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11th Survey of Emerging Risks

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11th Survey of Emerging Risks

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11th Survey of Emerging Risks

Emerging risks are a key component for enterprise risk management (ERM) practitioners with time horizons longer than a few months. For example, a pension plan's life cycle will last decades beyond the company it services and it must consider risks to investments and longevity far into the future. A life insurer who writes a term policy on a child could have that liability on its books for a full century. As much as the world has changed in the last 100 years, change occurring in the next 100 years is likely to accelerate even faster.

Unknown unknown risks are the Black Swans, things that happen but cannot be prepared for. Unknown knowns are another form of emerging risk that reflects ignorance of the future. This can reflect instances where historical data is not predictive, but also includes risks without data where a practitioner or theorist is not able to provide useful techniques to analyze the risk in the future. A risk may be an unknown known for one analyst and a known known for another.[1]

Practitioners use time horizon to determine what risks are important within an ERM context. It is a challenge to align incentives with the needs of a business, especially when incentives are based on short-term objectives. It is easier to align the incentives of business owners with long-term goals for a firm.

The emerging risk practitioner needs to think like an owner. André Choquet wrote eloquently about the need for pension plans to consider both the life cycle of the business and the plan, and the need for independence.[2] Assumptions previously considered stable, or trending, may now exhibit discontinuities. Here are some examples where a previously stable assumption could become an emerging risk. Life expectancy could lengthen if a cure for cancer is found, or shorten due to a pandemic or volcanic event that causes worldwide crops to fail. Morbidity costs increase as heat waves become more common due to both climate change and older populations driven by demographic changes. An owner mentality would more likely recognize the need to optimize the value of the firm over many years.

This survey attempts to track the thoughts of risk managers about emerging risks across time. It is the 11th survey of emerging risks conducted by the Joint Risk Management Section (JRMS), 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 and inactions. The survey responses, and especially the comments, give risk managers a way to anonymously network with peers and share new ways they think about risk. Each survey enhances the knowledge of those who participate by helping them think more deeply about the topic, and it is anticipated that the reader will benefit in this way as well.

Note that an Executive Summary hits the high points of the survey, a Results section provides commentary about the survey, and detailed survey results can be found in Appendix II. This appendix allows the reader to scan specific sections or questions based on their level of interest, and includes every comment received.

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[1] The extension of this definition results from a brief discussion between the researcher and Professor Paul Johnson, an adjunct professor at the Heilbrunn Center for Graham & Dodd Investing at Columbia Business School.

[2] Choquet, André, From Pension Risk Management to ERM, *Risk Management Newsletter,* July 2006, https://www.soa.org/Library/Newsletters/Risk-Management-Newsletter/2006/July/rmn-2006-iss8-choquet.aspx

Section 1: Executive Summary

Every year is unique, and 2017 was no exception. Geopolitical tensions, hurricanes, wildfires and more created opportunities for recency bias, while a total solar eclipse and less-heralded positive events may have productive benefits to health and longevity. Risk management evolution is captured by trends in the *11th Survey of Emerging Risks*, completed in November 2017.

One shift in practice is a tendency to look at emerging risks only over a period covering tactical time horizons, meaning a company's short-term projections that last less than five years. In one question, the survey asks risk managers to consider the top emerging risks when looking out to 2050. The differences are enlightening. The results shift away from economic risks, which are expected to cycle, and toward environmental, technological and societal risks.

Companies should consider both near-term and longer-term emerging risks, looking out over a time horizon consistent with the liabilities held. Risk managers can assist with this task, providing qualitative and quantitative analysis across the longer time frame. As with other risk identification and assessment work, risk managers need to be aware of the potential for groupthink. This is especially true when they are embedded in the business units.

The year's survey continues to highlight the outsized role of cyber risks, along with an improving global economic outlook and upward trending geopolitical risks. These key findings emphasize a need for ERM to adjust along with the risks themselves. It can be useful to bring in outsiders to the risk team who think differently due to alternative experience, whether a life expert helping a casualty shop or a retail risk expert providing input to an investment shop.

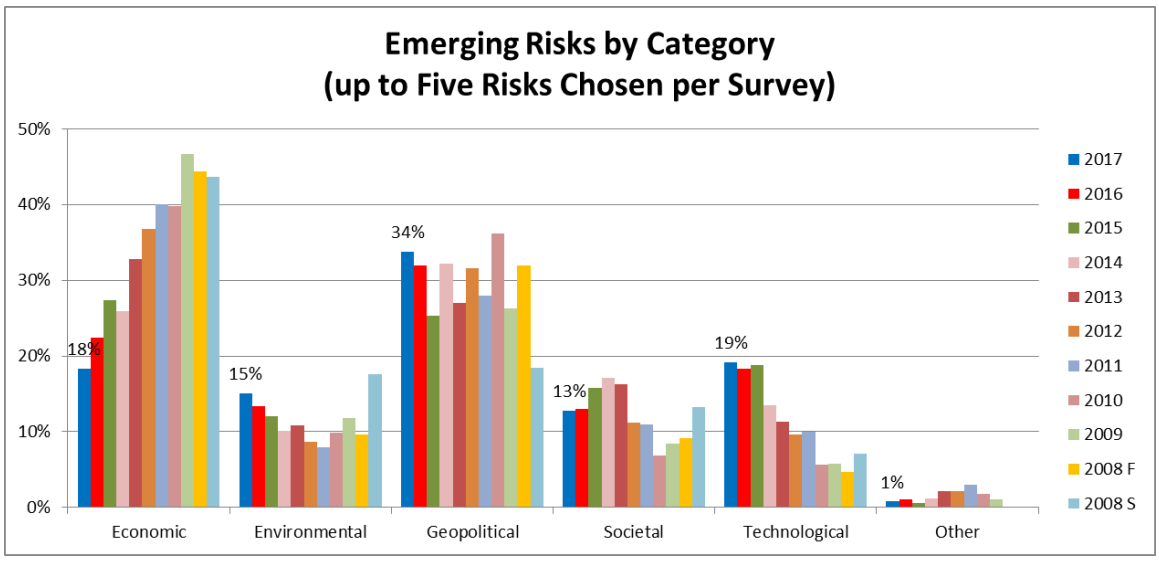
1.1 EMERGING RISKS

In addition to top five and top emerging risks, the survey also looks at the top current risk. Combinations of risks often follow the patterns shown when looking at emerging risks one at a time, but sometimes also reflect surprises. Some risks are more common when viewed with others than by themselves.

1.2 TOP FIVE EMERGING RISKS

Each year's data set is fascinating to review both in isolation, given recent events (recency bias), and in the context of longer-term trends and the changing demographic makeup of the respondents. As shown in Figure 1, the survey features five main categories (Economic, Environmental, Geopolitical, Societal and Technological). The Geopolitical category of risks increased (34% of the total chosen when up to five emerging risks were selected), maintaining the top category, as Technological moved into second (19%), just ahead of Economic (18%), Environmental (15%) and Societal (13%). The five categories are further segmented into a total of 23 individual risks. The uppermost choices (in the top five) in the Geopolitical category were *Terrorism* (41% of respondents choosing it in their top five, up from 39% in the prior survey) and *Regional instability* (up from 26% to 31%). Risks with new highs across the survey history were *Climate change* (29%), *Natural catastrophe: tropical storms* (16%), *Weapons of mass destruction* (21% up from 9%), *Interstate and civil wars* (19%), *Transnational crime and corruption* (14%), *Chronic diseases* (8%) and *Technology* (38% and overall third choice). A new low was recorded by *Energy price shock* (5%), *Chinese economic hard landing* (16%, a new low for the seventh consecutive survey), *Financial volatility* (29%) and *Demographic shift* (23%).

