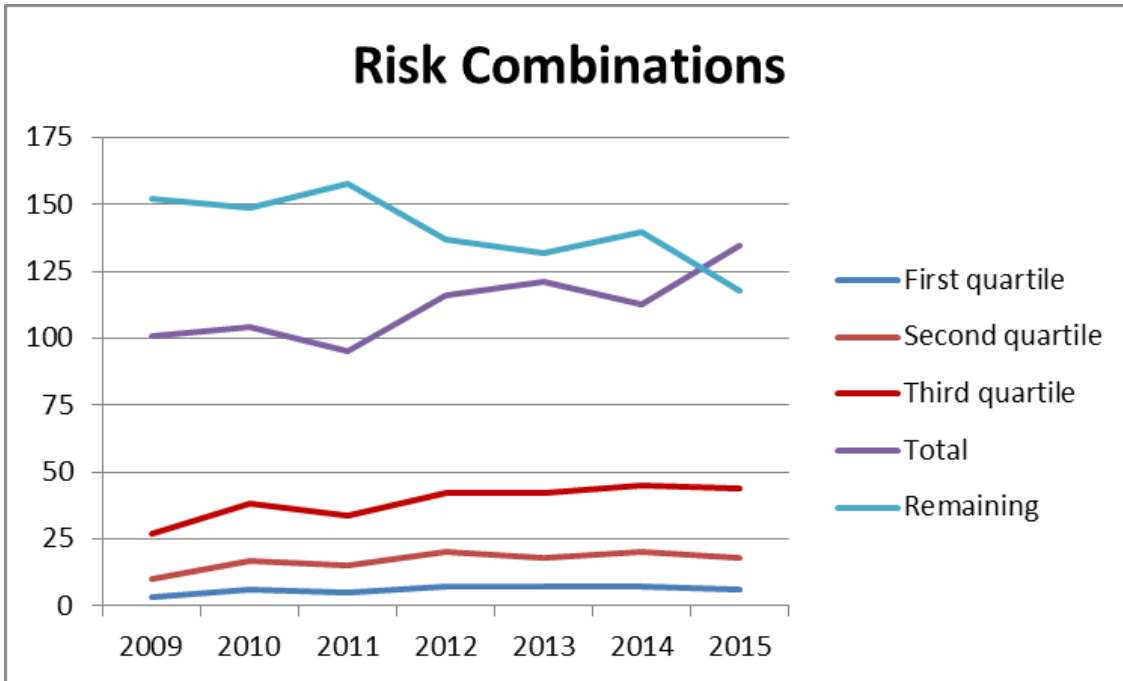
Combinations by category		2008	2009	2010	2011	2012	2013	2014	2015
Economic	Economic	34%	42%	29%	29%	29%	24%	19%	21%
Economic	Environmental	2%	3%	5%	3%	3%	2%	2%	2%
Economic	Geopolitical	22%	16%	21%	24%	21%	18%	15%	10%
Economic	Societal	2%	3%	2%	6%	6%	7%	9%	7%
Economic	Technological	1%	1%	3%	4%	3%	4%	4%	5%
Environmental	Environmental	7%	9%	7%	4%	6%	7%	7%	8%
Environmental	Geopolitical	2%	2%	3%	2%	2%	4%	2%	3%
Environmental	Societal	5%	3%	2%	2%	1%	2%	1%	3%
Environmental	Technological	0%	0%	0%	0%	0%	0%	1%	1%
Geopolitical	Geopolitical	16%	14%	20%	14%	18%	15%	19%	15%
Geopolitical	Societal	4%	2%	2%	1%	2%	4%	7%	2%
Geopolitical	Technological	1%	2%	3%	7%	4%	9%	8%	12%
Societal	Societal	2%	1%	2%	1%	2%	2%	2%	3%
Societal	Technological	1%	0%	1%	0%	1%	1%	2%	3%
Technological	Technological	0%	1%	0%	1%	1%	2%	1%	7%

Combination splits by category		Combo 3	Combo 2	Combo 1	Total	Combo 1	Combo 2/3	Overall
Economic	Economic	41	44	47	132	22%	20%	21%
Economic	Environmental	4	5	5	14	2%	2%	2%
Economic	Geopolitical	18	23	25	66	12%	10%	10%
Economic	Societal	15	15	13	43	6%	7%	7%
Economic	Technological	8	6	16	30	8%	3%	5%
Environmental	Environmental	16	24	11	51	5%	9%	8%
Environmental	Geopolitical	7	5	5	17	2%	3%	3%
Environmental	Societal	8	8	2	18	1%	4%	3%
Environmental	Technological	2	3	1	6	0%	1%	1%
Geopolitical	Geopolitical	31	30	31	92	15%	14%	15%
Geopolitical	Societal	7	7	1	15	0%	3%	2%
Geopolitical	Technological	28	20	27	75	13%	11%	12%
Societal	Societal	8	5	4	17	2%	3%	3%
Societal	Technological	4	6	6	16	3%	2%	3%
Technological	Technological	13	11	18	42	8%	6%	7%

2014 survey for comparison

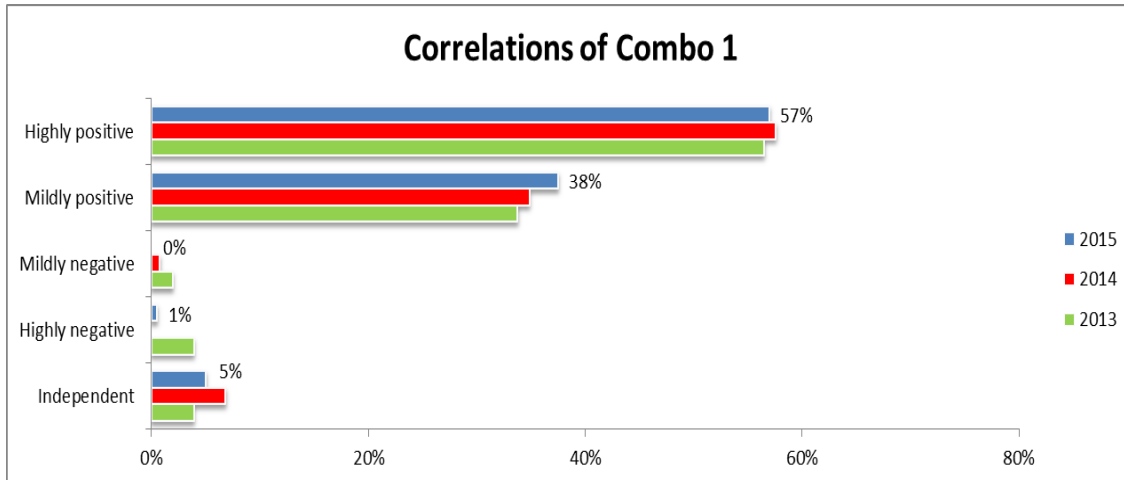
		Combo 1	Combo 2/3
Economic	Economic	27%	15%
Economic	Environmental	5%	1%
Economic	Geopolitical	12%	17%
Economic	Societal	11%	8%
Economic	Technological	4%	5%
Environmental	Environmental	6%	8%
Environmental	Geopolitical	1%	3%
Environmental	Societal	1%	1%
Environmental	Technological	1%	0%
Geopolitical	Geopolitical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





Question 6. For the first combination listed in Question 3, do you feel that the risks chosen will operate independently or be correlated?

- 114 responses 57%/58%/56% Highly positively correlated
- 75 responses 38%/35%/34% Mildly positively correlated
- 0 response 0%/1%/2% Mildly negatively correlated
- 1 responses 1%/0%/4% Highly negatively correlated
- 10 responses 5%/7%/4% Independent



Each year a specialty question is asked, with the anticipation that the question will not be repeated.

Question 7. Which risks do you expect to have the greatest impact on the supply chain? (Please select no more than three.)

198 respondents chose at least one for a total of 488 responses (2.5 average).

Economic—36%

- 7% 5 Energy price shock
- 8% 3 Currency shock
- 8% 4 Chinese economic hard landing
- 4% Asset price collapse
- 9% 2 Financial volatility

Environmental—13%

- 5% Climate change (includes space weather)
- 2% Loss of freshwater services
- 1% Natural catastrophe: tropical storms
- 2% Natural catastrophe: earthquakes
- 2% Natural catastrophe: severe weather

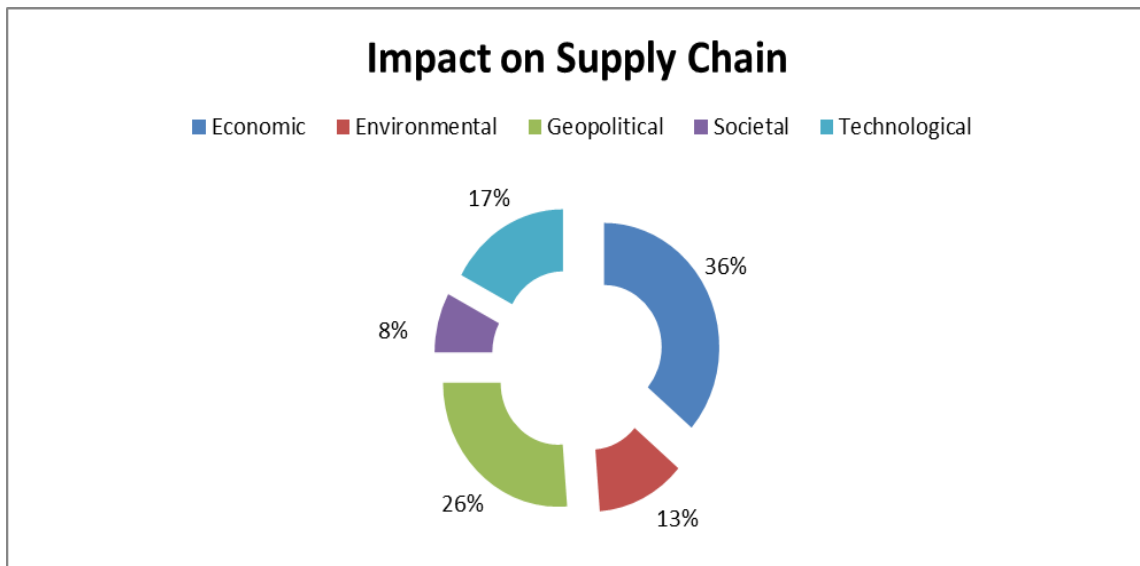
Geopolitical—26%

- 5% Terrorism
- 1% Proliferation of weapons of mass destruction (WMD)
- 5% Interstate and civil wars
- 3% Failed and failing states
- 2% Transnational crime and corruption
- 3% Retrenchment from globalization
- 6% Regional instability

Societal—8%

- 2% Pandemics/infectious diseases

- 0% Chronic diseases
- 1% Demographic shift
- 4% Liability regimes/regulatory framework
- Technological—17%**
- 13% 1 Cybersecurity/interconnectedness of infrastructure
- 4% Technology
- Other—0%**



Question 8. 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?*

- **Precious metals, as a form of currency insurance.**
- **That’s arbitrage, not risk management.**
- Cost of money.
- Technology, climate change, demographic shift.
- Financial products policyholder behaviors.
- Asset price collapse.
- Technology, demographic shift.
- Insurance products.
- The major innovation in risk management will be early diagnosis of needed changes in strategy and speed of adjusting exposures to risk accordingly.
- Digital technology to reach suppliers and clients.
- Interest rates.
- Distribution channel trends, industry consolidation.

* Some responses throughout the survey are bold to highlight them as particularly thought provoking.

- Regulatory framework.
- Financial volatility.
- We monitor all risks and emerging situations looking for upside opportunities and competitive advantages.
- Cannot answer due to corporate policy.
- Medical research; regulatory frameworks.
- Demographics.
- Asset prices; demographic shift.
- Asset price collapses.
- Diversifications among the regions.
- Regulatory.
- Financial volatility.
- While I am not monitoring, I feel climate change could offer real estate opportunities if you could guess where the new coastline could be.
- Insurance markets.
- VIX, data/network security company stocks.
- **New technologies to manage climate change and to create new energy sources.**
- **New technologies such as drones, self-driven cars, emerging markets.**
- New consumer behavior driven by technology.
- Liability regimes and regulatory framework, technology, cybersecurity, financial volatility.
- Technology, IoT, continued globalization.
- Expansion in Asia as USD becomes more dominant /
- Demographics.
- Cyber.
- Insurance linked securitization.
- Political risks: countries acting against foreign business interests.
- I monitor the energy sector, which impacts imports/exports, currency and overall economy. Stability of foreign states directly impacts these items, which is currently being tested overseas in Europe, the Middle East and Asia.
- New markets and/or distribution channels.
- Geographic distribution.
- Rating downgrades in the P&C sector—opportunities for fronting business.
- Cybersecurity, natural catastrophes (tropical storms and earthquakes).
- Energy price shock, natural disasters and financial volatility.
- Currency fluctuations.
- New product (e.g., new technologies).
- Cyber.
- Buying precious metals.
- **Demographic shifts, regulatory changes, asset price collapse.**
- Offering insurance for cybersecurity.

- **None, because these are short-term based. I am inclined to longer-term sustainability matters.**
- Extrinsic value in emerging markets that have low correlation.
- None—too risk averse.
- **Autonomous cars, GMOs, drones, the Internet of things.**
- Mortality improvement.
- Cyber coverage.
- Both mispricing and diversification opportunities.
- Technology.
- Cybersecurity, terrorism, currency shock, financial volatility, technology, regulatory framework, natural catastrophes.
- **Supply chain disruption, space weather, dislocation caused by emerging technologies.**
- **Investments in industries that do well during chaos, such as war-related industries (not my favorite thought) and companies providing security and cybersecurity services.**
- Climate change effects.
- Changing capital standards and the influence of international standards on the United States.
- Items and services required to response to natural and man-made catastrophes.
- Regulatory.
- Evaluation of global economic conditions in developed and emerging countries.
- Chinese market to some extent, news in general.
- Currency risk.
- **Privatized health care in the United States due to the expected failure of Obamacare.**
- Opportunities arising from regulation change.
- I am not a risk manager, but it occurred to me that the Fukushima disaster may be positive for providers of cancer treatment.
- New asset classes allowed by regulator. Insuring populations with a known risk factor.
- Technology.
- New insurance products.
- I'm a regulator—concern is more downsides than opportunity.
- Technology and demographics—use of technology by the younger demographic for conducting all business.
- Financial volatility.
- Managing chronic diseases better than the average health system.
- Raw materials.
- **Velocity of money is a leading indicator for currency shock and other risks.**
- Asset selection.
- Liability regimes and regulatory framework.

Question 9. 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

- Expense pressures on stock trade companies.
- Model risk.
- **Sustained low rates (I used “financial volatility” as a proxy for this.).**
- Technology driven unemployment.
- Electromagnetic pulse (EMP).
- News media and social media influence.
- Human resource issues such as access to talent, succession planning, utilization of resources, etc.
- Scandals—Libor, FX, etc.
- Genetically modified foods.
- Regulatory-DOL fiduciary issues.
- War between United States and China or Russia.
- Financial reporting misrepresentation.
- Industry/distribution channel consolidation.
- Specifically list interest rates.
- Moral collapse.
- Food supplies and quality.
- **DNA changes.**
- U.S. governmental debt.
- Behavioral risks.
- Discovery of alien life.
- **M society.**
- U.S. deficit.
- Long-term deflation.
- Social changes.
- Income disparity.
- Business strategy.
- China military.
- Changing consumer attitudes and preferences.
- Demographics and aging baby boomers.
- Political.
- Drought.
- Shift in business strategies due to disruptive technologies.
- Political climate.
- Governmental influence.
- Political, e.g., U.S. presidential election.
- Sports-related brain injury.

- Falling interest rates.
- Increasing rate of change.
- Regulatory.
- Solar eruptions/electromagnetic disruptions of electronics/communication/energy grid.
- Affordable Care Act long-term effects on the health of the nation.
- Autonomous cars.
- Multiple/simultaneous or massive volcanic eruptions.
- Systemic economic maleducation.
- Nanotechnology.
- Competition.
- Political radicalism.
- Refugee crisis in Europe and the inability of the EU to deal with it.
- Hydraulic fracturing.
- Income disparity and associated tensions.
- Aging infrastructure.
- Driverless cars.
- Consequences of lack of proper education in Africa.
- Government mandates life insurance.
- The Internet of things.
- 2016 presidential election.
- Global but limited nuclear war.
- Government action.
- Unsustainable government debt and low interest rates.
- Political risk in the United States.
- Fed mishandles end of QE II.
- Low real and nominal GDP growth (see answer to question 1).
- Commodity exhaustion.
- Disruptive market entrants.
- Regulatory expansion.
- Growing awareness of the cumulative impact of multiple concussions, particularly for school/amateur sports.
- Rising sea levels (long-term enormous risk).
- Runaway medical costs, including health insurance costs, due to the monopoly nature of modern allopathic medicine in the United States.
- Political.
- Competition from unconventional sources (outside of financial services companies).
- Severe damage to electrical grid.
- Aging workforce.
- Decline of middle class.
- Geopolitical.

- Failure of Obamacare.
- Morphing political landscapes.
- Health care costs.
- Mortality improvement reversal.
- There are a number of unlikely but devastating possibilities, including a supervolcano, a large natural electromagnetic pulse, a large meteor strike, etc. You can lump these in with climate change, but they are not really what the supporters of global warming are talking about. There is also deterioration of the food supply through GMO, herbicides, etc.
- New entrants to insurance market with other approaches like P2P.
- Right-wing, insular politics.
- Huge differences in standards of living between countries/regions.
- Low for long interest rate environment.
- Solar activity.
- Political climate.
- Reporting risk—Accounting may not react to changing events, or there may be another wave of accounting fraud.
- Landfills.
- Government regulation: rules being changed midstream.
- Debt sustainability.
- Volcanos.
- Regulatory framework should be separate from liability regimes; federal regulation is a big risk.
- Political shifts.
- Data fraud or theft.
- TPP/TTIP/CETA.