Figure 1: Emerging Risks by Category (up to Five Risks Chosen per Survey)



Overall, the primary trends continue to be those noted in past surveys. The Economic category reductions are the source for gains elsewhere as we move further from the global financial crisis.

Cyber/interconnectedness of infrastructure continued in its position at the top of the list of emerging risks, maintaining its level as 53% of respondents listed it as one of their top five emerging risks.

In most years, the survey has found evidence of recency cognitive bias, where responses gravitate toward risks that have occurred recently. This year's results are consistent with these tendencies, driven by the shortened news cycle, environmental concerns and technology events. Geopolitical appeared to cycle up in even-numbered years in the past, but 2017 recorded its highest result since fall 2010.

The evolution of the top five risks chosen provides evidence that trends can be relied on in this survey, and the general continuity between survey iterations adds credibility. As shown in Table 1, several risks have been consistently at the top.

Table 1: Top Five Emerging Risks, 2014–2017

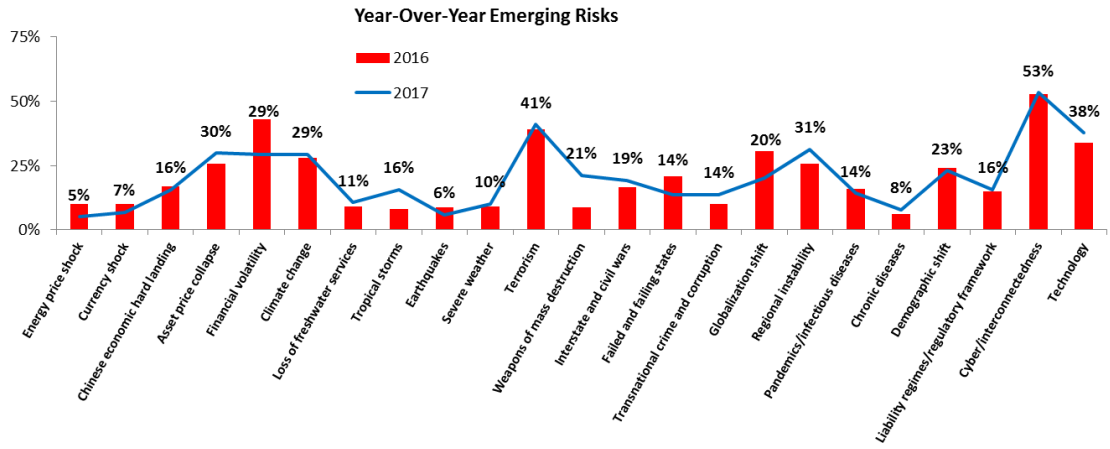
Year	2014	2015	2016	2017
1	Cybersecurity/ interconnected-ness of infrastructure	Cybersecurity/ interconnected-ness of infrastructure	Cyber/ interconnected-ness of infrastructure	Cyber/ interconnected-ness of infrastructure
2	Financial volatility	Financial volatility	Financial volatility	Terrorism
3	Terrorism	Terrorism	Terrorism	Technology
4	Regional instability	Asset price collapse	Technology	Regional instability
5	Asset price collapse	Regional instability	Retrenchment from globalization	Asset price collapse

Cyber/interconnectedness of infrastructure (13%) was also the top current risk, ahead of *Climate change* and *Asset price collapse*, along with the top emerging risk when choosing either five or a single risk.

Three risks increased materially from the previous survey when respondents were asked to choose their top five emerging risks. These included *Weapons of mass destruction*, *Natural catastrophes: tropical storms* (doubled from 8% to 16%), and *Regional instability* (fourth overall). Several risks were materially lower, including *Energy price shock* (10% to 5%), *Financial volatility* (43% to 29%), *Failed and failing states* (from 21% to 14%), and *Globalization shift* (30% to 20%). Geopolitical risks seem to be in flux, with some up and some down materially. The even-numbered-year cycle previously identified ended with the category reaching localized highs.

Figure 2 shows the results for the top five emerging risks from the most recent two surveys, listed in order of the risks (and categories), showing the volatility between years. Labels show results from the prior survey from fall 2016.

Figure 2: Year-Over-Year Emerging Risks



Respondents select from 23 risks in five categories as follows. 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*
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. *Weapons of mass destruction*
13. *Interstate and civil wars*
14. *Failed and failing states*
15. *Transnational crime and corruption*
16. *Globalization shift*
17. *Regional instability*

Societal Risks

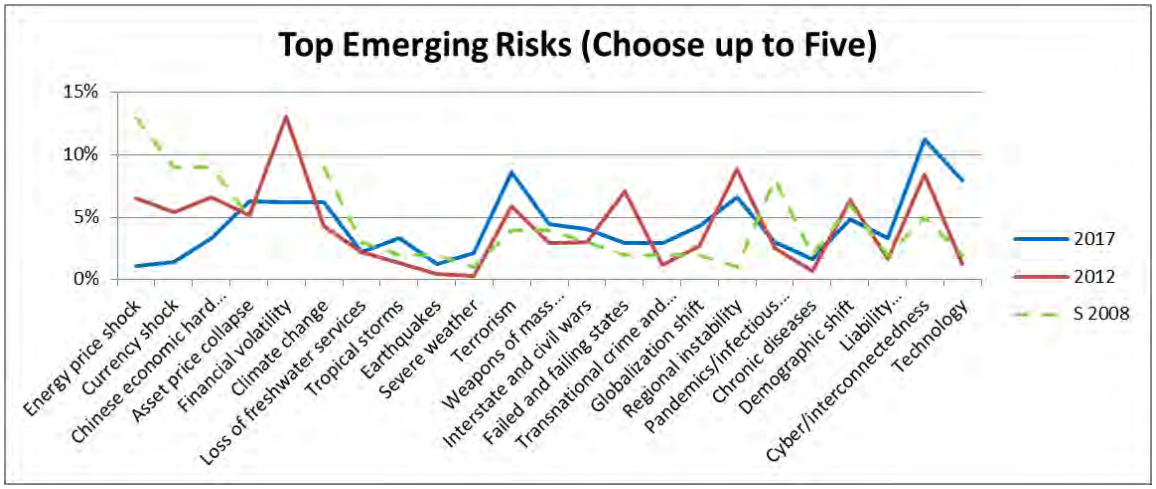
18. *Pandemics/infectious diseases*
19. *Chronic diseases*
20. *Demographic shift*
21. *Liability regimes/regulatory framework*

Technological Risks

22. *Cyber/interconnectedness of infrastructure*
23. *Technology*

These results evolve over time, with risk responses ebbing and flowing. Figure 3 shows an example of how the responses for each risk have changed over time, displaying results from spring 2008, 2012 and 2017 (note that risk number 5, *Financial volatility*, was added after the spring 2008 survey).

Figure 3: Top Emerging Risks (Choose up to Five)



1.3 TOP EMERGING RISK

When asked for a single emerging risk from the respondents' top five, the results are similar.