Option 2

- Investors' short-term views on how companies should be managed.
- Taxes and regulations that stifle entrepreneurship (I used liability regime/regulatory framework as a proxy for this.).
- Mass migration (war, climate change).
- Model risk.
- Concentration of wealth.
- Tax law changes.
- Market conduct regulation.
- National government failures.
- Endocrine disruptors.
- Lack of individual privacy.
- Genetic manipulation.
- Dislocation of refugees.
- Long-term deflation.

- Low interest rates.
- Political.
- Operational.
- Russian bold international moves.
- Civil disorder and disruption.
- Regulatory compliance.
- Food price shocks.
- Demographic shift in how products and services are purchased.
- Superpower default.
- Vehicle technology enhancements.
- Increased debt.
- Governmental leadership.
- Systemic risks to the insurance industry.
- Political extremism.
- 3D printing.
- Food supply disruptions/disappearances.
- Solar flares.
- Self-driving cars.
- Iranian nuclear development.
- Cyber terrorism and the vulnerability of the U.S. power grid.
- Increases in the age of eligibility for old age benefits.
- Drones.
- Return to the barter system.
- Microfinance.
- Government policies driving conflict (picking winners and losers).
- United States vs. China military confrontation.
- Failed countries (as opposed to states).
- Competitive pressure.
- Alternative RM solutions.
- Food and water distribution inefficiencies (worldwide).
- Political dysfunction.
- The future of medical breakthroughs.
- Aging infrastructure.
- Lack of access to food in some regions.
- If you define risk to be financial impact on the world economy, then financial volatility is essentially the same thing and not really a cause.
- Corporate governance failures.
- Disruptive competitors—use of big data to crush the current insurance industry.
- Declining middle class.
- Inflation risk.
- Fracking.
- Economic imbalance between the “haves” and “have-nots.”

- Keynesian economics.
- Large-scale migration.
- 20th-century diseases.

Option 3

- Prolonged low interest rates.
- Food production in the face of climate change.
- Succession of states.
- Regressive social reform.
- Availability of talent.
- Political shift in OECD (U.S. congress paralysis/dismantling of eurozone).
- Health CRISIS fueled by technology, e.g., excessive digital consumption and poor associated health habits.
- Interrelationship of space weather and earth weather.
- 3D printing.
- Donald Trump :-)
- Drones.
- Drug-resistant bacteria.
- Autonomous vehicles.
- Mobile technology.
- United States vs, Russia military confrontation.
- Housing bubbles.
- Commoditization of insurance.
- Increased frequency of “man-made” earthquakes.
- Sectarian conflict.
- Immigration.
- Lack of access to potable water due to terrorism and war in some regions
- Likewise, if you define risk to be disruption to the world economy, then asset price collapse is essentially the same thing and not really a cause.
- Excessive income inequality.
- Industry consolidation.

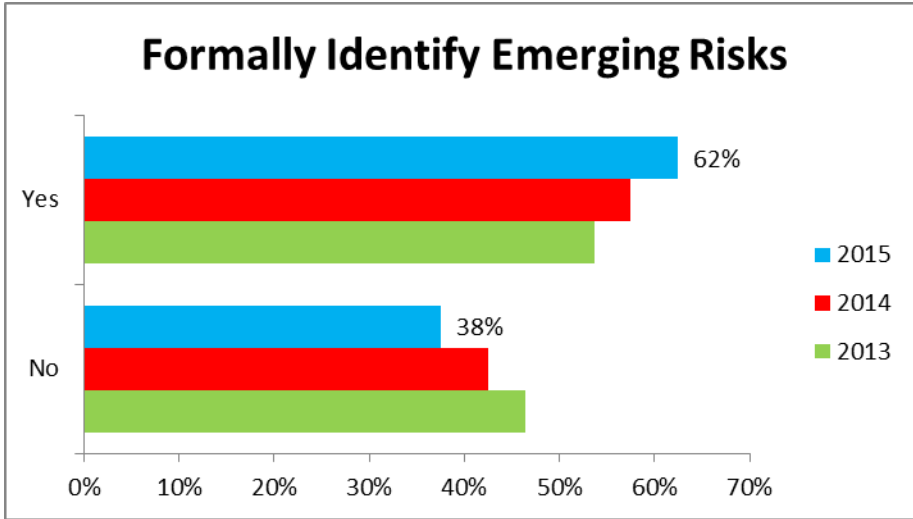
Section 2: Leading Indicators

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?

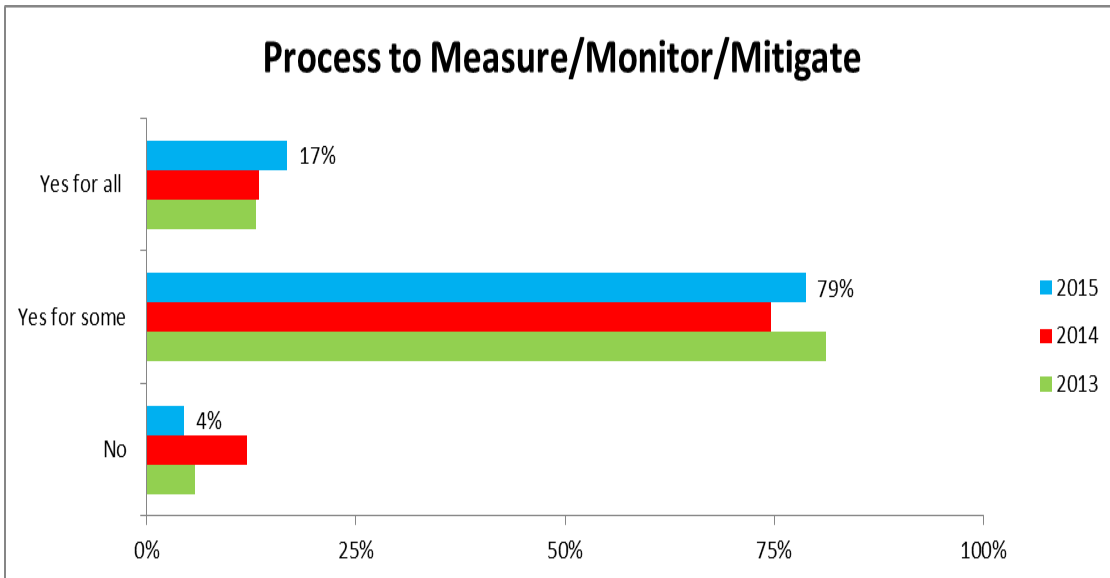
Percentages back out responses stating that the question is not applicable to them.

- 62%/58%/54% Yes
- 38%/43%/46% No



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

- 17%/13%/13% Yes for all
- 79%/75%/81% Yes for some
- 4%/12%/6% No



Question 3. If yes, please provide examples.

From those who responded *Yes for all*:

- Social changes regarding gender.
- Work teams to triage and manage response to an identified risk.
- Cyber liability coverage.
- We monitor exposures for natural catastrophes (hail, hurricane, earthquake and wildfires) on a daily basis.
- Monthly meetings to review associated metrics, action plans, etc. to reassess likelihood and impact.
- Risk identification of all upstream and downstream activities in the energy value chain.
- Annual emerging risk inventory is maintained and assessed. Results are shared with the leadership team and our board-level risk committee. Risk owners are defined for higher-rated risks according to our risk scoring methodology.
- Climate change, technology.
- Can't—client confidential information.
- **Underwriting of life insurance—fraud trends, changes in underwriting, technology dependence.**
- Emerging risk committee, formal assessments and monitoring of mitigating actions.
- Risk assessments, modeling for impact, estimate exposure, report to BOD.
- **Monitoring China, Brazil and commodities movement and potential impact to emerging market portfolio.**
- Tracking and reporting on the emerging risk. Quarterly discussions on potential impact to the company.

From those who responded *Yes for some*:

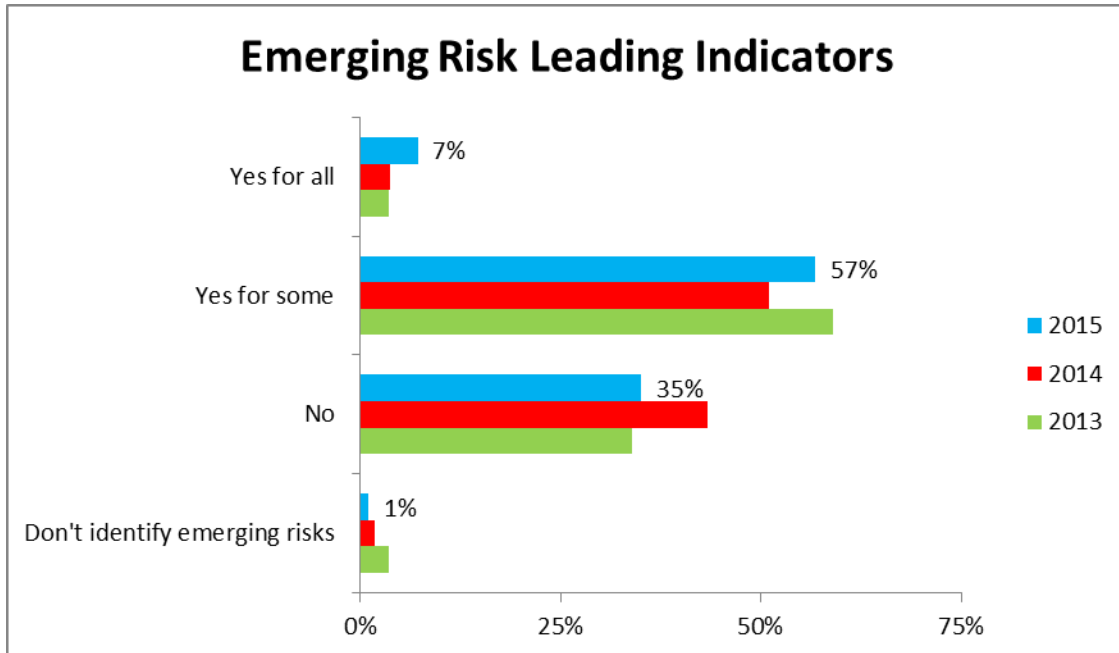
- Identify and discuss on ERM risk register.
- Technology (self-driving car), climate change (catastrophe), demographic shift and technology (distribution channels).
- **KRIs for financial risks, surveys for non-quantifiable.**
- Current focus is on monitoring, so we look at any work that might be going on in advance of the risk emerging (such is the case for regulatory changes). We do plan to measure these risks but have not yet built that process.
- Industry trends monitored.
- Media scans to monitor, crisis plan frameworks to mitigate.
- We monitor regulatory developments.
- Technology—monitor competitor usage of technology, work with technology partners to understand emerging trends.
- **Regulatory—actively monitor activity by all applicable regulatory bodies, participate in industry committees.**

- Assessment of emerging risks completed during annual business plan cycle.
- Financial emerging risks monitored for impact on investment portfolio.
Regulatory risks monitored for impact on new business, products.
- Oil shocks look at asset opportunities.
- We maintain an Emerging Risk Tracker and have biweekly calls to discuss those risks as well as determine if any new risks should be added or if any risks should be removed. Some macro examples include issues such as [Editor's note: none provided]. Other risks are more specific regulations affecting our industry. Other risks include those related to sustainability, [Editor's note: no additional information provided]
- Cannot provide due to corporate policy.
- We quantify the risk of various medical scenarios.
- Regulatory—change in definition of what is covered, impact of regulation on pricing and reserving assumptions.
- Annual review.
- **Demographic shifts—monitor macro statistics versus industry trends versus company trends.**
- **Dislocation of refugees.**
- **Climate change—arctic ice cover, methane release.**
- Scenario analysis to get the order of magnitude.
- Risks are monitored, though measurement and mitigation are not fully tracked over the lifetime of the risk.
- For instance, during 4Q2014 we identified oil price decline as an emerging risk, and we stress-tested our investment portfolio to simulate this scenario. We analyzed how much our portfolio would be affected by such event.
- ERM dashboard used to monitor company-specific risk.
- Each risk requires an analysis, including identification and quantification.
- A team discusses the risks and determines the impact on the viability of the company.
- For cyber, create a permanent position to stay on top of the latest in cybersecurity.
- **Pandemic—risk identified, potential results modeled, mitigation efforts integrated into business recovery planning.**
- **Cybersecurity—risk identified, outside audit conducted, recommendations turned into mitigation strategies, all of which are now in flight.**
- Hydraulic fracturing, Affordable Care Act, global regulatory convergence, climate change.
- Liquidity and contagion risks in financial markets.
- Praedicat helps identify exposure to emerging tort issues. Cyber is more difficult to monitor, aside from headlines.
- Risk report presented to a quarterly Enterprise Risk Committee.
- Creating an operational losses database to identify types of losses, probability (frequency) and impact (severity).
- Quarterly/annual reporting to the board risk committee.

- Low interest rate environment; counterparty credit risk.
- Monitoring changes in regulatory environment, public perceptions of company's value proposition.
- We have a process by which we prioritize emerging risks for further drill-down analysis.
- We've reviewed government shutdown, several technological advancements, consideration of demographic shifts, etc.
- We maintain an Emerging Risk Tracker and have biweekly calls to discuss those risks as well as determine if any new risks should be added or if any risks should be removed. Some examples include issues such as regulatory environment, financial markets and sustainability.
- Cyber, climate change, regulatory risk, nanotechnology. Known-unknowns but not unknown-unknowns.
- Climate change; traumatic brain injury; "man-made" earthquakes; tsunami risk (not new risk, but often overlooked); cyber risk from an insurance perspective.
- I have been concerned in the past about supply chain issues and have advocated ways to diversify suppliers to reduce the risk.
- Tail/extreme scenarios in economic capital.
- We will start a project to support the monitoring and realization of an emerging risk that surfaces if we feel it will significantly impact our business.
- Market volatility, Central Bank QE intervention.
- Assignment of emerging risks to various governance groups/task forces within our organization, e.g., cybersecurity.
- Monitoring of Internet and other media traffic on selected topics.
- Buildup of systemic risk within the insurance industry.
- Emergency/business resiliency plan in case of crisis.
- Tracking experience closely and reacting quickly to experience showing mispricing/Monitoring government proposals continuously.
- Currency shock, interest rate risk, default risk.

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 respondents stating that the question is not applicable to them or they are not sure of the correct response.

- | | |
|---------------|---|
| • 7%/4%/4% | Yes for all |
| • 57%/51%/59% | Yes for some |
| • 35%/43%/34% | No |
| • 1%/2%/4% | 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.

For those who answered *Yes for all*:

- **Change in tax law affecting our not-for-profit tax status. We keep a close eye on the federal government and proposed tax code changes. We monitor legislation.**
- Market metrics on financial emerging risks to measure volatility. Industry research on insurance emerging risks (frequency of earthquakes in areas with hydraulic fracturing such as OK, TX).
- Ongoing surveillance. Industry whitepapers, subject matter experts.
- Daily fluctuation in asset prices, new reports.

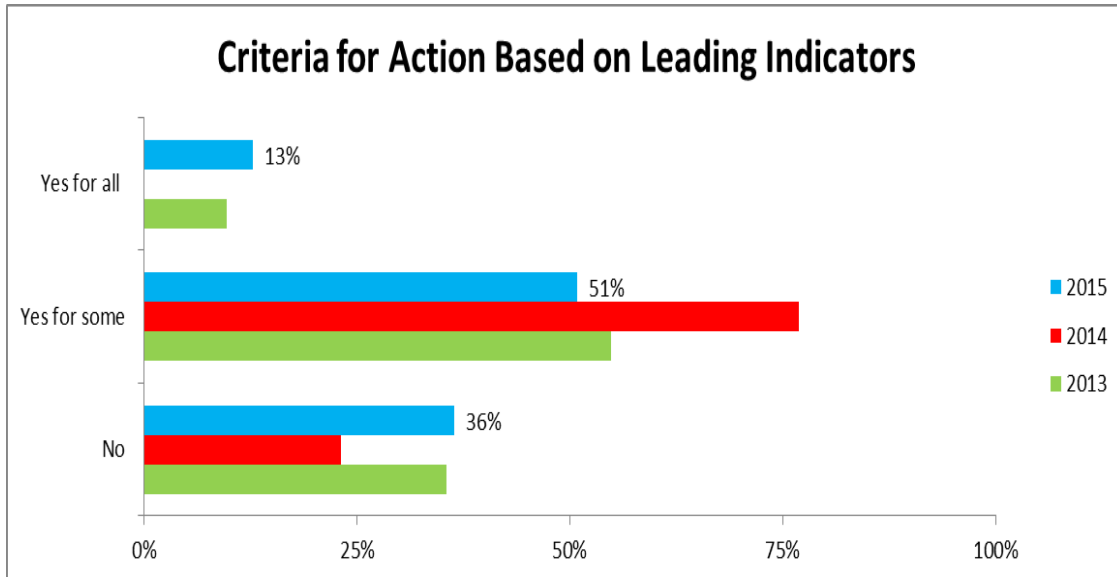
For those who answered *Yes for some*:

- Control weaknesses identified, then look for similar control weaknesses in other similar businesses.
- Various leading indicators used to monitor financial risks.
- For our industry-specific risks, we monitor regulation closely by following the state regulators, meet regularly with state regulators and work with other companies facing the same risks through trade associations.
- Cannot provide due to corporate policy.
- **Articles written on topic—tone of articles (positive, negative)/proposed legislation or stance taken by regulators.**

- War in Mideast.
- Monitor news/reports.
- Media impression count on selected topics.
- Within capital modeling exercises, we try to include the potential impact of indicators to identified risks. This is performed during modeling but not necessarily consistently throughout the year. Resource constraints.
- Risk aggregation methods.
- Follow evolution from an internal and/or external perspective and provide a trend compare to previous quarter.
- Credit risk indicators vary by counterparty/Interest rate risk analyzed by various economic indicators paired with in-house economist opinion.
- Increased claim activity (more of a lagging indicator, admittedly), news, legal environment.
- TBI—legal activity, trade press awareness; likelihood for T-bill yield increases for claims inflation.
- Scenario sets for economic capital to assess probability.
- Can't—Confidential client information.
- Economic indicators, commodity prices, global interest rates, industry credit spreads, stock indices, weather statistics, demographic trends.
- It is confidential to my job.
- Look at kick out rates on identity checks on applications to monitor fraud.
- No systematic approach.
- **During pandemic alerts, monitoring Internet traffic has provided advance warning compared to WHO or other organizations' official statements.**
- Sovereign bond yields, exchange rate derivatives, interest rate derivatives for currency and interest rate risk.