The results for the top emerging risk in November 2017 were as follows (the five highest were named by 58% of respondents, up from the previous survey's result of 57%):

1. *Cyber/interconnectedness of infrastructure* (16%)
2. *Asset price collapse* (12%)
3. *Technology* (10%)
4. *Terrorism* (9%)
5. *Climate change* and *Regional instability* (each with 7%)

Financial volatility and *Globalization shift* dropped out of the top five. Interestingly, *Asset price collapse* and *Cyber/interconnectedness of infrastructure* both had much higher results when considering the top emerging risk, resulting in shortfalls for 14 of the 23 risks.

All of the risks except *Currency shock* received at least one vote for top emerging risk in this year's survey. In 2009, 26% of the respondents chose this risk as the top emerging risk as the financial crisis developed. This could be a contrarian indicator.

1.4 TRENDING

Figure 4 shows results for this survey by category for the top current risk, the top five emerging risks (as a percentage of the total), the top emerging risk, and combinations. Risk managers are given an option if they feel a risk is not represented in the list (Other—typical references were to political and health/longevity issues). Only the survey question with the highest response rate includes a data label for each category.

Figure 4: Category Comparison Across Four Questions

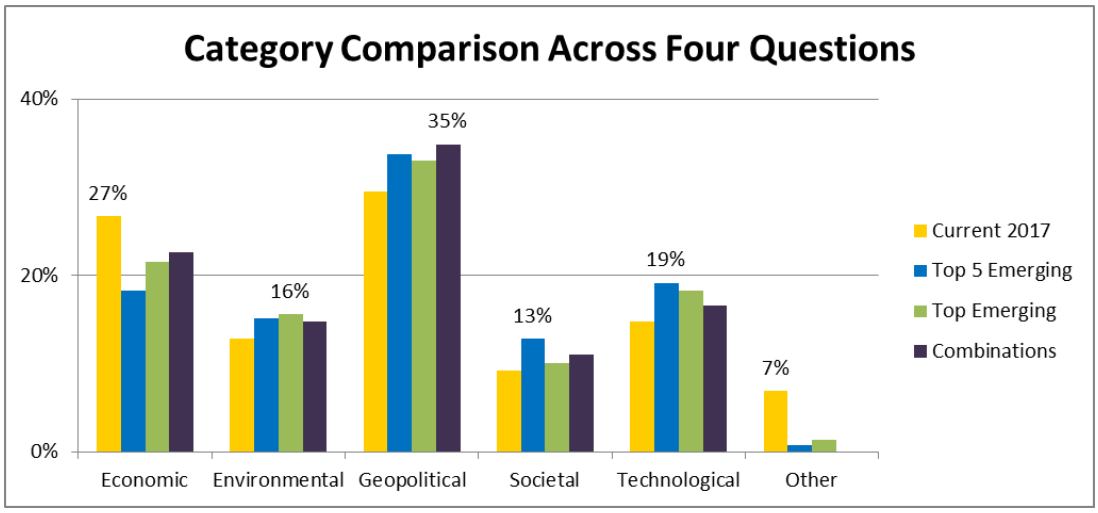


Figure 5 compares the current risk results to the top five and top emerging risk at the individual risk level. Hypothesizing why there are discrepancies is useful, and readers may have different viewpoints. The risks with the greatest disparity (above 2%) favoring the current risk over the top emerging risk are

- *Climate change* (3.6% differential)
- *Weapons of mass destruction* (3.2%)
- *Financial volatility* (2.7%)
- *Pandemics/infectious diseases* (2.3%)

The risks with the greatest disparity (above 2%) favoring the top emerging risk over the current risk are

- *Technology* (4.7%)
- *Cyber/interconnectedness of infrastructure* (3.4%)
- *Terrorism* (2.8%)
- *Liability regimes/regulatory framework* (2.4%)

The risks with the greatest disparity (above 2%) favoring the top five emerging risks over the top emerging risk are

- *Natural catastrophes: tropical storms* (2.8%)
- *Pandemics/infectious diseases* (2.5%)
- *Weapons of mass destruction* (2.1%)
- *Demographic shift* (2.1%)

The risks with the greatest disparity (above 2%) favoring the top emerging risk over the top five emerging risks are

- *Asset price collapse* (5.3%)
- *Cyber/interconnectedness of infrastructure* (5.0%)
- *Liability regimes/regulatory framework* (3.2%)
- *Technology* (2.2%)

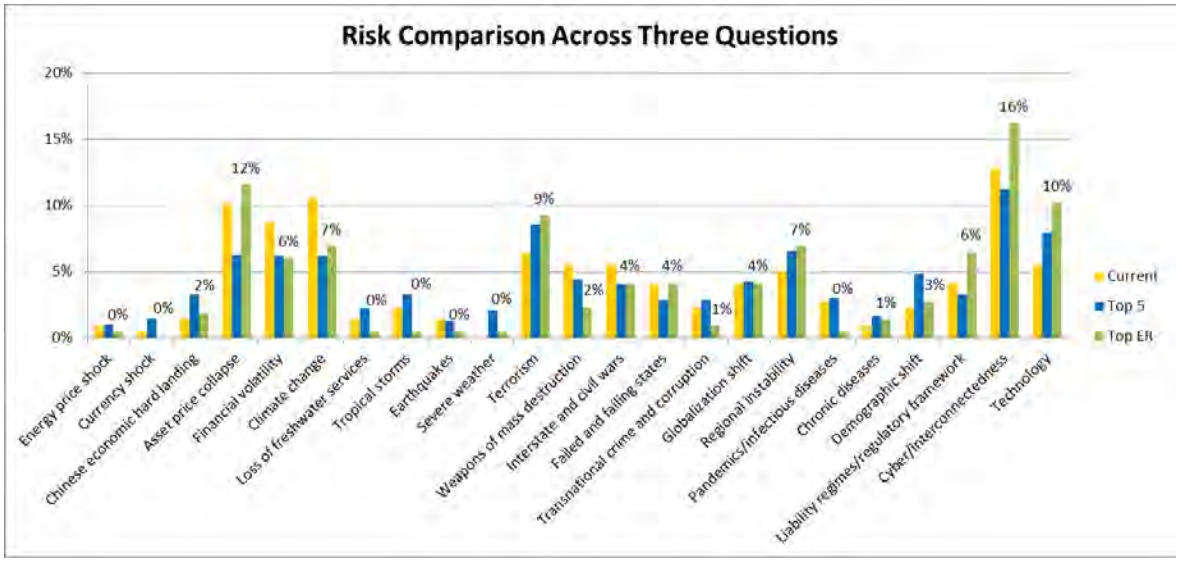
The risks with the greatest disparity (above 2%) favoring the top current risk over the top five emerging risks are

- *Climate change* (4.3%)
- *Asset price collapse* (3.8%)
- *Financial volatility* (2.5%)

The risks with the greatest disparity (above 2%) favoring the top five emerging risks over the top current risk are

- *Demographic shift* (2.6%)
- *Technology* (2.4%)
- *Terrorism* (2.2%)

Figure 5: Risk Comparison Across Three Questions



1.5 RISK COMBINATIONS

This year's survey again asked about concerns due to combinations of emerging risks. The top risks chosen in combination included *Cyber/interconnectedness of infrastructure*, *Financial volatility*, *Terrorism*, *Regional instability* and *Asset price collapse*. One combination ranked in the top five after being unranked in the 2016 survey. In fourth position was the combination of *Terrorism* and *Regional instability* (3%). Overall, Economic risks were down, with results spread across the other categories.

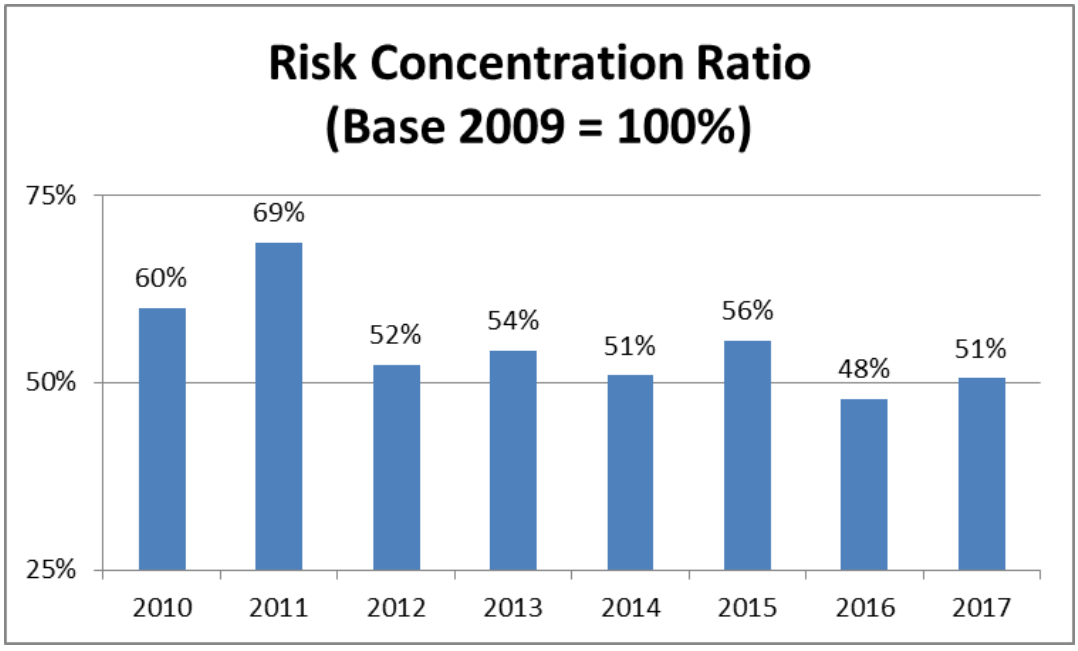
Top five combinations selected:

1. *Cyber/interconnectedness of infrastructure* and *Technology*—7%
2. *Asset price collapse* and *Financial volatility*—6%
3. *Terrorism* and *Cyber/interconnectedness of infrastructure*—5%
4. *Terrorism* and *Regional instability*—3%
5. *Climate change* and *Natural catastrophe: severe weather*—3%

Results this year for the top five combinations were a bit more concentrated, with their total adding to 23% after last year's comparable total of 21%.

There are 253 possible two-risk combinations from the 23 risks. As shown in Figure 6, the distribution of results was more concentrated than the prior year. The period immediately following the financial crisis is likely the extreme case, so 2009 is used as the base year of 100% for the risk concentration ratio. Comparisons are made by ranking the risks and comparing the resulting statistics, looking at the 25th percentile, median (50th percentile/median), 75th percentile and total. A higher percentage reflects greater concerns.

Figure 6: Risk Concentration Ratio (Base 2009 = 100%)



As a relative measure, the risk concentration ratio represents the current feeling among the risk management community. A low risk concentration ratio can be interpreted as reduced risk, or it may mean a greater variety of risks are being worried about.

1.6 TIME HORIZON

Some risks matter right away, demanding full attention. A pandemic or hurricane has a very high velocity; the risk develops very quickly. Others, like demographics, take decades and play out over a long time horizon. It is crucial for managers to remember the importance of such risks to the long-term success of the firm. This more naturally aligns with the incentives of an owner. In a question unique to this survey, respondents chose three risks that would be their top emerging risks prior to 2050. Results for individual risks are shown in Figure 7. Economic risks were assumed to cycle and took a lesser role, while *Climate change*, *Loss of freshwater services*, *Globalization shift*, *Failed and failing states*, *Chronic diseases*, *Demographic shift* and *Technology* each was higher with a 2050 time horizon.

Figure 7: Emerging Risks

1.7 EMERGING OPPORTUNITIES

Best practice risk management is evolving toward what is being called strategic risk management, and the respondents shared instances where emerging opportunities are being monitored. In addition to demographic shifts tied to increased population living to older ages and opportunistic technology (e.g., artificial intelligence, cyber insurance), respondents looked at opportunities to benefit from overpriced real estate and college degrees. Mean reversion of prices may provide opportunities to those who can overcome cognitive biases such as overconfidence and over-reliance on an assumption of efficient markets.

1.8 BUBBLES

While some argue there is no such thing as a bubble (market prices are always deemed correct), respondents shared quite a few potential bubbles. These included the Canadian housing market, cryptocurrencies, volatility (too stable), pensions, climate change (both pro and con), asset prices generally, and one who referred to an “everything” bubble (all assets).

1.9 UNKNOWN KNOWNS

In 2002, Donald Rumsfeld famously discussed known unknowns and other ways of thinking about probabilities. One combination rarely discussed is unknown knowns, where the analyst is ignorant of the

future event probability distribution. “Known knowns” is where the actuary wants to practice, using the law of large numbers to make decisions. Today’s environment is evolving in many ways, and actuaries must decide when not to use existing data. Many unique risks were suggested, with data security typical. The respondent’s management strategy included continuous monitoring and regular modifications. Responding quickly to this type of event is important, often defined by velocity to show how fast a risk can become important.

1.10 LEADING INDICATORS

As formal risk appetite policies and regulatory processes are implemented, less than half of firms formally identify emerging risks (40%). Most respondents who identify leading indicators for emerging risks also have criteria for action based on them (82%). Examples of the process include risk dashboards and scenario testing specific for each risk.

Some leading indicators identified include unemployment by region, dependency ratios, public reports of cyber events and general articles discussing a specific issue.

1.11 RISK VERSUS RETURN

Over half of respondents (55%) said that ERM had a positive effect in their company/industry, and 47% agreed that ERM improved returns relative to risk. Examples of positive ERM include targeted pricing, hedging specific risks and reviewing retention levels. Transparency and making better decisions drive improved returns where the process works, while overly conservative practices can restrict innovation.