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?

- 13%/0%/10% Yes for all
- 51%/77%/55% Yes for some
- 36%/23%/35% No



Question 7. If yes, please provide examples.

For those who said *Yes for all*:

- First must quantify likelihood and impact. Then look at ways to mitigate exposure (hedging, policy exclusions).
- Can't—Confidential client information.
- **Based on severity and likelihood and the potential impact and current and planned mitigation. Risk committee assesses and decides on the level of action and when risks should be accepted.**
- Asset sales.

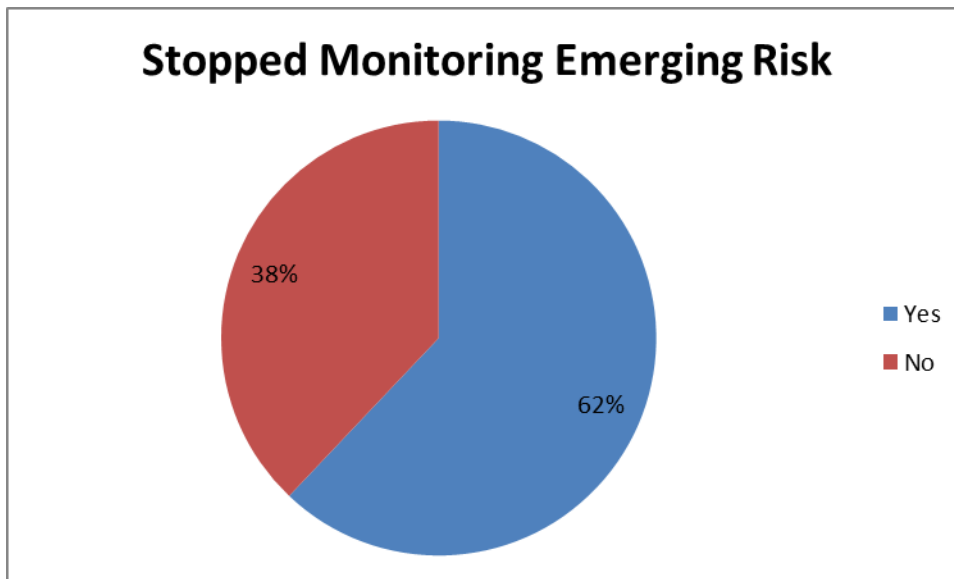
For those who said *Yes for some*:

- Proposed changes to the tax code.
- Various risk limits are monitored anywhere from monthly to annually.
- Cannot provide due to corporate policy.
- Avoidance. New opportunities for refugees.
- Those above a certain threshold.
- Through underwriting guidelines we can mitigate risk. Other risks are managed by appropriate capital planning.
- **DEFCON-type levels are assigned and action steps are triggered as you approach the red zones.**
- Probability of regulatory capital declining below the internal target, decline in book value per share, net operating income per share being below plan.

- **Using the KRIs created for monitoring, we determine whether the action is to reconvene and determine next steps. In the past, we've updated business continuity plans to take into account climate change, for example.**
- Cost benefit analysis and risk appetite monitoring for entering new markets or continuing to remain active in existing markets (natural catastrophes, cyber, medical malpractice, asset risk).
- Diversification of risks across investment portfolio, distribution channels.
- Not formalized but understood.
- Hedging of exchange rates off if parent company currency at risk compared to currency of profit centers.

Question 8. Have you ever discontinued (stopped monitoring) an emerging risk?

- 62% Yes
- 38% No



Question 9. Which one(s) and why?

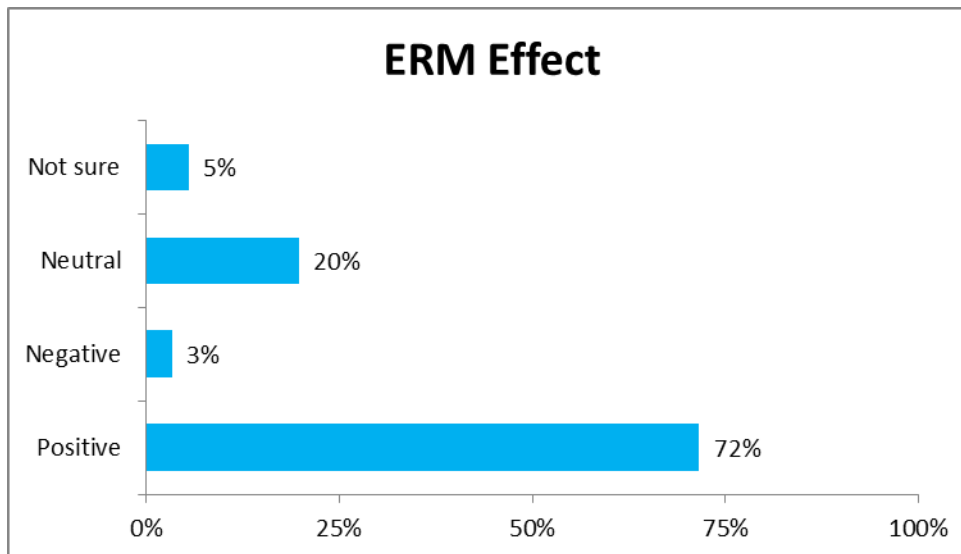
- Not sure, but certain emerging risks will not materialize. An example might be Rule 151A and its impact on FIA products. Once Congress stepped in, that risk went away.
- Cannot answer due to corporate policy.
- Various influenza/pandemic scenarios have been discontinued due to materiality, often replaced by other pandemic scenarios.
- Risk is reduced.
- **Those that are not “yellow” or “red” on our heat map.**

- **When an emerging risk has become emerged, it goes on the emerged or “top” risk list. Cybersecurity may be considered emerged, and cyber terror is emerging.**
- **If the risk has been determined to be mitigated or removed.**
- Housing price collapse. The market stabilized.
- Solar storms; the subject was investigated once and no further monitoring was felt needed.
- Markets that we have exited.
- Water crisis, impact to the company is not material.
- **If position in frequency/severity heat map moves to lower left quadrant (low/low).**

Section 3: Methodology

Question 1. Has enterprise risk management had a positive, negative or neutral effect in your company/industry?

- 72% Positive
- 3% Negative
- 20% Neutral
- 5% Not sure



Question 2. Why?

For those who said *Positive*:

- Improved quality of models and reporting structure.
- **Brings light to previously nontransparent topics and issues.**

- There has been and remains much low-hanging fruit to improve risk-adjusted returns within the industry on the risk side.
- **Increased awareness** and formality of risk management.
- Integration of risk management activities within a formal framework.
- Helped clarify the high-level view of the business.
- Alignment of assumptions.
- Creates more financially sound companies; raises awareness of risk issues; helps create ERM culture.
- Increasing awareness; making risk a consideration as part of decision making.
- Encourages businesses to see the big picture.
- ERM makes our company actually look at some risks that were either ignored or uniformly thought of as being minor. For instance, model risk is embedded in most of our employees' daily lives, but measuring it and validating it are difficult. Before ERM model risk management only existed in pockets of my company.
- **We are less siloed as a company.** Departments are more interactive on ERM. We still have a ways to go to fully incorporate ERM into our strategic processes.
- Instilling greater discipline.
- Better prepared for events. **Better alignment of strategy with risk taking.** More efficient use of resources.
- Created better awareness of the relative size of various risks the company is exposed to. Promotes consistency in risk definitions across the company.
- Created more awareness across the organization. Led to new tools being developed to monitor and mitigate risk.
- It helps us understand which risks we understand and which ones we do not.
- Made us think holistically and start to anticipate mitigation efforts.
- **Requires us to take a holistic view and to incorporate multiple perspectives.**
- Improved understanding of risks taken and taking; improved decision making.
- Encourages thinking beyond the linear planning cycle.
- Helps companies to explain risks to management through identification, quantification/qualification, monitoring, mitigation process. Helps companies to set risk appetite, risk tolerance and risk limit.
- You can't fix what you don't recognize or measure.
- Allocates time and resources to thinking about risks beyond just day-to-day issues and has **facilitated the study of significant macroeconomic events on the enterprise as a whole rather than just its independent businesses.**
- Leads to better awareness of risk in decision making.
- Using risk terminology has helped us to make quicker and better decisions.
- It has helped us find a balance between risk and potential rewards. It enables us to identify potential risks to the organization early and execute our activities in a risk aware manner.
- Help focus on the big picture.
- Creates a more holistic view of the organization and its strategy; greatly improves identification and assessment of risks facing the organization.

- Awareness leads to identification of mitigation actions.
- Increased attention, effort and resources focused on risk management.
- Forces discipline of risk being “everybody’s business.”
- Despite the unclear and inaccurate message that most people in the P&C insurance industry have regarding ERM, it has benefits for our company and industry as senior management becomes more aware of current and emerging risks that the company, industry and world are currently facing.
- Helps us identify, monitor and quantify risks.
- Coordinates the emerging risk discussion by leveraging cross-functional expertise across the enterprise.
- More work and solution needed for client.
- We have been more intentional with regard to procedures and processes that monitor issues prior to them becoming an item for urgent attention.
- Acts as a second line of defense. Not influenced by the lines of business as income generators.
- **Great discipline and prevents creating errors of the past. Less aggressive behavior.**
- Risk identification, planning and management have begun to permeate our corporate culture.
- We’ve changed some mitigation strategies.
- It engages all management members and some other employees into thinking about their jobs from a different perspective.
- Risk assessment consolidation provides long-term benefits.
- We have started to create a culture focused on managing risks.
- Raises awareness and forward thinking. Allows some reaction time to handling emerging risks to the extent that they have been properly identified and studied.
- It has given us a framework to identify and evaluate new and emerging risks.
- Provides a structured forum and framework to identify risks and plan accordingly.
- Better understanding on future viability of company
- It makes companies consider the interrelationship of their risks and what can go wrong.
- **Board of directors has quantified risk appetite and tolerance, which has helped us by establishing a “boundary” in several areas, beyond which we will not go.**
- ERM has brought threats and opportunities to the attention of company executives that, through identification and management, have helped produce more consistent results.
- Investment management is made better when taking a risk management perspective. We earn a return by exposing ourselves to risks we want, and we preserve capital by hedging against risk we do not want
- **Raised awareness. Changed the corporate culture.**
- Our company puts more thoughtful consideration into identifying and addressing potential threats.

- Brings value in understanding, quantifying and monitoring risks.
- Forces the quarterly discussion around risk tolerances.
- Raising the level of risk awareness and risk consciousness locally or across the industry is a positive.
- Forced us to be more complete in our risk analysis, with a more active dialog. It previously was a focus but without as strong a communication process outside those immediately involved.
- **Development of tools and models to understand the interdependence or risks.**
- Risk awareness.
- Forced a common understanding and language for describing risks facing the firm.
- ERM processes encourage company managers to consider potential risks to the company and how the company would/should respond.
- Because it allows us to look at the entire portfolio of risks we undertake, their diversification, correlation and any undue concentrations that would be missed in a “silo” approach. Looking at individual risks in a first line of defense is important, but it must be supplemented by a holistic ERM view in order to properly manage the risks across the enterprise.
- Imposed a discipline
- It supports anticipation of risks, which is useful for building resilience and identifying opportunities.
- Brought risk into a discussion that had been primarily sales vs. expected profitability.
- Enterprise view rather than siloed view.
- Improved risk culture, risk awareness and risk mitigation.
- More awareness of risks results in better decision making, even if not directly quantifiable.
- ERM has the ability to connect different businesses and functional areas and drive appropriate conversations around emerging and other risks. Quantification efforts are just one piece of the puzzle. **Especially with emerging risks, often the qualitative scanning, assessment and monitoring are more important**, with quantification to follow, influencing decision making. Knowing when and how to balance speed and precision is key to quantification. Clear communication and appropriate governance are key to qualitative assessments.
- More thoughtful of risks that might otherwise be off the radar; more thoughtful about the potential interconnectedness of risks both across lines of business and across different types of risk (e.g., insurance, investment and operational).
- My industry is insurance and risk is endemic. Formalized processes have had a major and positive impact.
- Slightly positive, as many large companies are applying it, but I am not sure how conscientiously. **I do not think small companies are embracing it at this time.**
- Structured approach to identify, measure, monitor, mitigate and report on risks.
- Additional consulting opportunities.

- Increased our risk awareness and provided guidance to management.
- More transparency of risks that could impact global economy, implications on business and investments and alignment of business and risk teams in terms of possible action items.
- Strengthened internal processes and policies around risk.
- Informed decisions about mitigation, controls and business strategy.
- The parent company has introduced risk committees.
- Leading to a consistency between risk appetite and risk strategy.
- **Better strategies up front mean less problems later on.**
- It has been improving awareness of risks by management so that decisions are less likely to put the company in a precarious position. A more complete spectrum of risks is considered.
- Raised the awareness of risks and motivated discussion and actions to manage them.
- The risk management culture has grown at least a little bit outside of the areas traditionally looking at risk.
- **Allows for more objective decision making. Quantification allows the company to determine the magnitude of the risk, not just that it exists.**
- Better matching of risk/return.
- More structure and conversation about risk—both traditional and emerging.
- It brings risk to the attention of company leadership.
- Keeps us forward focused.
- Forces executives to think about their businesses.
- Forced quantification, strategic planning.
- Encouraged regulatory discussion around the “real” risks.
- Forcing companies to look at all actions on as they impact the entire company, rather than by segregated areas.
- Awareness and accountability.
- Thinking about risks at a global level has helped management to get a broader understanding of the company and how we can survive any crisis.

For those who said *Negative*:

- **Shifted focus from using reasonable assumptions to using overly optimistic assumptions. Much more focus on “governance” at the expense of accurate risk analysis.**
- ERM has not been taken seriously enough by senior management to commit the resources necessary to ensure appropriate risk assessments are in place. As a result of this, many of our internal capital risk factors have been determined on ad hoc bases for which there is substantial cultural inertia against changing once established (regardless of the roughly dartboard method by which some of them were created).
- Inordinate amount of effort for no meaningful change in risk profile.

- **More “box-checking” activities than value-added activities were added.**
- Poor understanding within the company/industry as to why it exists and how to use it.
- **ERM approaches too costly and misused for political purposes.**

For those who said *Neutral*:

- Management of risk is in our culture—not convinced that a formal ERM program has enhanced that materially.
- Still in the buildup phase, but awareness has increased.
- ERM is not important to upper management.
- ERM hasn’t come up with enough viable, actionable solutions to managing the company’s risk. As it is implemented here, **it mostly serves to add more bureaucracy and slows down development time.**
- Enterprise risk management is not a uniform, off-the-rack product but a tailored product suited to particular client objectives and associated risks.
- Not fully realized yet.
- Due to conservative nature of company and market, some natural limits to risk exposure were already in place. Quantifying the risk per ERM has not dramatically changed, yet, how we do business and what we monitor.
- Key risks were already considered.
- ERM is new, little impact so far.
- Don’t take it seriously.
- Retired.
- Too much discussion and not enough action.
- Lacking good quantification.
- Management has not made different decisions in light of ERM protocols and findings. Furthermore, ERM has not influenced contingency planning or any other action . . . or having a rapid response available should an event emerge.
- Limited use of risk models due to (1) the risk models tend to be too top-down, (2) awareness.
- **Too many scenarios and too much emphasis that today is bad as opposed to today is the new norm and things could improve or go to hell in a handbasket.**
- **Area operates in isolation within our company.**
- ERM is the management practice du jour, elevated to a mandated or regulatory requirement. It is fashioned by financial models, yet so little of practical risk management within insurance is amenable to these models. Instead, risk management is more commonly a repackaging of long-standing, good business practices. The potential value of ERM is not in doubt. But this potential comes with a cost, measured not just in overhead, but practices that have gone awry or blown up despite or even because of the belief in having the best or most sophisticated ERM practices.

- We are living in an emerging market and business development is more important than risk management sometimes.
- In Mexico the risk management is focused in compliance and regulation.
- The concept of risk and reward balances the overall impact to our company and industry.
- The capability is not well developed and results are opaque.
- I am not a risk manager.
- Not yet fully embedded—still seen as academic exercise rather than important to the business.
- My company is active in risk business (so ERM is positive as it gives us business), but I don't think our company is ready to face risks.

For those who said *Not sure*:

- Actually both positive and negative. Positive impact in understanding risks internal and external to industry and broader focus on risk overall. However, some risk models are extremely complex and **at times, I feel it is more a modeling exercise than something truly insightful**, and there is a **lack of individuals within senior management to challenge some of the assumptions/models**.
- It is not monitored.
- ERM effort in the country is still in its infancy.
- Have no idea how well it is being done or if it has changed anything for well-run companies.
- Effective risk management can (and does) have positive effects but is very expensive to do well. Measuring the overall net value is challenging.
- I have not seen corporate changes stemming from the ERM committee's listing of risk.
- Easy for ERM to leave important other parties out of their risk analysis. They can focus on the wrong risks by not bringing SMEs into their discussion.
- It has not yet been properly implemented in the industry.

Question 3. Under what circumstances have quantification efforts enabled better decision making?

- Evolution of catastrophe modeling tools has greatly helped the P&C industry make better quantification of risk.
- Financial risk for sure, beginning for operational risk.
- ALM/duration-matching.
- When there is a reasonably well-accepted method to quantify risks.
- Internal model results informing pricing in areas where statutory capital requirements are not granular enough.
- Not privy to decision-making initiatives.
- In the context of regulatory requirements for ERM and ORSA.

- Lends support to decisions; decisions not made in a vacuum.
- Seeing the impact of certain risks in a stressed environment has led to discussions about level of risk and either agreement that it is acceptable or actions taken to mitigate further.
- **We have been able to geographically sell certain products to certain markets that are more profitable. We have also been able to get out of some markets after doing extensive modeling and seeing we have greater risks than we want to assume. We have also been able to curtail our reinsurance treaties as analysis has been done to better understand the financial impact.**
- Few because quantitative efforts generally have too long a duration from identification of risk to measurement of risk. Quantification in conjunction with other efforts is much more effective than quantitative analysis in isolation.
- Led us to curtail premium flow on a specific line of business.
- Better understanding of capital-adjusted returns.
- Better choices on reinsurance (as an example).
- **Using key rate duration to talk about interest rate risks.**
- Assessing segregated fund guarantee designs.
- Allowed us to have better look at big picture impact of risks. Impact to capital, earnings.
- None.
- **Quantification focuses efforts. Even if not everything gets the attention it deserves, at least some get some attention.**
- Risk-adjusted returns.
- None of the serious quantification efforts have changed judgments on material risks.
- Improved capital allocation.
- Macro hedging.
- Allowed for better asset purchases.
- Volatility of GAAP earnings modeling confirmed that our strategy called for unrealistic amount of risk.
- Able to see the impact to the bottom line.
- In deciding which products to issue and how to price them.
- In terms of understanding the changes in concentration of portfolio, volatility of return and likelihood of project success.
- Quantification has allowed managers to make thoughtful, long-term strategies to de-risk and manage long-term risk/return.
- At the aggregate level this has improved, but at more granular levels nothing has changed much.
- We already have a good structure to quantify financial risks, need to expand to operational to understand if that enables better decision making.
- It helps us better understand how much risk we are willing to take and what mitigation steps are needed to reduce or eliminate risks we are uncomfortable with or are unsatisfactory to the regulators.

- I have seen too much time quantifying the risk and not enough spent on avoiding/mitigating the risks.
- Difficult to pin.
- Quantification of financial risks coupled with short- to medium-term product planning horizon leads to optimized hedging strategy.
- **Strategic planning taking a longer-term perspective and establishing policies for how to react or manage and mitigate impact of identified scenarios.**
- Risks where data and models are validated and useful, and within the observed part of the probability distribution (e.g., 50th to 90th percentile).
- Almost all.
- Tools and techniques such as stress and scenario analysis and economic capital modeling have enabled senior management to realize the impact of undesirable events. Although these numbers are treated as aid to decisions and the uncertainty around these numbers are clearly articulated, it has helped visualize the potential risk of such events.
- None.
- Pricing, reinsurance purchasing.
- Acquisition, market risks.
- Awareness of how large some potential risks could be.
- More discipline in pricing.
- Precious few. Reliance on financial engineering scares the daylights out of me due to counterparty risk.
- Depends on the emerging risks.
- None so far.
- The use and analysis of industry data, reinsurance analysis and benchmarking against competitors have given us a better understanding of the risks we are taking.
- **Better understand what risks are wanted, acceptable vs. not wanted.**
- Not there yet.
- When the data is adequate enough to do the quantitative analysis.
- Utilization of databases that are from different areas of the company used to come up with a better comprehensive viewpoint on the numeric result.
- When you understand what you are trying to measure.
- Capital modeling is a perfect example. Allows us to determine if we are properly positioned to withstand certain events and if possible we can reflect on desirable risks and which to avoid.
- When determining how much reinsurance to purchase and our mix of investment assets.
- Capital modeling.
- Effective scenario planning.
- **We have pushed countrywide risk tolerances for natural catastrophe perils down to states and metro areas to help us monitor exposure concentration at a more granular level.**

- **Two circumstances: (1) threats perceived to be significant were shown to have negligible impacts; (2) quantification efforts highlighted the cumulative long-term effects of threats that involved comparatively small short-term incremental impacts.**
- Market risk analysis; marginal VaR ranking as a way to quickly reduce portfolio risk.
- Capital management.
- Better identify new opportunities for risk transfer or which specific risks to avoid altogether.
- Every circumstance.
- Better understanding of catastrophes and behavioral risks—quantification allows to identify risks that truly are impact, based on data, as opposed to anecdotes.
- Scenario testing and stress testing help to change perceptions of the risk into something more tangible and more easily discussed/debated/communicated internally (particularly with folks without an actuarial background).
- The main benefit is less from pure quantification and more from trends in the rough quantification, i.e., directional trends, not absolute amount. This helps us monitor catastrophe exposures and various other exposures via scenario testing (such as inflation risks).
- **Allowed us to understand indirect impacts.**
- Quantification efforts have not enabled better decision making yet.
- When there is a lot of information about risk factors.
- Enhanced and identified new opportunities.
- **None—quantification usually doesn't apply where we're simply avoiding risks.**
- Development of tolerances for easily quantifiable risks enables better decision making.
- Quantification efforts help determine which risks deserve the most attention or action.
- Understanding the economic view of risk and the diversification/correlation of risks has opened the eyes of leaders to the “true view” of their risk profiles.
- Concentration of risk/Correlation of risks.
- Prioritization.
- Product pricing, investment strategy.
- Considering interest rate risks.
- Risk appetite, benchmark pricing tools, risk/reward metrics.
- Improved transparency of risks for executive suite and board.
- Assessment of potential new business lines and of which existing lines should be grown or shrunk; assessment of potential new investments; assessment of appropriate level of ceded reinsurance, and potential impact in differences in coverage between business written and ceded.
- Better risk simulation tools such as economic capital models are the best example I can think of.

- Some reinsurance decisions have utilized the results of quantitative models.
- Economic capital giving insights into economics unlike STAT or GAAP.
- Can't provide examples—Confidential client information.
- Visibility to key risk indicators has improved decision making.
- Business planning and asset allocation tail risk assessments.
- Only aging analysis of business has really done anything to help with decisions.
- Asset/liability management.
- The actuarial pricing of products has been improved.
- Risk monitoring and relating the limit to the risk tolerance.
- They have not.
- Better hedging of financial risks.
- Amount of certain business we allow to be issued; better ALM practices.
- Deciding whether to launch a new product balancing synergy of sales against direct profits. Knowing how great a quantity of illiquid assets we can invest in.
- **Even if quantification is not precise, relative impact of risk enables better ability to articulate trade-offs when making decisions.**
- The process raised certain risks that had not been visible to the risk management teams, until somebody outside of that team raised it via the ERM process.
- Interest rate mismatch has been reduced due to the quantification of the potential loss from falling interest rates.
- Quantification has helped determine levels of liability insurance. It has helped leadership focus on the risks that pose a greater financial threat. It has helped identify areas where improvements can be made to reduce the potential impact of the risk.
- A more holistic approach to capital allocation.
- Lot of work around catastrophe management.
- Analysis of surplus and asset risk has enabled better decisions regarding acquisitions and new ventures. Quantifying risk exposure concentrations has enabled better decisions regarding reinsurance and diversification.
- **We all respond better when there are metrics measuring what we do.**
- Capital allocation and product focus.
- Increased awareness.
- Understanding impact of interest rate and equity markets on multiple product lines enables more effective and efficient hedging.

Question 4. Under what circumstances has qualitative analysis enabled better decision-making?

- Under most all circumstances.
- Not sure.
- **Bringing attention to risks, such as cybersecurity, has enhanced priority and focus.**
- General awareness and discussion.

- Independent review of business proposals by team of experienced specialists.
- Not privy to decision-making initiatives.
- None.
- Raises awareness among management and board of directors.
- Qualitative is harder but I think where this has played a role is in generating awareness.
- Qualitative analysis has produced emerging risk reports. This has enabled us to figure out the direction we want to go into the future knowing what risks are on the horizon and the magnitude of those risks.
- Most group decisions require discussion of qualitative considerations.
- With our business continuity work and preparation for disaster recovery.
- **Project discipline—clarity of risks, particularly common understanding of likelihood/impact.**
- Pretty much every decision.
- Operational risk identification and assessment has helped management define and prioritize mitigation initiatives.
- Enhanced the discussion process around certain risks.
- None.
- Focus on underwriting result.
- Only for risks that were not identified under the prior regime.
- IT security.
- Don't know.
- Allowed for quick decision making.
- Reduce concentration with single manager.
- Able to see significant impact the company even though the amount is small.
- In terms of understanding the potential events that could reduce profitability or slow down progress.
- Qua
- **Increased requirements to at least think about risk has led to better feedback loop.**
- At a high level we have looked at a qualitative assessment of risk that impact successful execution of our long term strategy. Still a work in progress, working on building out KRIs to help inform.
- **It has enabled us to have more frequent and deeper discussions around the emerging and current risks we face.**
- See below.
- Prepare executive management for possible surprises.
- Risks lacking meaningful data or models, and tail risks of all types.
- **For those which cannot be quantified (e.g., reputation risk).**
- **Assessing risks where data is not available such as in the case of drones and cybersecurity.**
- None.

- Strategic, operational risks.
- Awareness of downstream impacts of some nontraditional risks (i.e., 3D printing, drones, legalization of marijuana).
- Not sure.
- Depends on their acceptance.
- None so far.
- When the imagination of unforeseen risks results in protections that appear worthless when initially created.
- The use of publicly available competitor information, vendor information and analysis. Giving us an outside look at ourselves.
- Mitigation strategy.
- When there is not enough data to do the quantitative analysis.
- **The more diverse the population of the group, the better the opinions of the members help to hone in on the proper decisions.**
- When you understand what you are trying to assess.
- This is a circular process. Identifying risks qualitatively leads to quantification which in turn allows us to make qualitative decisions based on the results. Identifying the risk and placing a rank on the risk go hand in hand.
- Determining the impact of a new policy system.
- Capital modeling.
- Qualitative analysis has helped us to filter the risks we face and prioritize which ones are material enough to spend time and effort on.
- **Separating emotion from decision making.**
- Strategic management.
- Better identify new opportunities for risk transfer or which specific risks to avoid altogether.
- Every circumstance.
- Qualitative brainstorming helps identify missing risks or things that we have not always thought about as risks.
- See answer to #3.
- **In evaluating soft risks such as bench strength and hiring quality.**
- Brought multiple functional areas together to discuss risks and implications of decisions.
- Helped in prioritization of capital allocation.
- When there is not enough data to quantify a risk.
- Focus on the objective vs. subjective.
- Not applicable.
- **For operational risks and other risk events that are harder to put numbers to . . . it is necessary to provide qualitative factors.**
- Qualitative analyses have highlighted areas of opportunity within the company to become better at what we do and/or offer.
- Certainly the emerging risks discipline has done this.

- Transparency.
- Regulatory change risk.
- Considering regulatory/governmental risks.
- Account level underwriting.
- Assessment of potential new business lines; earlier identification of business units that could generate unexpected risks/losses.
- Social and governmental risks.
- Anticipating economic and tort trends has assisted with pricing and reinsurance strategies.
- Consistent operational risk self-assessments with standard measures of likelihood and impact give good ORM overview for prioritization of resource allocations.
- Can't provide examples—Confidential client information.
- Business planning and asset allocation tail risk assessments.
- Rarely, if ever, on its own.
- Strategic marketing.
- Leadership culture includes prioritization of risks.
- Operational and strategic risk.
- They have not.
- Regulatory risk monitoring,
- None that I can think of.
- Understanding dynamic linkages between market participants enables anticipation of the types of outcomes that are possible, even if probabilities cannot be placed on those scenarios.
- Focus on cyber risk and privacy as emerging concerns for the business.
- **Qualitative analysis has allowed experts throughout the company to voice their concerns over risks that might not have been on leadership's radar. It has also encouraged diverse areas to work together to reduce risk and better understand how the company operates.**
- Most internal model outputs can't be taken too literally—very volatile and don't consistently produce reasonable looking results
- It is important to have qualitative measures as many elements of risk management are hard to measure quantitatively.
- All?
- Pandemic pricing for life insurers is now included through capital.
- Unknown.

Question 5. Under what circumstances has a combination of qualitative and quantitative analysis enabled better decision making?

- Not sure.
- **Independent review of business proposals by team of experienced specialists, supported by impact analysis using economic capital model**
- Not privy to decision-making initiatives.

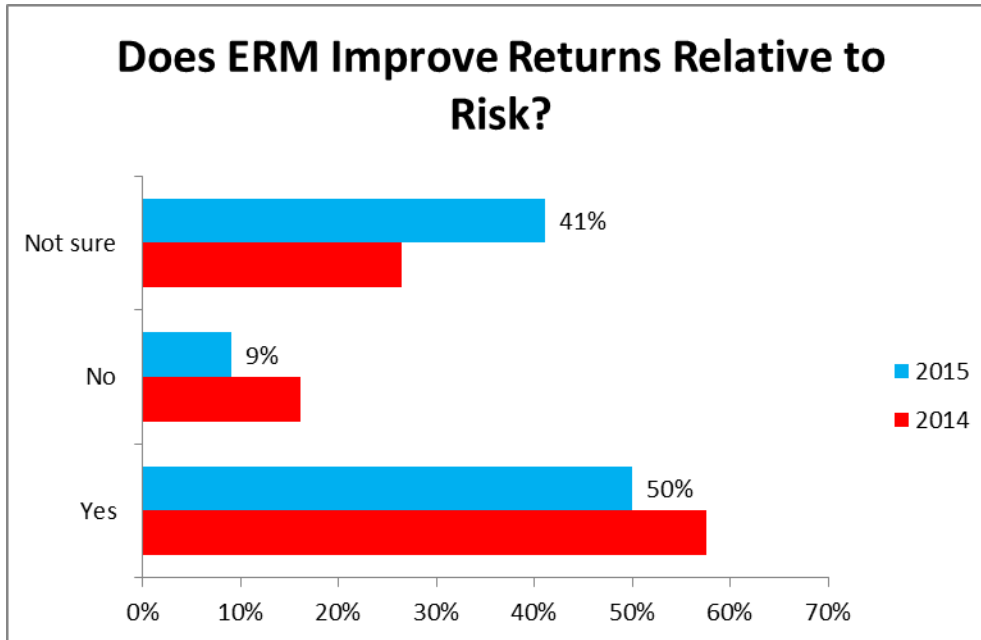
- None.
- Raises awareness among management and board of directors.
- **I think under all circumstances as risks are never black and white and performing so a combination of both helps to put risks into perspective and you can then discuss under which circumstances the impact may be worse.**
- Model validation includes both qualitative and quantitative analysis. We now have better alignment within the company on our methodology and assumptions because now we have teams that are seeing a large amount of models and comparing them across the enterprise.
- The real issue is value of better information and its relation to cost of discovering and communicating additional information—a crucial portion of the actuarial curriculum in the last millennium.
- We're not there.
- Reinsurance.
- Creating awareness of the importance of managing operational risks.
- Entire ORSA process has made us a better organization with tools to assist us in making better decisions, more informed decisions. This is as a result of both a qualitative process and quantitative as well.
- None.
- Since not all risks are easily quantified, qualitative efforts help move thoughts toward a more complete framework.
- Several circumstances are certainly possible for this to occur, but none have occurred at my current employer.
- Decisions to enter new territories or lines of business need a mix of qualitative and quantitative analysis.
- Don't know.
- Allowed for greater authority to aid in timely asset purchasing.
- Allocation of high risk, high return asset classes.
- The two combined allows companies to make better decision.
- ?
- It has enabled us to identify our highest risks and develop a plan to mitigate those risks to an acceptable level.
- Risk dashboard that is aligned with senior management targets and metrics.
- process improvement to prevent some risks realization when the qualitative assessment pointed to the largest potential negative impact.
- Integrated scenarios.
- Lead to discussion and readiness among executive leadership at an enterprise level.
- This combination may enable improved decision making relating to tail risks.
- When looking at ERM.
- When data is available but quantitative output is believed to be misleading and when quantitative impact seems to be unreasonable given its probability and the exposure of the company to certain risks.

- None.
- **The advantage of attempting both quantitative and qualitative analysis is that we are able to remove the geeks from the numbers a little and the theory people have to observe reality. Given that ERM types of approaches have now had several years to mature, we have the opportunity to go back and look at prior projections and bring some humility to the fore.**
- Depends on acceptance of extreme likelihood of the risk.
- None so far.
- In the type and amount of reinsurance purchased.
- See above.
- When the data is not so adequate to reach a 100% reliable conclusion but some valuable suggestions.
- **Reverse stress testing is a good example. Identifying unusual risks that we don't always consider that may impact a book of business and then quantifying the impact as well as interaction of risks, until a plausible but highly improbable scenario is created, challenging the solvency of the company. This is studied and mitigation efforts are suggested and discussed.**
- When evaluating a new business venture.
- Capital modeling supplemented by scenario planning.
- Usually it has been one or the other approach.
- Managing through volatile markets—having a game plan to reduce risk, but also staying calm and taking advantage of opportunities.
- Pro forma planning.
- Better identify new opportunities for risk transfer or which specific risks to avoid altogether.
- Every circumstance.
- It's best to qualitatively identify risks and unintended consequences, and then quantitatively measure probability and impact of each, confirming or updating risk severity.
- For certain risks, the combination approach is superior due to the difficulty (i.e., subjectiveness) of the quantification.
- It's important to keep in mind that quantitative tools are based on a number of assumptions. Those assumptions and sensitivity of results need to be kept in mind when reviewing model output. The quantitative analysis can help with the big picture reasonableness.
- Helped in prioritization of risk mitigating actions.
- For hard problems, when there are as many advantages as disadvantages in every solution.
- More and better quality information.
- Scenario analysis.
- Prioritization and transparency.
- Reputational risk.
- Interest rate risk, climate change, etc.