One respondent who answered *Not sure* about the effect of ERM at their company framed the debate in an interesting way: *If ERM is integrated within business decision making, it will have a positive impact. However, if too much focus is placed on building overly complex models, ERM will have limited value, and will be viewed solely as a compliance exercise.*

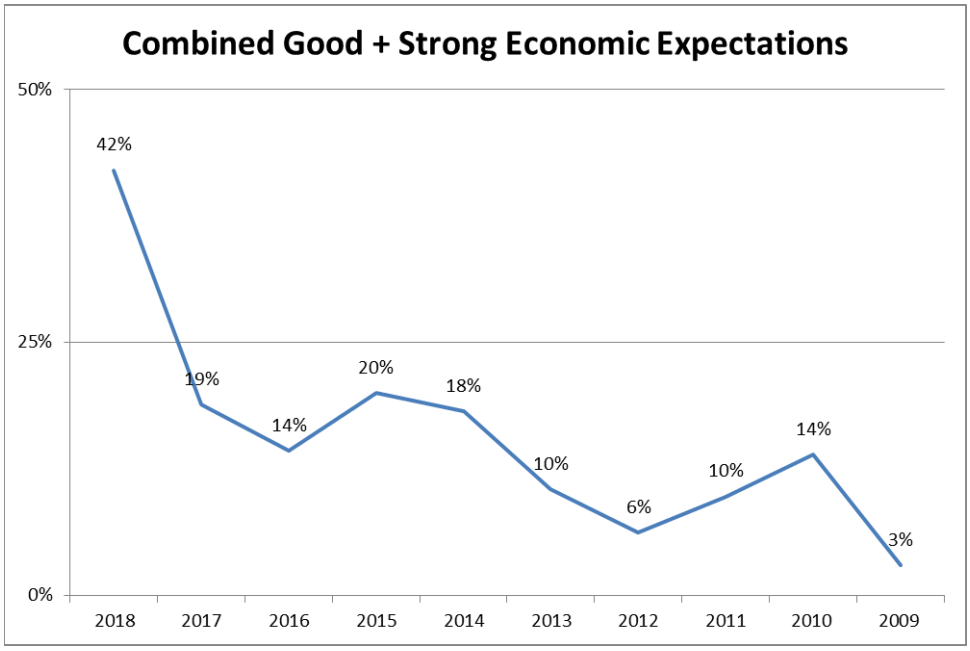
Another focused on people: *It can depend on the type of people involved. Implementing an ERM program should involve someone who is willing to accept more risk, not just risk-averse folks.*

Section C, Question 4, of Appendix II is excellent reading material for both new and experienced risk managers. The quality of these comments is representative of those received throughout the survey.

1.12 ECONOMIC EXPECTATIONS

Respondents are more upbeat about global economic expectations than previously, with the highest percentage reporting *good* or *strong* in Figure 8 (42%—doubling that of any prior survey). This may be a result of the low financial volatility experienced during 2017, and may be tied to the continual decrease in the Economic category results since the global financial crisis.

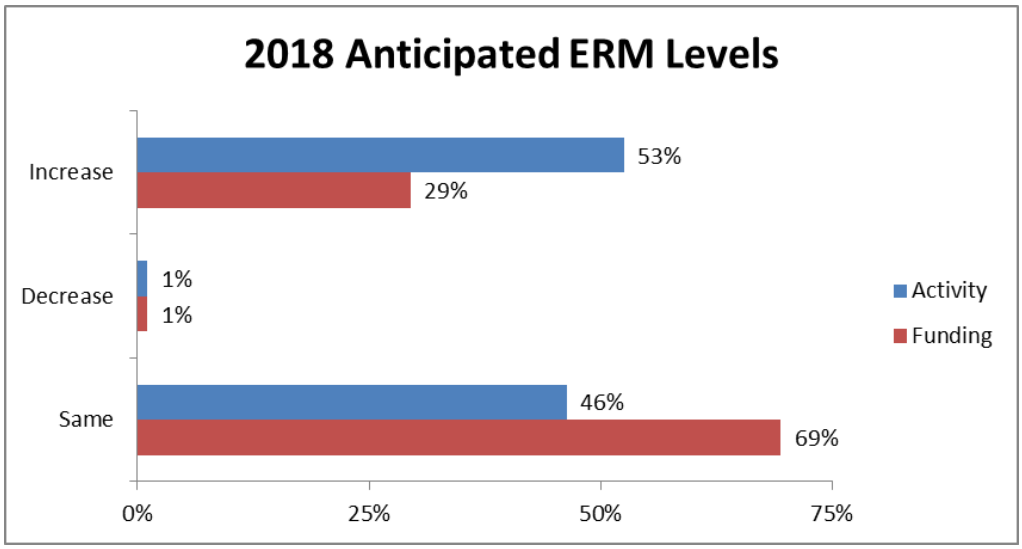
Figure 8: Combined Good + Strong Economic Expectations



1.13 RISK ACTIVITIES

Risk managers report that risk tools are being used more frequently to increase the depth of quantification methods. Activities related to ERM continued to grow in 2017 (but only 35% experienced staff growth), with 53% expecting activity growth in 2018. Only 29% anticipate an increase in funding, so it is no surprise that efficiency is also high on the list of project plans. Data science (big data) and combining common activities to look across complex organizations were some of the current projects. Over longer time horizons, combining data analytics with Delphi survey techniques may provide actuaries with competitive advantages in the market.

Figure 9: 2018 Anticipated ERM Levels



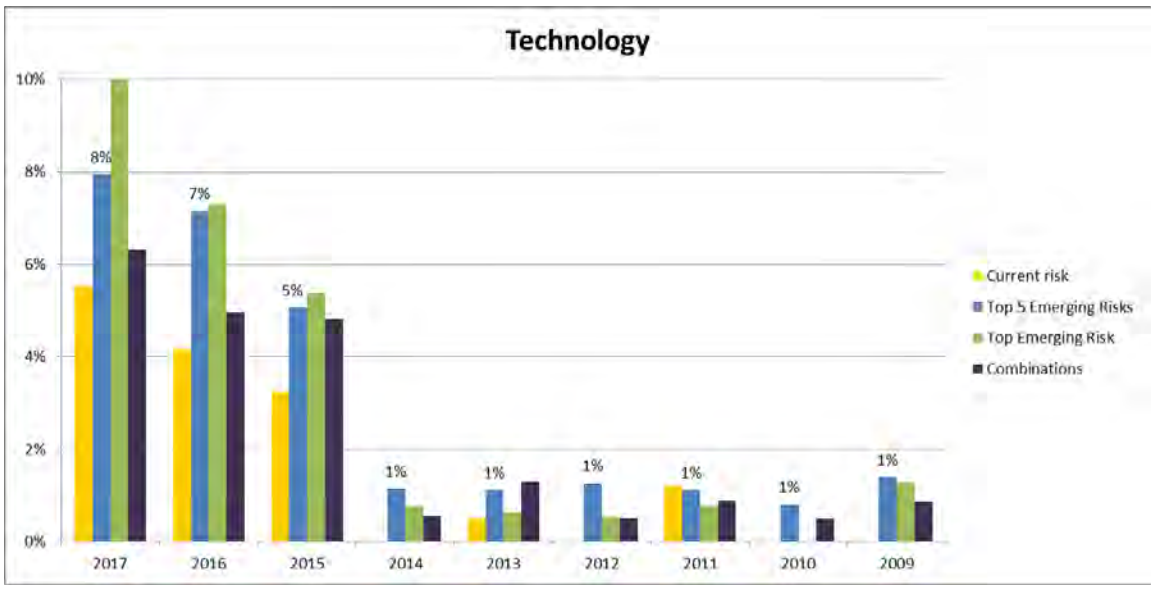
1.14 STRATEGIC OPPORTUNITY

In a result that is disappointing to those hoping risk managers will become more involved in strategic discussions, nearly half (48%) reported that they have input but no vote when their firm considers a strategic opportunity. It may be that best practices include the risk manager in these discussions, and numerous examples were shared where this had occurred. These include taking the lead on cyber risk, being proactive with hurricane risk and new products, and creating scenario tests around negative interest rates. Recognition from one risk manager commented that their board *appreciated increased clarity and alignment with risk appetite*.