- Book of business underwriting.
- Climate change.
- Formal models along with risk appetite analysis has assisted in underwriting, decision making.
- Consistent operational risk self-assessments with standard measures of likelihood and impact give good ORM overview for prioritization of resource allocations.
- Qualitative information always improves quantitative analysis and may be better by itself.
- The depth of management discussion has been enhanced.
- Business planning and asset allocation tail risk assessments.
- In some cases considering both together has resulted in decent decision making. The GLIB industry has very limited data and not much cycle time of observing contract owner behavior. That aspect should improve over time.
- They have not.
- Cybersecurity.
- None that I can think of.
- **This is the situation in most types of risks that have strategic impact—a lot of qualitative analysis supported by quantification where available. For example in deciding on launching a new business initiative.**
- None to date.
- See 3 and 4.
- In some cases, such as information security, qualitative analysis may be used to monitor actions taken to reduce risk and the processes in place to limit risk. Qualitative analysis is used to determine the potential impact of a security breach along with its probability distribution.
- All.
- Each major decision is put through a risk assessment process to identify risks and the appropriate mitigation. The process covers both quantitative and qualitative analysis.

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

- 50%/57% Yes
- 9%/16% No
- 41%/26% Not sure



Question 7. Why or why not?

For those who answered *Yes*:

- brings light and organization to selected areas.
- ALM.
- ERM helps avoid or mitigate risks outside of risk appetite by developing an integrated view of risks faced by organization, including interactions, as associated risk management activities.
- Better view from rating agencies' perspectives.
- Allows for risk adjustment in metrics; more appropriately / efficiently deploy capital.
- **Yes because you should be rewarded appropriately for taking risk. If you aren't then you need to ask why you are taking the risk. Ultimately this should lead to better decisions that improve returns and value.**
- Allows for all risks to be aggregated together, and to consider how risks impact each other.
- Otherwise, risk taking is dumb luck. Blind risk taking (without ERM lens) will either take too much or too little risk.
- Mitigation efforts can be focused upon.
- **ERM makes it harder to gloss over risks that are unusual or difficult to quantify.**
- At the very least, it provides insight into what should be of concern, and if that segment should still be pursued. It can help limit the downside of the risk, so on average, would keep it more stable and less likely to be negative.
- **Better risk understanding correlates strongly with better decision-making.**

- Just by putting some attention on risk areas it naturally leads to de-emphasis on those that are also less profitable.
- Better balance risk and return measurement.
- **You avoid selling unpriced for risk—you aren't necessarily able to price for risk that is par for the course.**
- It includes the amount of risk that will be incurred to get a certain return in the decision making process.
- **A more deliberate allocation of capital occurs when an ERM department can act as an independent trusted advisor to the senior most management.**
- It allows us to make more informed, risk based decisions which mean fewer surprises and satisfying the needs of the regulators. With the growing number of audits in our industry, this means less money is spent on manpower to handle audits, reduced legal costs and the reduction or elimination of fines or other sanctions.
- Minimize risks, help choosing projects or initiatives.
- At the very least, having risk-return information at your disposal allows leadership to make an informed decision.
- Can begin to identify how better to allocate capital against risk.
- In theory it does. However, I believe it is too early to answer this question accurately as most of the ERM practices in the industry as more for regulatory purposes (NAIC ORSA, Solvency II, GSSA and CISSA in Bermuda and so on).
- From a different perspective, it does because a rating upgrade in ERM has a positive correlation in earnings.
- Implementing is the key term here. One could argue that a successful implementation of ERM may lead to a stronger franchise. However, it may also lead to some short-term strain. If the enterprise is not willing to engage the ERM principles and face short-term strain, the relative risk of the enterprise is virtually unchanged . . . and risk/value equation unchanged for short and long term.
- Awareness across the company of potential emerging risks and in-depth discussion across cross-functional committees.
- By identifying concentrations of risk ERM can point to growth opportunities that don't add to volatility.
- **Risk could only be felt in the past, but it can be counted now.**
- Better decision making.
- Able to make better decisions on where to invest capital in the firm.
- Better risk decisions lead to better results.
- Taking a portfolio view of risk highlights the contributions diversification makes to the mitigation of risk and typically results in smarter reinsurance purchases that provide more effective protection for less money, thereby increasing returns relative to the amount of risk.
- A holistic approach to risk analysis allows companies to better understand their risk profiles and deploy capital accordingly.
- Studies have shown positive correlation.

- Companies used to focus on returns and give little attention to risks. ERM provides a framework to include risks, including financial impacts, to include risks in decision making.
- With a better assessment of risk comes a better return on it.
- It improves the range or the profile of the returns by helping to avoid certain negative outcomes.
- **ERM drives coordinated efforts across the enterprise.**
- Greater RAROC on portfolios.
- Informs decision making which should produce better decisions.
- Because it forces companies to take a more holistic view of risk, allowing them to diversify risk properly and better assess profitability.
- Enables risk taking with greater confidence and helps maximise the chance of success.
- **ERM is able to leverage diversification on a broader scale which leads to improved risk adjusted returns.**
- Helps identify policies / business lines written that do not make sufficient contribution to return given their risk profile. / Helps in attributing capital to business units, so they can be equitably assessed on a RoC basis. / Helps in purchasing appropriate reinsurance / Helps assess which new business opportunities are most likely to generate sufficient return for their risk profile
- History shows that huge losses have occurred from foreseeable perils.
- Better assessment of risk return. Links to company strategy through the risk appetite statement (with risk limits and preferences) enable better and quicker decision making by predefining what the organization is willing to accept in different strategic initiatives.
- It helps to ensure that we are managing within our risk tolerance levels.
- Protection of capital by quantification of risk and dynamically adapting our risk budget and hedging tail risk has limited losses during periods of financial market distress.
- Because it becomes a conscious goal to do so.
- **Without ERM, you can get lucky or unlucky. With ERM, you have a better shot at understanding the range of outcomes (returns) and the reasons/drivers that can help you achieve them or that can be obstacles (risks) to achieving them. You still need some luck, but luck favors the well prepared.**
- Better risk awareness, capacity to quantify risks and understand the risk return profile of each decision
- More information, on an informed basis, is generally a good thing, as long as it's taken seriously and communicated properly.
- Part of the decision-making process.

For those who answered *No*:

- Upper management view is short-term focused and almost 100% insular.

- See previous comment regarding insufficient commitment to ERM by senior leadership.
- Already considered prior to formal ERM.
- **Usually no improvement to returns due to override by management judgment/executive decision. Management tends to “pick and choose” which items it wants to measure/manage and to take actions in a more demonstrative manner rather than an efficient one. Also, many exercises are aimed at measuring risk rather than mitigating it.**
- Limited use of risk models.
- Not if already have a good analysis and decision-making process. If not may be helpful if used but then how/where are decisions being made?
- Not yet, but we have high hopes.
- **This exercise is an expense to the company. The purpose is not to provide a return but rather to alleviate potential severe loss. In the long run, it should produce financially sound organizations but does not produce immediate economic gain.**
- Improved company returns have usually been allocated to other interventions and the amount of risk is not readily available to be able to confirm the statement.
- It is not well-developed here. In theory you should get a better risk-adjusted return in comparison to an “untreated” return. In reality, ERM is not well enough developed to accomplish anything close to other things we are producing.
- **Better decisions at a higher cost.**
- What to measure and how to measure it is yet to be determined.
- While we do risk identification, I am not sure that we have done anything to affect the company’s return on equity as a result.

For those who answered *Not sure*:

- **ERM needs to be embedded into value added decisions at the first line of defense, often times it becomes a “check the box” type of exercise that is the responsibility of the second line of defense.**
- It would vary by company and the company’s previous positioning.
- May increase returns simply by avoiding major losses or pitfalls.
- Regulatory pressure has increased the ERM department. It has yet to be seen whether increasing head count is really increasing returns. My guess it will increase returns in the worst case scenarios, but under status quo it is a large expense.
- **Read “not sure” as “depends.” The question is like ask whether pinch hitting and/or relief pitching improve baseball results—depends on who the hitter/pitcher is and who is playing on the other side.**
- We have not done a thorough analysis.
- It should, but we’re not in a position to quantify.
- It depends on how well the ERM framework is integrated into the underlying business processes vs. being a compliance add on. To be effective, ERM needs to

- be integral to the business decision process, not simply measurement and reporting after the fact. Further, regulatory capital requirements tend to be more conservative than a company's view, and thus a constraint for company returns.
- Our enhanced tools have not been used long enough to provide a response.
 - Not developed enough at this point to accurately assess impact.
 - Unclear whether the ERM aspect was any different than normal anticipation of possible outcomes. No special or extra work done "because" of ERM. Perhaps we either aren't "doing" ERM or have "always" done it.
 - Not sure if the cost is worth the effort on many things.
 - I would like to think so, difficult to prove out.
 - It seems like it might enable better risk/return results, but doesn't assure it.
 - Too soon to know.
 - Too soon to tell. If done properly, should improve risk-adjusted returns.
 - ERM tends to cause us to go for long term solutions but it also tends for us to look at long term trends as possibly manageable. Not sure that is an appropriate conclusion.
 - Hasn't really been implemented in our company.
 - Too soon to be realize for us.
 - I don't know if we can calculate an answer to that. I would like to think that returns are enhanced, but proving so is difficult.
 - Too soon to tell.
 - It should help avoid or mitigate risk, but whether it helps overall returns for a given risk is a relative term. The potential for improvement depends on what was there before the formal ERM process.
 - It is hard to directly correlate the impact to capital as a result of our ERM program.
 - Effectiveness is highly dependent on the quality of implementation.
 - **It's difficult to measure things that don't happen.**
 - Implementing ERM has resulted in increased focus on ROE, but perhaps taken focus away from maximizing operating profit, subject to constraints. This has resulted in increased ROE, but shrinkage.
 - I think I need more time to see actual results from current strategies.
 - This is almost impossible to determine unless the event for which you are monitoring occurs, and then the evaluation usually is subjective.
 - Commercial/financial goals can still overrule risk concerns, but at least the decision makers are now better informed than before.
 - My organization is not yet mature enough in risk management practices to have demonstrated success.
 - It needs to be implemented effectively before company returns are directly impacted.
 - Not yet embedded in culture with enough significance.
 - It has not yet been properly implemented in the industry.

Question 8. Are there lessons learned that you would like to share with risk managers developing an ERM framework (e.g., what worked, what did not)?

- **Baby steps.**
- **Make it company-wide, not just in the hands of an ERM department.**
- Proportionality in application for ERM helps show that ERM adds value. Embedding ERM in management of business supports improvements in risk culture within organization.
- Not enough information.
- Not at this time.
- Challenge in the future is to make sure ERM is not just a fad or regulatory exercise.
- **I think the key is culture—you can develop a great governance package but if you don't get everyone aligned and thinking about risk, you can still fail. Tone from the top is also important—the board and senior management need to be engaged.**
- Look at interactions between risks that are usually independent of each other.
- Worry more about getting people involved and thinking on their own than the purity of the logical structure.
- **Perseverance and try to make it as simple as possible to meet audience and Board member needs. Do not try to do everything the industry is doing or the latest item suggested by a consultant if it truly will not fit your culture right now.**
- **CEO buy-in is key, without it, you cannot win. So start there.**
- Work with the business managers directly, not just via template completion. Template completion is a compliance exercise and will not give you a full view. Direct conversations with business managers (at all levels), will provide valuable depth and color.
- **Implement ERM tools that work for your company and your leaders. A tool that isn't used won't find its way into the toolbox and likely distract you from enhancing the risk management process.**
- No.
- **Make sure you have more than one champion among the senior leadership.**
- Include multiple stakeholders in ERM development so that they buy into the concept.
- Communication is key.
- Allow lots of time and don't try to do anything without real commitment (including resources) from senior management.
- Tone from the top is important. Help to set key indicators. Help management to see the trade-off.
- **Focus on those areas most impactful to the company...do not try to do too much at the beginning.**
- **Do not try and make everything work for all situations.**

- Writing down a risk appetite is hard. Defining trigger levels and **guardrail levels** is hard. Get something down and refine from there. Do what works for your organization.
- Risk managers must employ the competencies of influence, communication, relationship building, and leadership courage to be successful in this role. If just starting out, be patient in the first two years as you begin to build your program. As we begin our third year, we have a clearer picture of what we need to do and accomplish.
- **Search for illusive precision in risk quantification. It sunk many man-hours and did not help getting the risk committee credible in the eyes of the board. Shift to a 5-point scale was beneficial.**
- Need to get buy in and support from senior leadership. Must be able to articulate the value of an ERM program.
- **Yes, be patient—take time—keep continually improving.**
- **It is not easy to design an ERM framework, therefore, the best advice I could give is to give plenty of room for improvements and to have a well-diversified team—not only actuaries, but involve other professionals with different backgrounds.**
- Focus on metrics, deliverables, and actions. Make it meaningful to your business.
- **Need cross functional committee, not just ERM employees.**
- **The message is that they should look back to what they said five years ago and ask are they doing a better job now!**
- No.
- **Stay independent of the businesses.**
- Yes.
- **A dynamic team devoted to this topic and area of study is crucial. The team should interact regularly with all areas within the company to best understand risks facing different departments.**
- **Yes, get senior management and the board involved early to create a tone at the top and accountability.**
- **If you are small, and have limited staff, don't feel that you simply can't do anything. We have made significant progress vs. our peers by doing a little bit every year for a long time, even with limited staff. Make incremental progress, and over time you will notice a big difference.**
- Having a dedicated CRO or “risk leader” is important. CROs with other duties appear, in my experience, to assign low priorities to their ERM-related duties versus their other duties. Equally important, if not more so, CEO-level support is critical. Otherwise, ERM simply becomes a compliance exercise.
- **Do not discount the importance of communication in the process.**
- Without buy in from the board and the executive members, then nothing will change.
- Not at this time.
- Change management and embedding risk into the culture are critical to success.

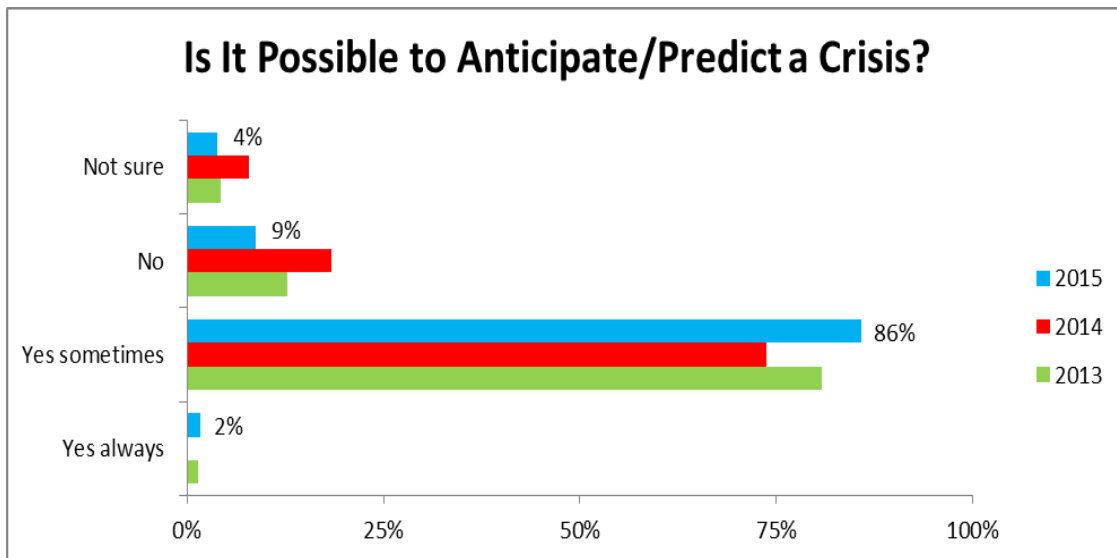
- Don't try to develop an ERM framework for an immature organization or one that is not sure how it will go about its future.
- SMEs from the affected areas so that a diverse group owns the process.
- Small companies don't limit risk discussions to ERM meetings only.
- Must take it one step at a time. Key is senior management buy-in. If they don't buy-in, at least tacitly, your efforts will fail.
- **Communication is THE most important thing you can do in ERM. Awareness results in actions. In the words of Dave Ingram, "Risks grow in the dark." As most companies have a small ERM team, the best thing you can do is turn on some more flashlights—communicate what risk is and how to escalate it and the company will be better.**
- Remain open to change.
- The level of interdependencies between risks in extreme circumstances tends to be understated.
- **The insurance industry tends to suffer from institutional amnesia—when considering what can go wrong it's important to also think about Spanish flu, the Great Depression, asbestos, country debt defaults, the hyperinflation of the 1970s and what their current equivalents might be.**
- Models are incredibly useful tools, but they will always be imperfect and should be used with that in mind
- **Carveth Read—1898—"It is better to be vaguely right than exactly wrong"—far more important to consider all aspects of a risk and have a total impact in a +/- 20% range than to be "precisely" right on only one aspect of that risk.**
- None at the time.
- **The qualitative not just the quantitative matters.**
- Tone at the top is critical.
- **Don't overthink the situation. Simple models combined with qualitative information and informed judgement usually work best.**
- Communicating to the leadership team on a regular basis is mandatory. Educating the management team on the reasons behind the process is needed to ensure proper absorption and implementation of the process.
- Formal risk committee process of reviewing risk and new and existing business limits has been a healthy forum to bring diverse opinions together to decide on appropriate risk delegation authority and escalation decisions.
- **Start simple and keep building. There is no such thing as "perfect ERM."**
- No.
- **Worst thing to do is to build barriers between ERM and SMEs. SMEs understand the risks and can be valuable.**
- Communication is key—communicate early, often, and with lots of audiences.
- No.