1.15 HIGHLIGHT—TECHNOLOGY

The survey continued to reflect increasing trends for technology risks other than cyber, with all four questions (current, top five emerging, top emerging, and combinations) in their third year of higher responses. The relative importance of each shifted from prior surveys as a greater number chose *Technology* as their top emerging risk than any of the other questions. It is now the third most popular of the emerging risks both when five are chosen and when choosing the top emerging risk. As risk managers think about driverless cars, drones, DNA editing and other technology risks, this trend is likely to continue. Figure 10 shows the progression of this risk since 2009.

Figure 10: Technology



Section 2: Top Takeaways

While this report provides many additional nuggets of information to those who read it in its entirety, those who scan the initial pages will find the primary conclusions. The following bullets provide interesting tidbits that hopefully prompt you to read further. Reviewers with different backgrounds and experience from the researcher may highlight alternative comments. This is why the entire data set is reproduced in Appendix II.

2.1 WHAT RISK MANAGERS ARE THINKING

- Technological category risks continue to increase overall. Cyber risk concerns have stabilized but remain at the top of the rankings. The *Technology* risk is growing.
- Geopolitical category risks broke a pattern of even-numbered-year increases as worldwide populism and U.S. political uncertainty remained high.
- The Economic category fell, offset by increases in the Environmental, Geopolitical and Technological categories.
- *Liability regimes/regulatory framework* and *Cyber/interconnectedness of infrastructure* are ranked higher when considering the top emerging risk than the current risk or the top five emerging risks. *Climate change* and *Financial volatility* are ranked highest as a current risk. *Demographic shift* is higher under the top five emerging risk question.
- *Technology* risk continues to move up the rankings and is now in the top five for both emerging risks and top emerging risk. This risk highlights the insurance industry's unique role in risk management, not only managing its own risks but seeking out and accepting the risks of others to help businesses increase resilience.
- Time horizon matters. When we look out to 2050, risks like *Climate change* and *Demographic shift* take on leading roles. Practitioners at firms with long-tailed liabilities should take note, and at least qualitatively monitor risks that align and set up incentives consistent with that.
- Global economic expectations are higher than in the recent past, with 42% of respondents expecting 2018 to be good or strong.

2.2 LEADING-EDGE ACTIONABLE PRACTICES

- ERM has had a positive effect for many, with improved returns relative to risk when the culture encourages engaged discussions. Concerns were expressed when implementation focuses on overly complex models and overly conservative teams who say no to all opportunities.
- Risk management is moving toward strategic planning in best-practice companies.
- Risk managers consider it their job to present scenarios that cover a range of possible outcomes.
- Concerns were expressed around overvalued assets—examples include Canadian housing, cryptocurrencies, volatility, student loans and pensions.

2.3 CONCLUSIONS

Emerging risks are a critical component of a healthy ERM process. New and evolving risks are not less important but are harder to quantify, especially over long time horizons. Risk and return should be balanced and managed, taking an owner's mentality across a long life cycle. Technological and Geopolitical risks should be considered, not just Economic considerations. Societal and Environmental risks become more important across longer time horizons.

It is more comfortable for the modeler to add complexity, but better decisions will be made when an axiom like Einstein's to keep it as simple as possible, but not one bit simpler, is followed. A healthy balance between considering risk and letting risk drive decision making is important too. The risk manager who becomes identified as Mr. No will cease to be effective.

The environment we live in, both economically and environmentally, is changing more quickly than ever. Risk managers need to identify leading indicators for emerging risks that will help them identify when it is appropriate to ramp up quantitative analysis of a risk. Risks like demographics happen slowly at first, then all at once. It is much easier to adjust before they start to move quickly.

Interactions between emerging risks can seem to accelerate the severity and velocity (how quickly they develop). Here are some potential risks and events that could go from distant possibility to immediate concern very quickly. Developing a qualitative game plan now for these types of risks will pay off as a thought process is developed and improved.

- Systemic financial risks arise due to connections between various parts of the financial system. These complex interactions could cause unexpected results due to debt and lack of liquidity when needed.
- Antimicrobial resistance has the ability to change our everyday lives by returning us to an era where a simple cut or accident leads to death. Who would be willing to enter a hospital, play sports or swim in the ocean if antibiotics were known to be ineffective?
- Famine is more likely than many realize. Our reliance on monoculture (one disease could destroy the entire crop), the impact of a large volcanic eruption (sulfuric and fluorine gas directly kills, and ash blots out the heat and light of the sun, leading to multi-year crop failures), and the effects of climate change (warming the planet, higher carbon dioxide levels in the air and water, changing jet streams and ocean circulation patterns) could all provide the circumstances needed for crop failures, which would also lead to other food shortages and massive starvation.

It is only a matter of time until a tipping point is reached around a risk on this list of 23. Those who have a game plan in advance will be the survivors and have a competitive advantage. Hopefully readers of this survey will find it helpful as they develop this game plan.

Section 3: Background[3]

This research project was funded by the JRMS of the CIA, CAS and SOA. A survey was developed and made available through an email link to members of the JRMS. Others were invited to participate using the International Network of Actuarial Risk Managers (INARM) Listserv, membership distribution lists of several SOA sections and social media such as Twitter and LinkedIn groups related to risk management. A total of 222 responses were received. This represents a material percentage relative to the number distributed (more than 2,500 to JRMS). This is the 11th survey completed. Many questions generate sustained trends that suggest conclusions, but the results continue to evolve as the time since the financial crisis lengthens and geopolitical changes occur. The previous surveys were distributed in April 2008, November 2008, December 2009, October 2010, October 2011, October 2012, October 2013, October 2014, November 2015 and November 2016. The current year survey was conducted in November 2017. All articles and previous research reports can be found at:

https://www.soa.org/resources/research-reports/2015/research-emerging-risks-survey-reports/

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 https://www.soa.org/research-reports/2009/research-2009-emerging-risks-survey/

December 2009—Third survey

- Research report https://www.soa.org/research-reports/2010/research-2009-emerging-risks-survey/
- 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

October 2010—Fourth survey

- Research report https://www.soa.org/research-reports/2011/research-2010-emerging-risks-survey/
- 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

[3] This section has been updated with new information but is otherwise consistent with prior surveys.

October 2011—Fifth survey

- Research report https://www.soa.org/research-reports/2012/research-2011-emerging-risks-survey/

October 2012—Sixth survey

- Research report https://www.soa.org/research-reports/2013/research-2012-emerging-risks-survey/
- 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-reports/2014/2013-emerging-risks-survey/
- 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-reports/2015/2014-emerging-risks-survey/
- 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

November 2015—Ninth survey

- Research report https://www.soa.org/research-reports/2016/2015-emerging-risks-survey/

November 2016—Tenth survey

- Research report https://www.soa.org/research-reports/2017/10th-emerging-risks-survey/
- SOA News Canada Blog September 2017 https://www.soa.org/Files/Research/Projects/erm-lessons-master.pdf
- Summary of Findings https://www.soa.org/Files/Research/Projects/10th-emerging-risks-survey-summary.pdf

Rather than developing a unique set of emerging risks for consideration when the survey was first developed, the research team chose one originally created by the World Economic Forum (WEF) for the initial survey. The WEF reports (annually since 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. Some definitions were updated for consistency and to reflect current common risk definitions. *Climate change (includes space weather)* was shortened to *Climate change* as it seemed to confuse some respondents. *Retrenchment from globalization* was updated to *Globalization shift* to reflect the two-sided nature of the risk. 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% so stated totals may not add up to exactly 100% (charts 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.

3.1 RESEARCHER

The researcher for this project is Max J. Rudolph. Additional related articles and presentations can be found at his website or LinkedIn profile. His contact information is

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Section 4: Results

The *11th Survey of Emerging Risks*, sponsored by the JRMS, includes sections covering 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 222 surveys were submitted. The survey asks for individual rather than company responses. It uses an anonymous electronic format encouraging the expression of opinions, and the respondents delivered! Many multiple-choice format questions are followed up with questions asking "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. Readers are encouraged to review all of the comments and perform their own analysis.

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 except when these responses were considered meaningful. Analysis of this year's trends was very thought-provoking for the researcher, as occurs each year, and hopefully you will agree.

4.1 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 that affects the other risks.

4.2 HISTORY

As in previous reports, the survey results show that current values of the Standard & Poor's 500 (S&P 500) equity index (Figure 11), a barrel of oil (Figure 12) and the U.S. dollar relative to the euro (Figure 13) seem to anchor perceptions of risk. Results have evolved over time, often led by recent 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.[4]

[4] Sources: S&P 500, Yahoo Finance; price of oil, the Energy Information Administration at http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=RWTC&f=D; dollar/euro exchange rate, http://www.federalreserve.gov/releases/h10/Hist/dat00_eu.htm.

Figure 11: S&P 500

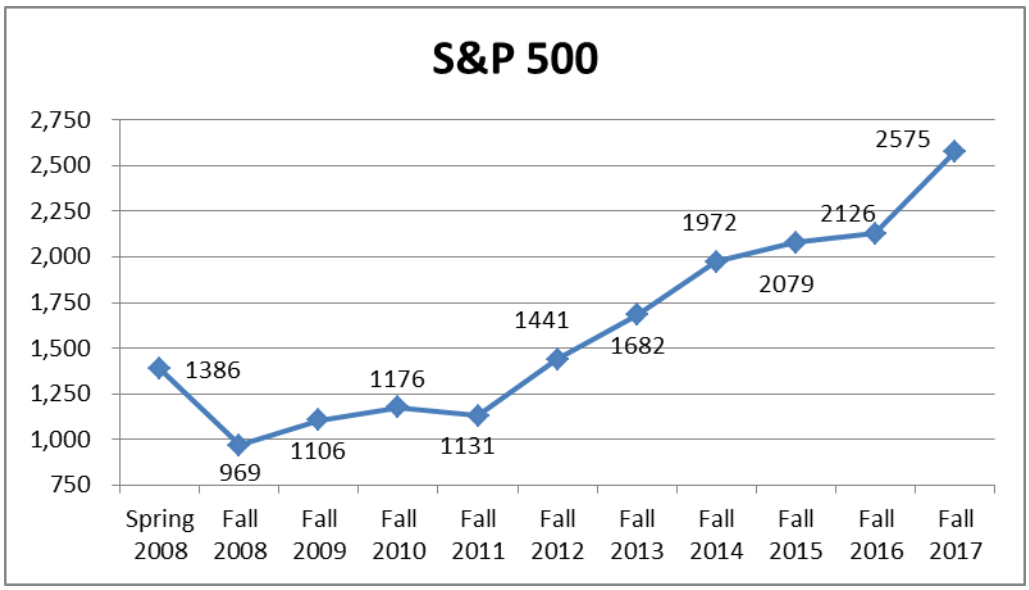


Figure 12: Oil ($ per Barrel)

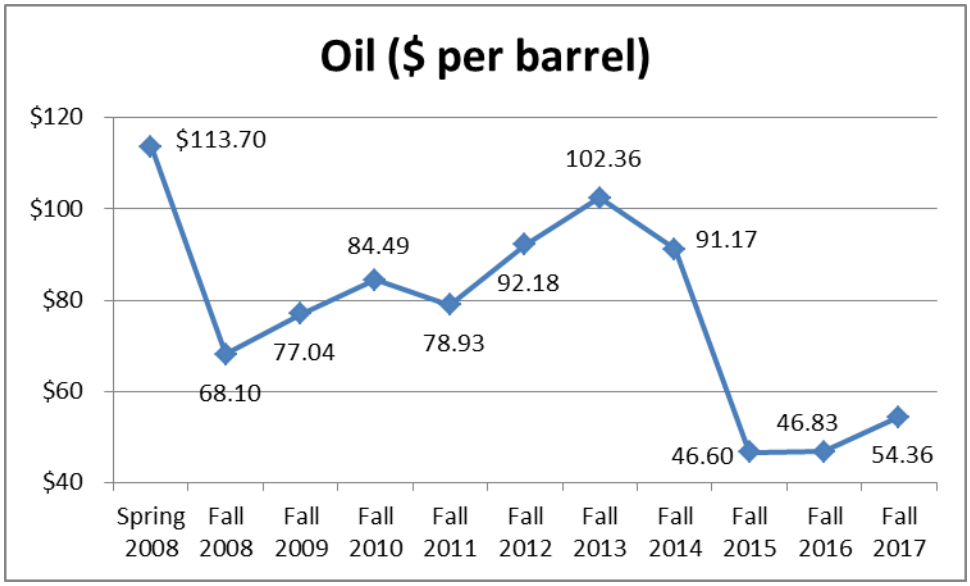
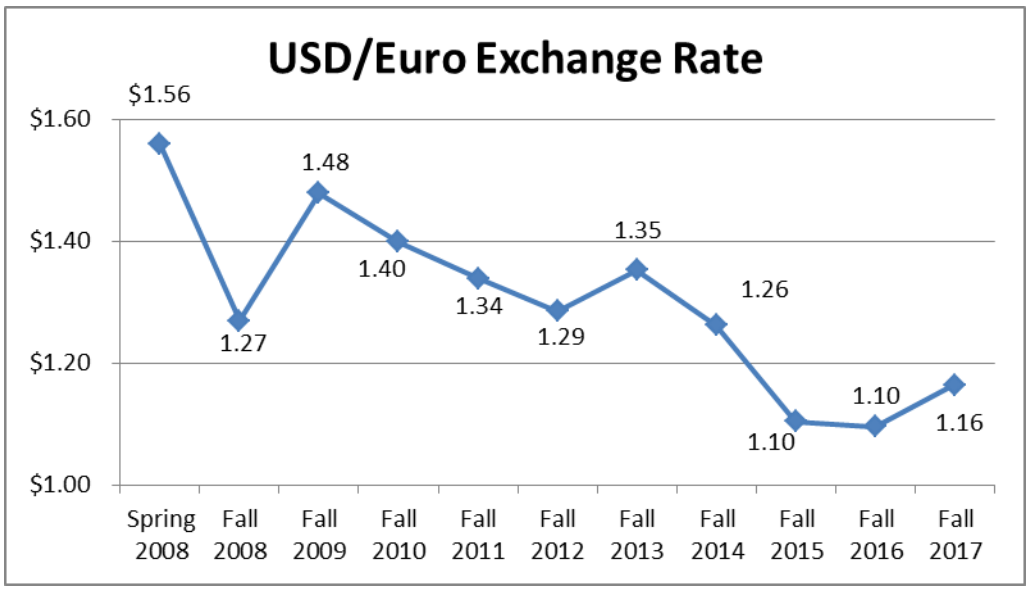


Figure 13: USD/Euro Exchange Rate



World events that transpire while surveys are open significantly influence the results. The geopolitical environment continued to evolve in the first year following the election of Donald Trump as U.S. president. North Korea, Venezuela and Syria were among many hot spots, while the earth warmed and calm markets rose. The following information provides context to previous surveys. Note that these responses are to a question asking for their top five emerging risks. For example, in Survey 1 listed immediately below, *Oil shock* was listed by 57% of respondents as one of their five. (Ed. note: some risk names have evolved over time, e.g., *Oil shock* is now *Energy price shock*.)