- **Get top management buy-in, showing them that while ERM sometimes says “no” to something they want to do it more often says “don’t pursue the goal that way, but instead pursue it this way.”**
- Key to ERM is a shared understanding of risk at the top of the organization that is also translated into bite-size communication and application throughout the organization. This is the essence of the risk culture. Without it, the ERM efforts are severely handicapped.
- Tone at the top is critical; if there is any doubt there, it will be magnified many times over as you try to embed in all levels. Must have engagement of the business people to embed well.
- Leverage the systems you already have in place. The most difficult part is gaining buy-in from various areas of the company, and they are more likely to participate if there is less red tape and fewer new processes to learn. Support from top levels of leadership is very important. Keeping track of all risks, big and small, may be unrealistic, especially the first few years. Focus on key risks that are likely to have an impact. Talk to ground-level people who have a deep understanding of what is driving the risks. Make sure the information is vetted by the experts, and be sure the quantified risks and resulting analysis have a formalized direct line to the C-suite and the board of directors.
- Compare actual to expected. It’s humbling and not the whole answer, but there is no substitute for it.
- Document the framework and decision making process well.
- one needs to have the backing of the CEO and his/her direct reports and a board that takes it seriously. Otherwise, one only has some success at the margins.
- **Every time senior management heard the term ORSA, it was an occasion for a joke even though several key staff members below senior management spend considerable amount of time in preparing the company’s response. It is in the hand of the regulators and rating agencies, I believe, on how serious they expect companies to take ERM.**
- **Obtain buy-in of both board and employee stakeholders at all level throughout the company, embed in performance compensation.**
- **Your boss may select against you—giving credit to the company for risks avoided and blame to you for the risks missed—especially if they (incorrectly) perceive themselves to not be as smart as you are.**
- Ensure communication across the organization not just the C-suite.

Section 4: Predictions

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

- 2%/0%/1% Yes always
- 86%/74%/81% Yes sometimes
- 9%/18%/13% No
- 4%/8%/4% Not sure



Question 2. Comments

For those who answered *Yes always*:

- That's what actuaries should always have been doing.

For those who answered *Yes sometimes*:

- **Risk identification and scenario analysis help detect vulnerabilities.**
- The financial crisis of 2008 was predicted by some but heard by few.
- **Key issue is taking action before crisis.**
- It depends on what you mean by a crisis . . . If you mean 2008, we would never have predicted that. If you mean product changes and possible implications, or a down grade in rating, this is more predictable.
- And 100% of the time in hindsight.
- Internet bubble of 2000 and housing price bubble were predicted prior to the following crises.
- You can plan, but not sure you can always predict.
- This takes much focus and is beyond most cases companies' capacity but can be done.
- Have to set biases to the side and consider what may seem like unlikely events
- There are none so blind as those who will not see.
- **It is almost always possible to predict a crisis. The difficult part is less in the analysis and more in the discipline and luck of monitoring relevant information at a relevant time.**
- Problem is you can anticipate crises that never occur.
- One can see patterns in history.
- The info is probably there. If enough people guess, someone will likely predict it.

- You can teach yourself to better notice when things are not “normal.” But it is not the main job of the CRO.
- Stories from the recent financial crisis illustrate the foresight of some, especially those who profited.
- Financial and political events are often predictable.
- The prediction usually has much uncertainty.
- I think we just turn a blind eye to possibilities sometimes, like a megacatastrophe hitting the northeast.
- Anticipate, yes—predict, no.
- I think the financial crisis of 2008/2009 is a good example, where several market participants had anticipated a bubble in U.S. housing.
- impending rise in interest rates.
- Cannot predict, but can anticipate and put in mitigation processes.
- Even a blind squirrel will occasionally find a nut.
- Sometimes you can tell that the current situation is not stable, or doesn’t make sense, and something has to or will change in the near future.
- For example, bankruptcy.
- Many saw the 2008-2009 financial crisis, but few listened to those who said the housing bubble would burst.
- Not always.
- I think that the occurrence of a financial crisis following financial and speculative excesses such as we are experiencing now is predictable, but the timing is not. Natural catastrophe crises are less predictable, though I believe that catastrophes on the scale of Fukushima (both natural and social elements) will continue to occur.
- There will always be unforeseen and unanticipated challenges experienced.
- Potential emerging risks and bubbles can be identified, but not when they will pop.
- The housing crisis of 2008 could have been predicted.
- Lots of folks saw the financial crisis coming—maybe not to that extent, but it was clearly coming.
- But almost impossible to accurately predict the timing.
- No reliance on feelings but on facts.
- Yes (for example, some of the failures in implementing the Affordable Care Act).
- When asset bubbles build it is appropriate to predict a crisis even if you are not always right.
- “Predict” = guess, so sure.

For those who answered *No*:

- You can prepare for a crisis but not anticipate it.
- **In most cases, one prediction is as good (or bad) as the other. Using ERM to predict is a failure in purpose. Using ERM to identify and mitigate potential crises must always be the goal.**

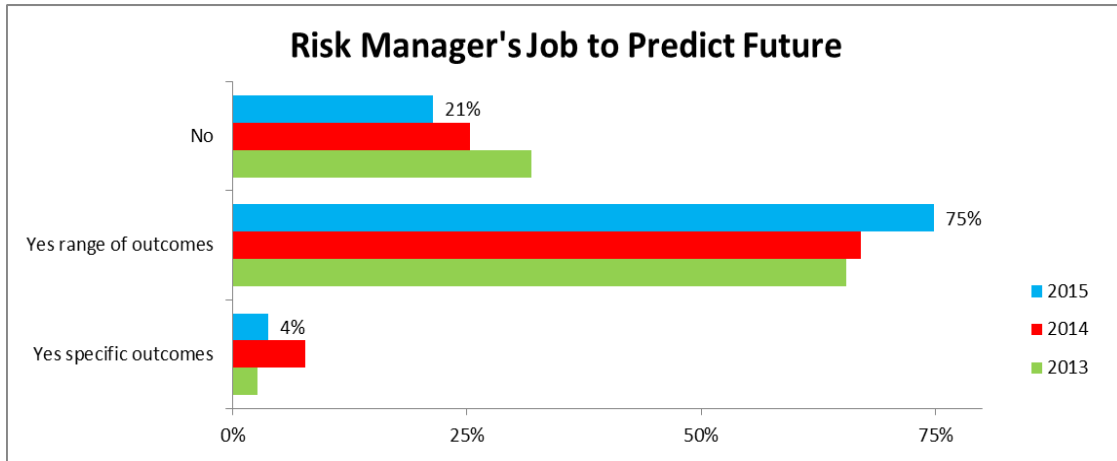
- Predictions are always difficult—especially of the future. The Chernobyl disaster was a major factor in bankrupting the Soviet Union and causing it to dissolve. The Fukushima disaster may cause more radiation in the United States (not to mention Japan) than Chernobyl caused in total. The disaster has the potential to impact the United States and Japan, as well as other countries, negatively to a significant degree. This risk seems to be overlooked. The United States and Russia are engaging in warfare in the same country—Syria—and many Americans seem oblivious to the danger of doing this. Likewise, the United States staged a coup in the Ukraine, the Crimea voted to join Russia and was annexed. The Donbas voted to join Russia and has not been annexed. Again there is the possibility of warfare quickly escalating to a nuclear exchange. Americans seem oblivious. The United States had Saudi Arabia lower the price of oil to hurt Russia, but the price will come back in a few years. Meanwhile Russia and China are buying up gold and distancing themselves from the dollar. This could lead to a greater gold backing to foreign currencies and a collapse of the dollar. The media seem to try to distract everyone with terrorism and climate change—which are no threats to the United States—so Americans do not see the real risks.
- A crisis happens when a scenario you thought was bad goes beyond what you could have imagined.
- Some realize crisis is happening quicker than others, but that’s not same as anticipation.

For those who answered *Not sure*:

- Sure, it’s possible; just do as Roubini, Shiller, or even Peter Schiff do—always predict a crisis. It’s not clear, though, that this can be done in a useful or productive manner
- Usually not.
- Models can give indications when results are outside of historical norms. That by itself does not mean we’re nearing a crisis.
- **Anticipate and predict are, in my view, quite different. Anticipate allows you to prepare to mitigate a crisis without predicting that it will happen—just that it may happen.**

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

- 4%/8%/3% Yes—specific outcomes
- 75%/67%/65% Yes—range of outcomes
- 21%/25%/32% No



Question 4. Comments

For those who answered *Yes—specific outcomes*:

- Yes, specific and range of outcomes.

For those who answered *Yes—range of outcomes*:

- Both range of outcomes and specific outcomes (scenarios).
- While one side of risk management is about accurate predictions, the other piece is monitoring and mitigation. By actively monitoring risks and having mitigation strategies prepared should a risk move in one direction or another, risk managers can manage risk in the moment through informed decision making. We make predictions about the future based on certain assumptions or criteria and prepare for multiple outcomes. We do not predict or speculate in absolute terms.
- **Probabilistic ranges are important to understand, but do necessitate educating company leaders.**
- Modeling allows us to make financial predications.
- I think the key is the range of possibilities—making one single prediction will result in the risk manager being wrong almost all the time. We should be able to have a sense of the range and have an opinion regarding the probabilities surrounding the various possible outcomes.
- Always have to be forward looking and try to anticipate the next big thing.
- We are all to some extent a risk manager.
- Don't pay me on precision, please.
- While one side of risk management is about accurate predictions, the other piece is monitoring and mitigation. By actively monitoring risks and having mitigation strategies prepared should a risk move in one direction or another, risk managers can manage risk in the moment through informed decision making. We make predictions about the future based on certain assumptions or criteria and prepare for multiple outcomes. We do not predict or speculate in absolute terms. It's more

- important to be prepared for a range of potential outcomes rather than predict any single one.
- But also accept that not everything can be predicted.
 - **Perhaps “identifying possible and probably outcomes” is a better description than “predicting.”**
 - No future prediction should ever be thought of as a point estimate.
 - Ranges for both positive and tail risk.
 - Management generally likes to consider a specific prediction, but need to be aware of the range.
 - It is not predicting a specific future but thinking about the types or range of futures that may occur.
 - I’m not always right, but predicting some tail events in advance is a winning strategy even if not always right.

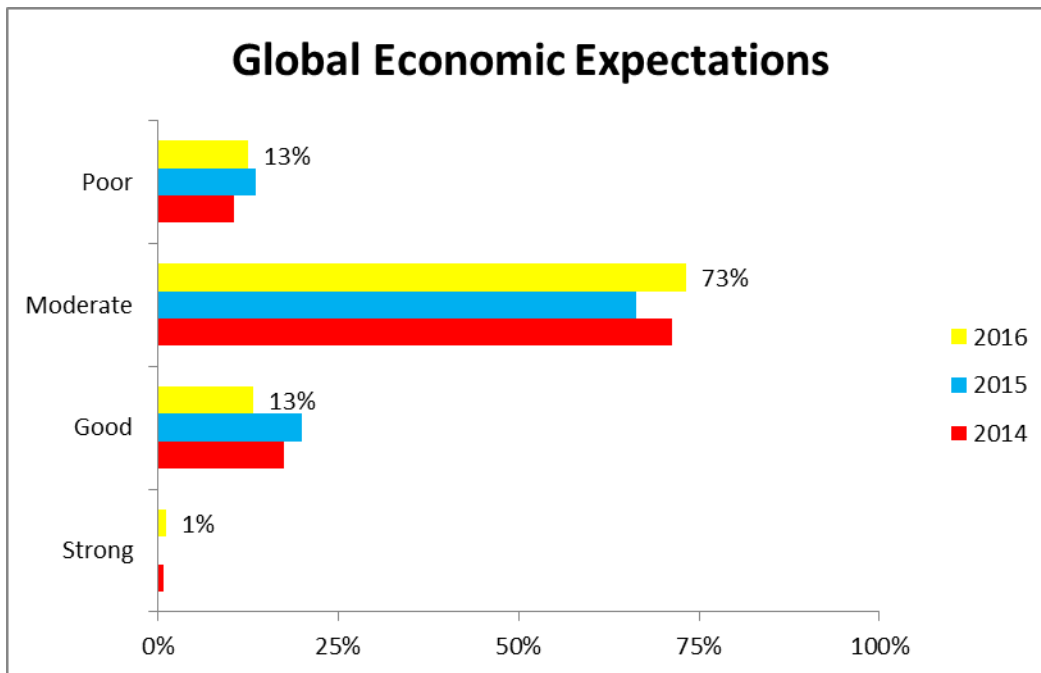
For those who answered *No*:

- Measure your exposure to different possible futures; if you can predict the future you should be working for a hedge fund manager.
- I can discuss the future and potential future trends, but there is no way to predict the future.
- Need to be prepared of possible outcomes. Don’t kid yourself on predicting them.
- I do not predict anything, I assess the impact of potential severe events.
- That was a trick question. Risk should identify POTENTIAL future events but not predict the future.
- **Prediction actually distracts from risk imagination.**
- Helping shape potential scenarios is part of the job.
- Preparing for potential outcomes, yes. Predicting those outcomes, no.
- Prepare the organization for a range of possible outcomes.
- Predicting is a bit strong a term, suggests a single outcome; forecasting is more apt, suggesting uncertainty and a range of outcome or
- Preparing to measure and manage risk is part of the job.
- Predicting the future is for carnival tents. Analyzing complex business situations in a variety of circumstances/scenarios is for risk managers.
- Predicting the future is not part of my job, but considering what could happen and what we would do about it if it did, is.
- **The government of the United States also does not seem to take steps to protect the population in the event of certain disasters. For example, a natural electromagnetic pulse from space could disrupt the power grid and halt communication, transportation and utilities. Does the government have a plan for getting everything back to normal as quickly as possible? Are critical portions of the infrastructure shielded from radiation so as to expedite the return to normality? Maybe they are, but I have my doubts. The government seems more worried about confiscating yogurt in luggage than worrying about a meaningful response to risk.**

Section 5: Current Topics

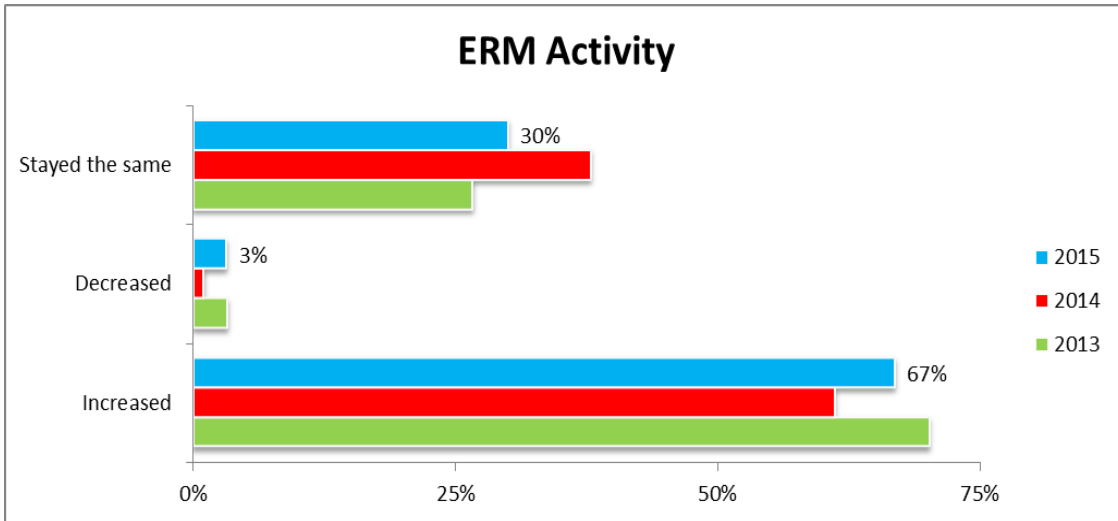
Question 1. Your expectations for the 2016 global economy are:

- 13%/14%/11% Poor
- 73%/66%/71% Moderate
- 13%/20%/17% Good
- 1%/0%/1% Strong



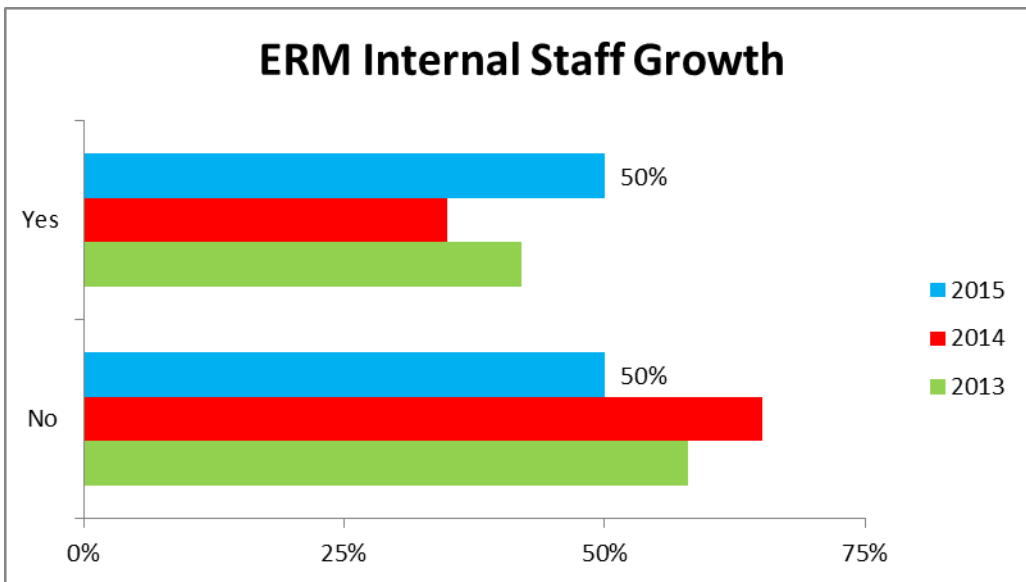
Question 2. Did you experience a change in the level of ERM-focused activities for your organization or clients in 2015?

- 67%/61%/70% Increased
- 3%/1%/3% Decreased
- 30%/38%/27% Stayed the same



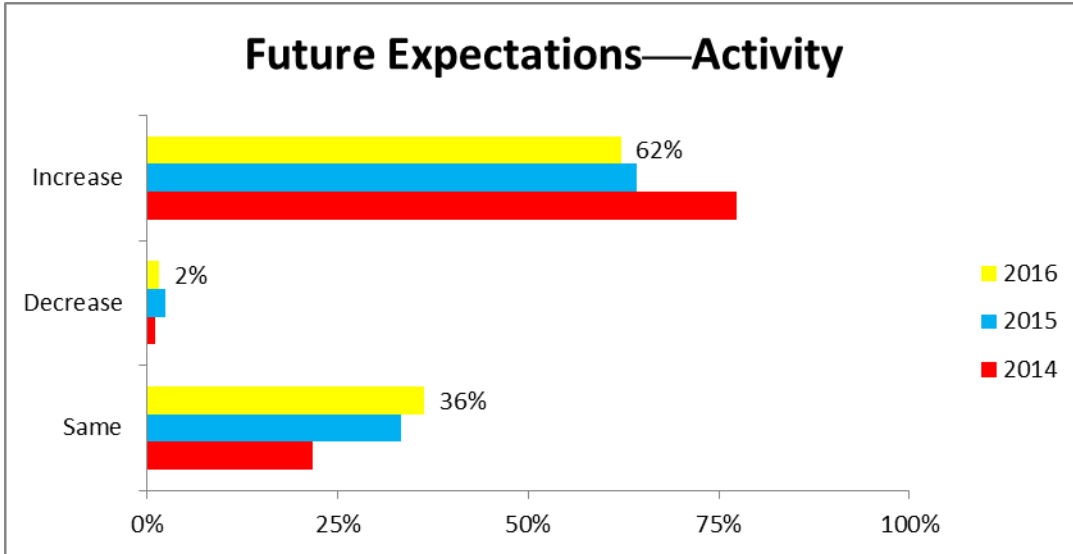
Question 3. Did your internal ERM staff increase in 2016?

- 50%/35%/42% Yes
- 50%/65%/58% No



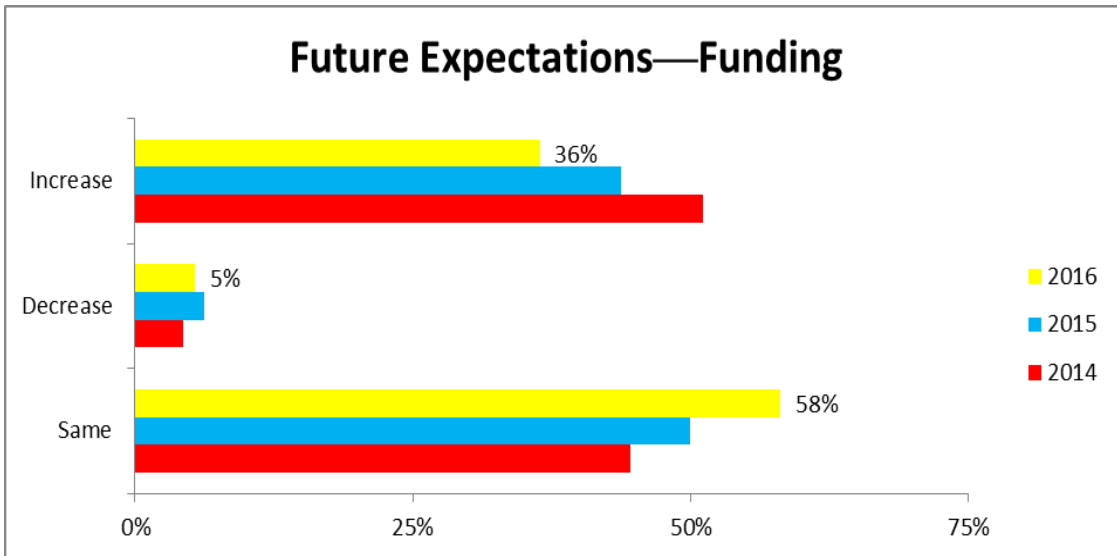
Question 4. Do you anticipate a change in the level of ERM-focused activities for your organization or clients in 2016 relative to 2015?

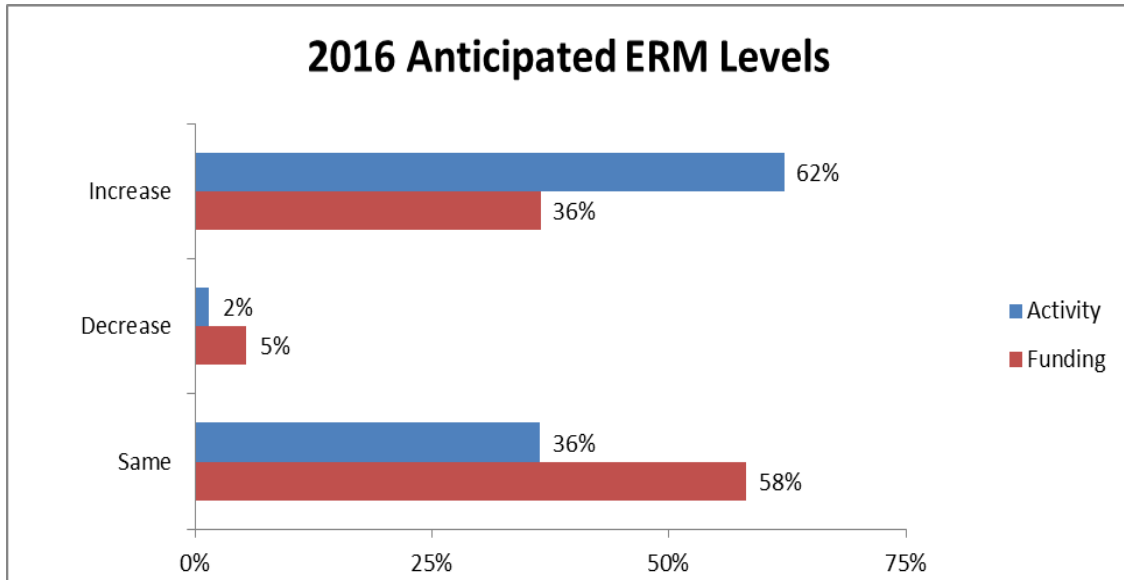
- 62%/64%/77% Increase
- 2%/2%/1% Decrease
- 36%/33%/22% Stay the same



Question 5. Do you anticipate a change in the level of funding dedicated to ERM-focused activities for your organization or clients in 2016 relative to 2015?

- 36%/44%/51% Increase
- 5%/6%/4% Decrease
- 58%/50%/45% Stay the same



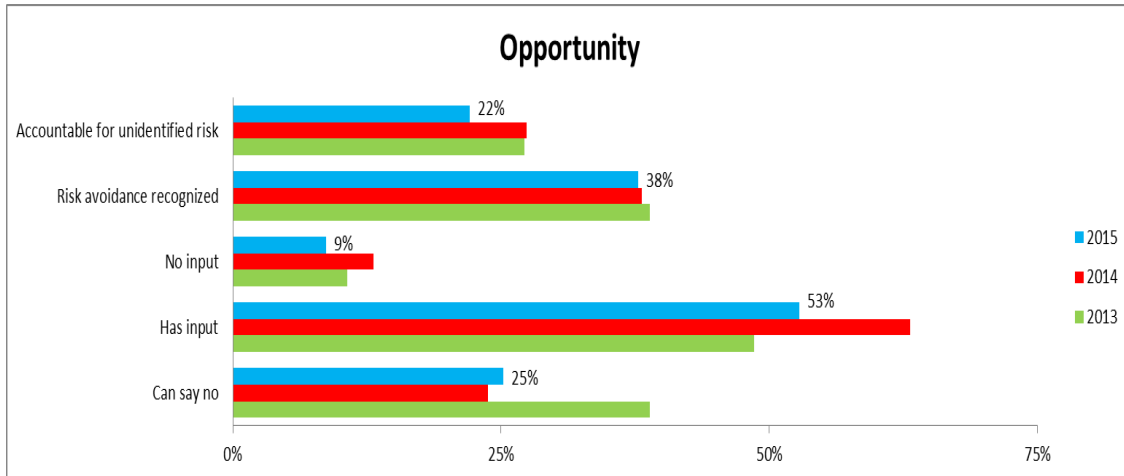


Question 6. The true measure of an ERM program is how it is received by the board and senior management. Which of these is true in your situation? (Please select all that apply.)

Percentages back out respondents stating that the question is not applicable to them.

- 25%/24%/39% Our ERM function can say no to a strategic opportunity.
- 53%/63%/49% Our ERM function has input but not a vote when a strategic opportunity is being considered.
- 77% report that at least one of the preceding is true.

- 9%/13%/11% Our ERM function has no input when a strategic opportunity is being considered.
- 38%/38%/39% If the firm avoided a risk identified by the ERM department, the value of the department is recognized.
- 22%/27%/27% If the firm was subjected to a risk not identified, the ERM department would be held accountable.



Comments/Examples

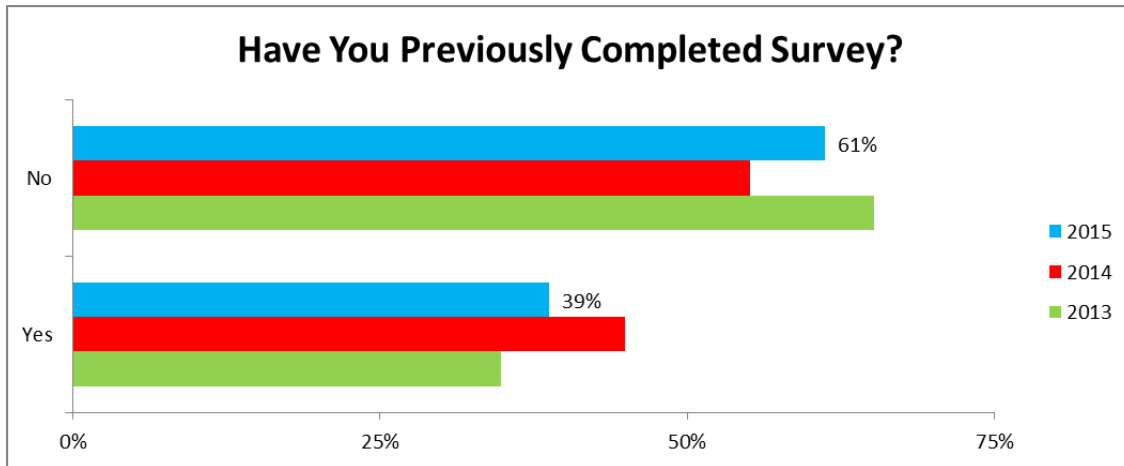
- **Disagree—true measure is the way in which members of the organization reflect ERM in executing their responsibilities.**
- **Our ERM function has input and a vote when a strategic opportunity is being considered.**
- ERM function has input on things it knows about.
- We view our role as providing advice to the strategic decision. Hopefully that advice is considered as senior leaders make decisions.
- **These are poor choices/examples. Our ERM program has strong support.**
- We are working to change that, now having built an ERM foundation we are better able to leverage existing processes with an ERM lens.
- Our ERM function has input and a vote.
- **ERM has not changed our management structure, nor where responsibility lies for business decision.**
- Our board of directors is very in tune with what is going on in ERM.
- important to note that given our small size, the risk management and investment management committees are conjoined.
- **Our ERM function has input and a vote, but not the only vote.**
- We are between the two on strategic—asked for opinion and “vote,” but no power of “veto.”
- Varies by client.
- We allowed the sale of a product with an identified policyholder behavior risk. When the risk actually emerged we had to remind management that we had highlighted the risk during product analysis, but distribution’s base case was accepted by management.
- The ERM function is, unfortunately, not integrated with strategic planning.

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?

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



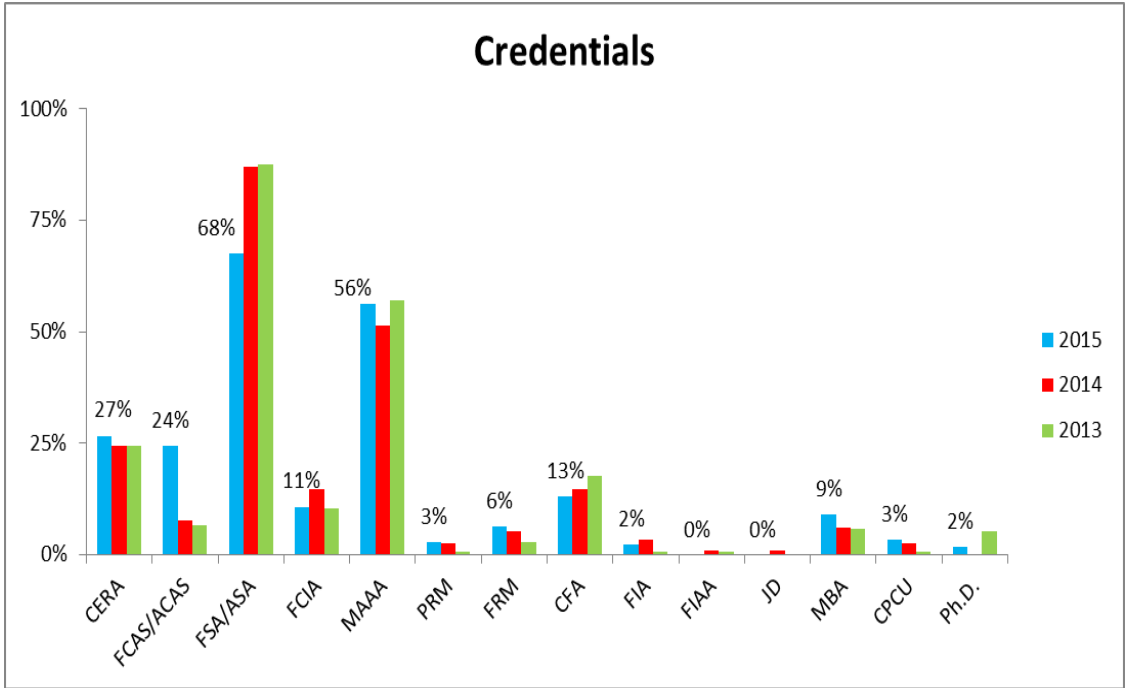
Question 2. What credentials do you currently hold? (Please select all that apply.)

395 responses from 176 surveys (2.2 average)

Percentages are based on 176 surveys

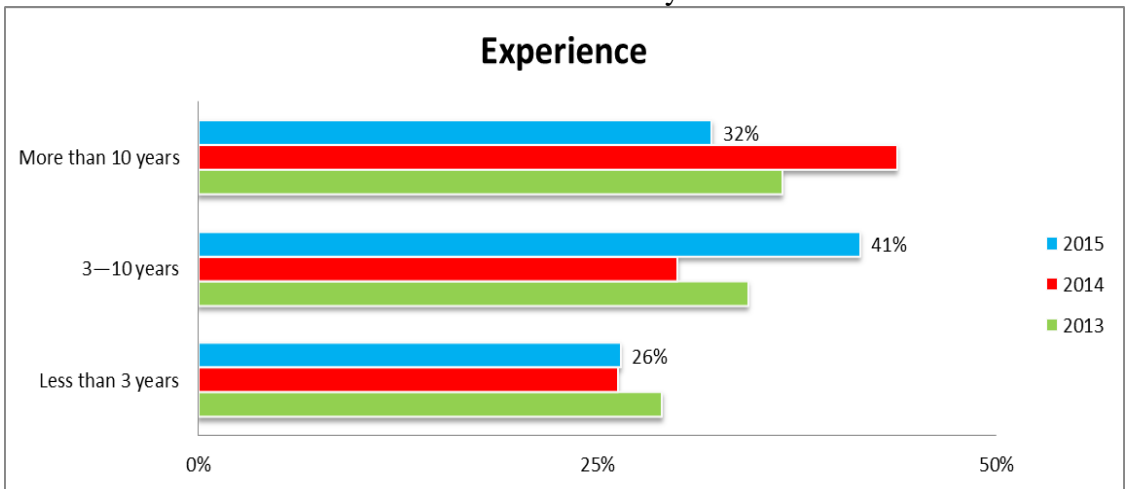
- 27%/24%/24% CERA
- 24%/8%/7% FCAS/ACAS (Fellow/Associate, Casualty Actuarial Society)
- 68%/87%/87% FSA/ASA (Fellow/Associate, Society of Actuaries)
- 11%/15%/10% FCIA (Fellow, Canadian Institute of Actuaries)
- 56%/51%/57% MAAA (Member, American Academy of Actuaries)
- 3%/3%/1% PRM (Professional Risk Manager, PRMIA)
- 6%/5%/3% FRM (Financial Risk Manager, GARP)
- 13%/15%/18% CFA (Chartered Financial Analyst, CFA Institute)
- 2%/3%/1% FIA (Fellow, Institute of Actuaries)
- 0%/1%/1% FIAA (Fellow, Institute of Actuaries of Australia)
- 9%/6%/6% MBA (Master of Business Administration)
- 3%/3%/1% CPCU (Chartered Property Casualty Underwriter, The Institutes)
- 2%/0%/5% Ph.D. (Doctor of Philosophy)
- 5%/3%/9% Other actuarial credential (please specify)
 - MSPPA
 - French actuarial credential

- Fellow of China Association of Actuaries
- FCA (2)
- CIA
- Swiss Actuarial Association
- 19%/19%/9%
 - Other non-actuarial credential (please specify)
 - FLMI (6)
 - CLU (5)
 - ChFC (2)
 - Assoc. of Reinsurance Administration (2)
 - ARM
 - CPA
 - M.S.
 - CPCU
 - FALU
 - CASL
 - CLF
 - CAPM
 - PMP
 - GBA
 - MCSE
 - CISA
 - B juris
 - CFE
 - AINS
 - ERMP
 - CRP
 - CFSA
 - RHU



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

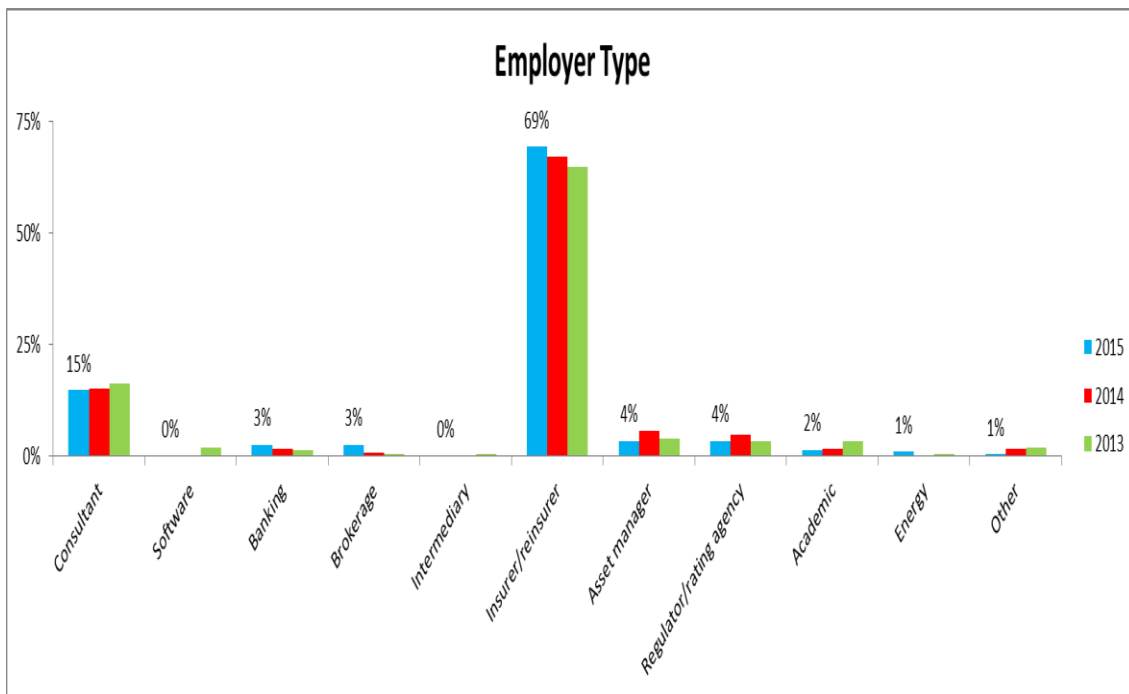
- 26%/26%/29% Less than 3 years
- 41%/30%/34% 3–10 years
- 32%/44%/37% More than 10 years



Additional analysis shows the addition of CAS members in this survey: 19% less than 3 years, 69% 3–10 years and 12% more than 10 years.

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

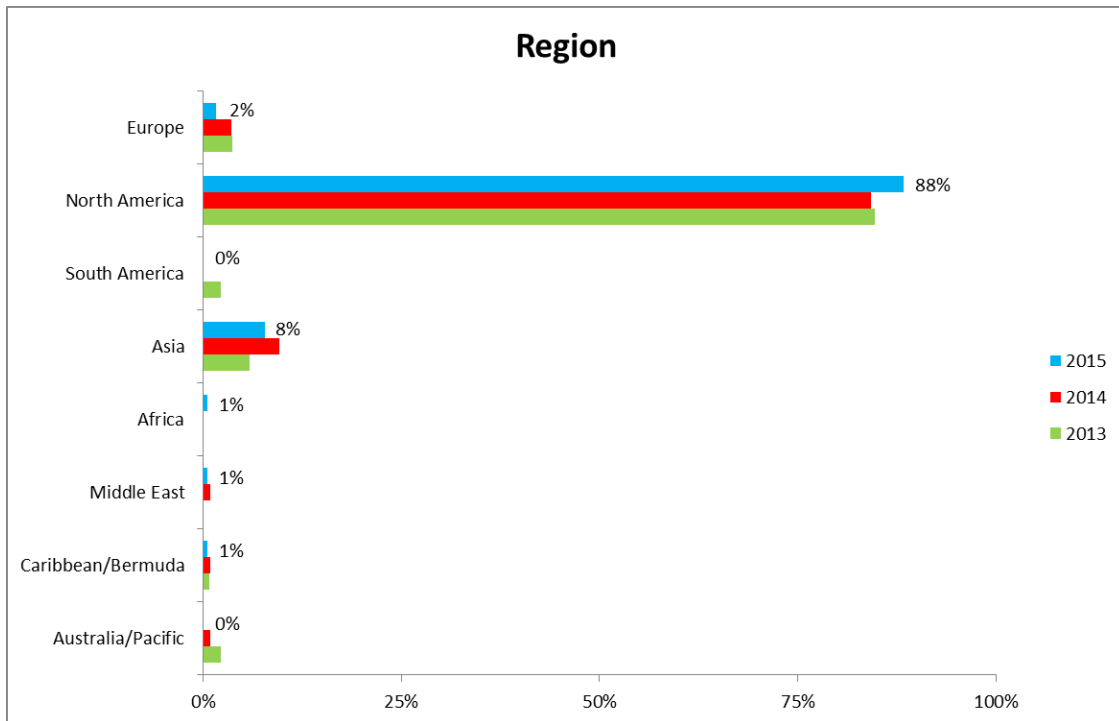
- 15%/15%/16% Consultant
 - 0%/0%/2% Software
 - 3%/2%/1% Banking
 - 3%/1%/1% Brokerage
 - 0%/0%/1% Intermediary
 - 69%/67%/65% Insurance/reinsurance company
 - 4%/6%/4% Asset management
 - 4%/5%/3% Regulator/rating agency
 - 2%/2%/3% Academic
 - 0%/0%/0% Manufacturing/services
 - 1%/0%/1% Energy
 - 1%/2%/0% CRO at CRO Council firm
 - 0%/0%/1% CRO at CRO Forum firm
 - 1%/2%/2% Other
- CRO



Question 5. Primary region (Please select one.)

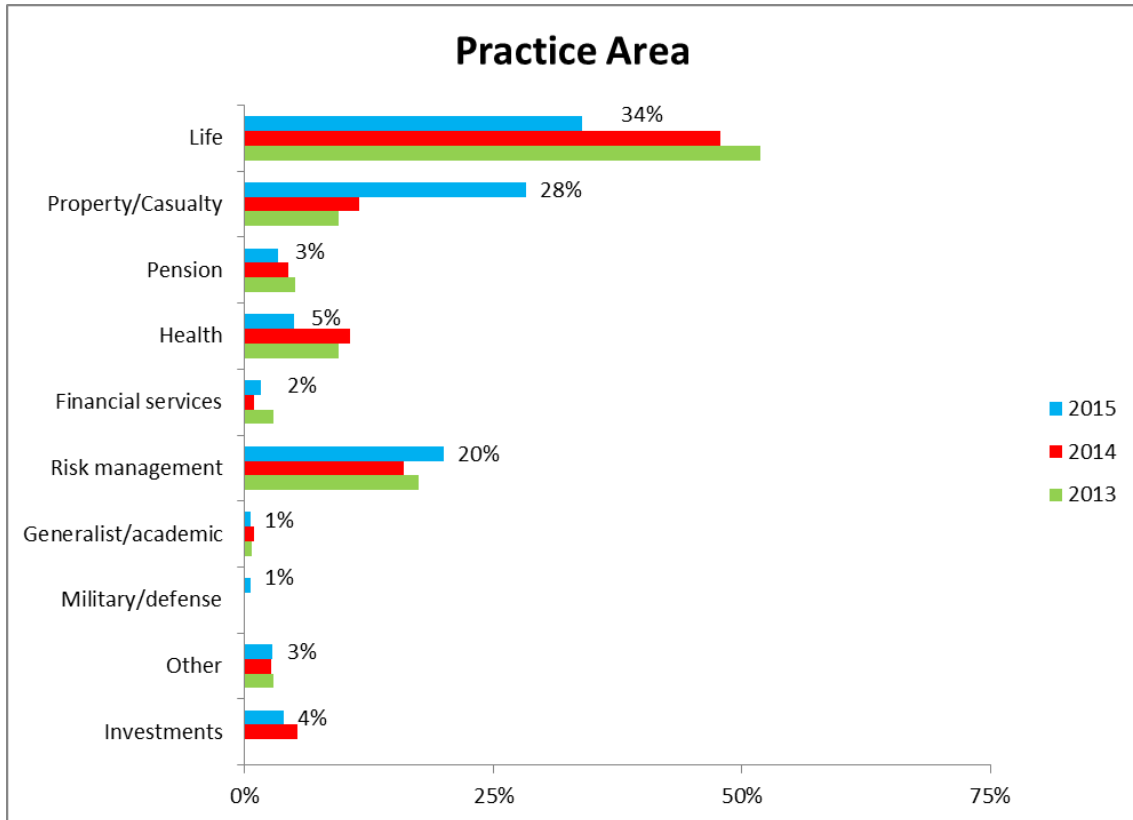
- 2%/4%/4% Europe
- 88%/84%/85% North America
- 0%/0%/2% South America
- 8%/10%/6% Asia

- 1%/0%/0% Africa
- 1%/1%/0% Middle East
- 1%/1%/1% Caribbean/Bermuda
- 0%/1%/2% Australia/Pacific
- 1%/0%/1% Other
 - Have global oversight/accountability but North America is largest region



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

- 34%/48%/52% Life
- 28%/12%/9% Property/casualty (general insurance, nonlife)
- 3%/4%/5% Pension
- 5%/11%/9% Health
- 2%/1%/3% Financial services (non-insurance)
- 20%/16%/18% Risk management
- 1%/1%/1% Generalist/academic
- 1%/0%/0% Military/defense
- 4%/5% Investments
- 3%/3%/3% Other
 - Banking
 - Group life & disability



Question 7. What sources do you find valuable when scanning for emerging risks (list up to 3)?

- Trade press; financial press; consultant publications
- News aggregator, World Economic Forum, internal expertise
- ERM Magazine, Google
- ERM newsletters and publications, internal management surveys, news media
- CEB Inc., Swiss Re survey
- Informal search that is broad
- Seminars, news headlines, industry articles
- Economist, BBC, various blogs
- Bloomberg, “Nightly Business Report,” popular media
- Industry surveys—CIA, SOA, consulting firms
- CEB emerging risks survey, ERM symposium
- **Citigroup pension index, IRS Segment yield rates, weather forecasts**
- Cannot provide due to corporate policy
- Reliable news sources; colleagues; business start-ups
- *Wall Street Journal*, Bloomberg, investment bank newsletters
- News aggregators, blogs

- Annual reports from various companies / Magazines or various papers on risk management / Conversations with reinsurers
- **Academic papers, surveys, listening to line management**
- Actuarial resources, news
- **CEB, IIA, daily insurance articles and news services**
- SOA documents, webinars, symposia
- Wolters Kluwer
- Reinsurance / consultant reports, mainstream media, conferences
- Rating agency and industry publications
- Big Four consultants' reports, reinsurer's reports
- **Corporate Executive Board, RIMS**
- Industry and general business periodicals, online resources (blogs, LinkedIn)
- Ongoing environmental scanning
- **World Economic Forum, CRO Forum and North American CRO Council**
- **Top emerging risk surveys from S&P, Swiss Re, PwC, World Economic Forum**
- *WSJ, Financial Times*
- Actuarial newspaper technical articles/speeches
- General news services
- Dowling, Advisen and Conning reports
- Conferences, publications
- The website of actuarial organizations
- CAS meetings
- Internet, discussions with employees, news
- Periodicals—both insurance and noninsurance
- Munich Re, Swiss Re, RIMS
- ISO, reinsurers, SNL
- Cross-asset strategists; academia, blogs (believe it or not)
- *WSJ, Bloomberg, The Big Picture Blog*
- Website: InsuranceERM, *Canadian Underwriter, CAS*
- Alternative news sources, *Wall Street Journal*
- Colleagues and other internal subject matter experts
- Industry trade press, science press, claim developments
- WEF, IRMSA, own sources
- News, economic indicators, experts' opinions
- Press, strategy writers
- Aon's annual risk list, WEF, Lloyd's
- ISO
- World Economic Forum, Google Alerts
- Swiss Re SONAR, Google, news
- Lloyd's emerging risk; internal emerging risk "newsletter"
- Magazines, academic journals

- **Alternative “news” internet websites and radio programs; *Trends Journal*, publication of the Trends Research Institute**
- Industry surveys
- Talking with my clients’ employees engaged in the clients’ primary work or the area being evaluated
- Internal group, news
- Emerging risk survey results (WEF, OSHA, SOA, Protiviti, etc.), insurance broker intelligence (Ace, Marsh, Swiss Re, etc.)
- News
- Trade periodicals, networking
- The ERM Survey, general news sources, Google
- Unsure
- **Published papers, forum, seminar, internal discussions with business units**
- **Several daily news feeds beyond the regular press (All are non-actuarial.)**
- Consultants’ reports
- Internet, WEF Emerging Risk Report
- Survey, interview
- Risk management magazines, actuarial conferences
- Financial news, industry news
- ***Economist* magazine, *Smithsonian* magazine, *National Geographic* magazine**
- **Industry publications, CEB Risk Council, internal discussions**
- Exogenous factors (The more data the better it is, provided that the data are credible and predictive analytics are strong.)

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

- Excellent survey.
- **Refine classification systems—risk management is not all or none and not uniform so of concern is with whom one communicates, current challenges (e.g., Cadillac tax) that are likely to be short-lived and long-term challenges such as climate change.**
- Split the emerging risk questions between a general economy/industry view and a company-specific view.
- Please clarify the question regarding the supply chain. I didn’t understand the context in which it was asked.
- Separate national and international; have more economic categories of emerging risks.
- Agreement with another organization (e.g., PRMIA, GARP).
- **Hard to select from the list of 23 risks because they don’t all fit on one page. Would be nice to see them a bit more compressed so it’s easier to choose without scrolling up or down.**
- It seems longer than the 15 minutes suggested.

- **Include a progress bar at the top of each page. I had no clue if I was getting close to the end.**
- Add a question about the respondent's organization's maturity of risk management program. It would be good to know if people are in the development stage or have a well-oiled machine.
- Show respondents the layout of the survey (list of questions/areas) to better explain how to respond.
- Allow for "other" risks specified to (1) carry forward to later lists of risks from which to choose, and (2) be used in "combinations."
- **Actually, it's a pretty good survey. I like that it made me think through my own philosophy and current view of the markets.**
- Include questions specifically about long-term risk. For instance, I would rank climate change as very high risk, but not in the next 3–5 years.
- Extend the time horizon to longer-term risks (e.g., rising sea levels), as some long-term risks require investment now.
- I suspect there are risks that are nearly completely below the radar right now, including that of a societal collapse in the United States (caused by any number of factors, including currency collapse).
- Some comments are above. You might also give your definition of impact. As I was answering the questions, I kept thinking of incidence and severity. The more severe a risk is, the less likely it is, and impact has something to do with both.
- Enable participants to contribute to the GSU-Bloomberg CRO Risk Index to develop a view of how strongly the collective participants feel about various risks.
- Many of the risks listed in the first few questions are so large (e.g., global financial crisis), there is not much that a single company can do to ameliorate such a risk. Indeed, they are so large that we wouldn't list them in a report to the board. The survey should ask more questions about business and operational risks
- Could be improved and more relevant questions could be asked based on the results of this survey.

Thanks for your participation!

[Researcher's notes for future questions]

- Add questions probing
 - 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? (resilience)
 - Consider expanding *Natural catastrophe: tropical storms* to include inland convective storms or make clear it is with "other".

- 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.
- Add option for input and a vote to Section 5, Question 6
- Create a question that talks about avoiding a bad outcome rather than “timing the market”—seems like this is where winners reside.
- Section 2 Question 3 – ask about metrics used
- How can we incorporate Piketty inequality issues?
- Greatest impact – go beyond financial risks
- Risk combination 1 – what metrics are used?
- Opportunity – input and a vote
- Cyber – terrorism, security, warfare, risk, etc. – rename to cyber?
- Technology – definition should include drones, self-driving cars, 3D printing
- Consider moving interconnectedness of infrastructure
- What bubbles do you see today? (Section 4)
- List the number of sections on the first page of the survey so respondents have an idea how close they are to finishing (or at beginning of each section say Section x of 6)

Appendix III—Survey Results 2014 and Earlier

Detailed results for prior surveys can be found at <http://www.soa.org/Research/Research-Projects/Risk-Management/research-emerging-risks-survey-reports.aspx>.