Survey 1 (April 2008)

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

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. By the end of October 2008, from the previous survey, the S&P 500 had dropped 30%, the price of a barrel of oil had decreased 40% and the U.S. dollar had strengthened 23%. The top four emerging risks from this second iteration of the survey were as follows:

Survey 2 (November 2008)

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

Systemic risk was perceived to be very high at the time, with asset values in free fall. Oil prices had fallen, U.S. currency was considered a safe harbor and Barack Obama had just been elected to his first term as U.S. president. The third survey was in December 2009. The S&P 500 had increased 14%, the price of a barrel of oil was up 13% and the U.S. dollar had weakened 17%. The economy had begun to recover. The top four emerging risks included *Chinese economic hard landing* for the first time.

Survey 3 (December 2009)

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

The indicators had not changed materially by late 2010 as the European debt crisis ramped up. The stock market was up 6%, the price of oil was up 10% and the dollar had further strengthened by 6%. Most of the top five results continued to come from the Economic category. *International terrorism* and *Failed and failing states* made their first appearance among the top five.

Survey 4 (October 2010)

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

In late 2011 the U.S. stock market was down 4% overall while being volatile during the year, the price of oil was down 7% and the dollar had further strengthened against the euro by 4%. Several major events occurred, including the Japanese earthquake/tsunami and the Arab Spring.

Some of the risks were updated for the 2011 survey. One risk was moved to a different category, two were combined and one was added. (These changes, along with others since then, are described in Appendix I. Comparisons were adjusted for trending purposes.) Most of the top six results continued to come from the Economic category. A 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 last time (to date) that *Oil price shock* (or *Energy price shock*) has appeared.

Survey 5 (October 2011)

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

In 2012, equity markets surpassed the levels of spring 2008 for the first time (up 27% since the previous survey), while oil prices rebounded (17%) and the dollar strengthened (4%).

Survey 6 (October 2012)

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

Equity markets (17%) and oil prices (11%) continued their upward trend in 2013, while the dollar reversed course and weakened (5%) versus the euro. Natural disasters were prominent, including Hurricane Sandy in the United States and Typhoon Haiyan in Asia.

Survey 7 (October 2013)

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

By the fall of 2014, the dollar had started to strengthen against the euro (7%), the stock market was up (17%) and the price of oil had started to go down (12%). Much stronger moves in oil and the dollar occurred after the survey closed, leaving the geopolitical crisis in Eurasia as a top concern. An Ebola outbreak in Africa raised concerns of a potential pandemic.

Survey 8 (October 2014)

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

Fall 2015 saw the dollar strengthen relative to the euro (up 14%), which also drove the price of oil down (by 49%) since it is primarily transacted in dollars. The U.S. stock market increased by 5% and cyber risk seemed to be constantly in the news.

Survey 9 (November 2015)

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

The fall 2016 survey occurred during a period of transition, and the metrics were stable. The top three risks remained the same. *Retrenchment from globalization* made the largest move as voters around the world

considered populist candidates and causes. The top catastrophic events in 2016 were earthquakes, wild fires and flooding, due to both tropical storms (e.g., Hurricane Matthew) and thunderstorms.[5]

Survey 10 (November 2016)

1. *Cyber/interconnectedness of infrastructure* (53%)
2. *Financial volatility* (44%)
3. *Terrorism* (39%)
4. *Technology* (34%)
5. *Retrenchment from globalization* (30%)

The fall 2017 survey capped a period of calm following the global financial crisis nearly 10 years ago, while geopolitical tensions continued to be high. Natural disasters, some driven by record warming, included hurricanes Harvey, Irma and Maria along with atmospheric rivers on the west coast of the United States and wild fires. Earthquakes in Mexico, Cyclone Debbie in Australia, European temperature extremes and Asian flooding all contributed to worldwide risk events.

Survey 11 (November 2017)

1. *Cyber/interconnectedness of infrastructure* (53%)
2. *Terrorism* (41%)
3. *Technology* (38%)
4. *Regional instability* (31%)
5. *Asset price collapse* (30%)

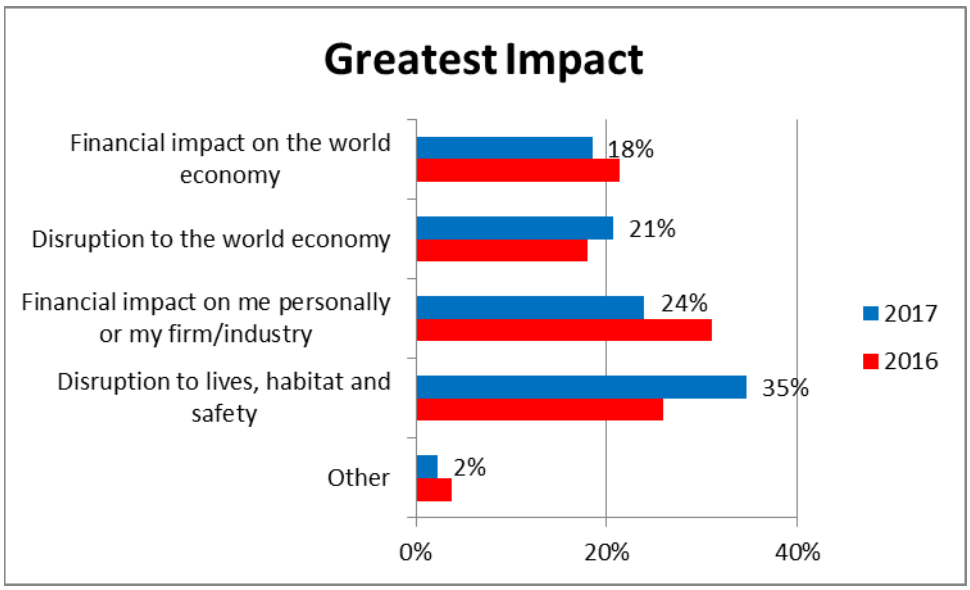
4.3 INTRODUCTORY QUESTIONS

During 2016 inequality and the rise of populism became event drivers. The results, including Brexit and the election of Donald Trump as U.S. president, continued to dominate the risk landscape in 2017, joined by weather-related natural catastrophes.

Respondents have varying definitions of emerging risk. Four options each received at least 18%. As shown in Figure 14, the answer most commonly reported was *Disruption to lives, habitat and safety* (35%), replacing *Financial impact on me personally or my firm/industry* as the top response.

[5] Swiss Re, Preliminary sigma estimates for 2017: Global insured losses of USD 136 billion are third highest on sigma records, December 20, 2017, http://www.swissre.com/media/news_releases/nr20171220_sigma_estimates.html

Figure 14: Greatest Impact



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

Geopolitical Risks

11. *Terrorism*
12. *Weapons of mass destruction*
13. *Interstate and civil wars*
14. *Failed and failing states*
15. *Transnational crime and corruption*
16. *Globalization shift*
17. *Regional instability*

Societal Risks

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

Technological Risks

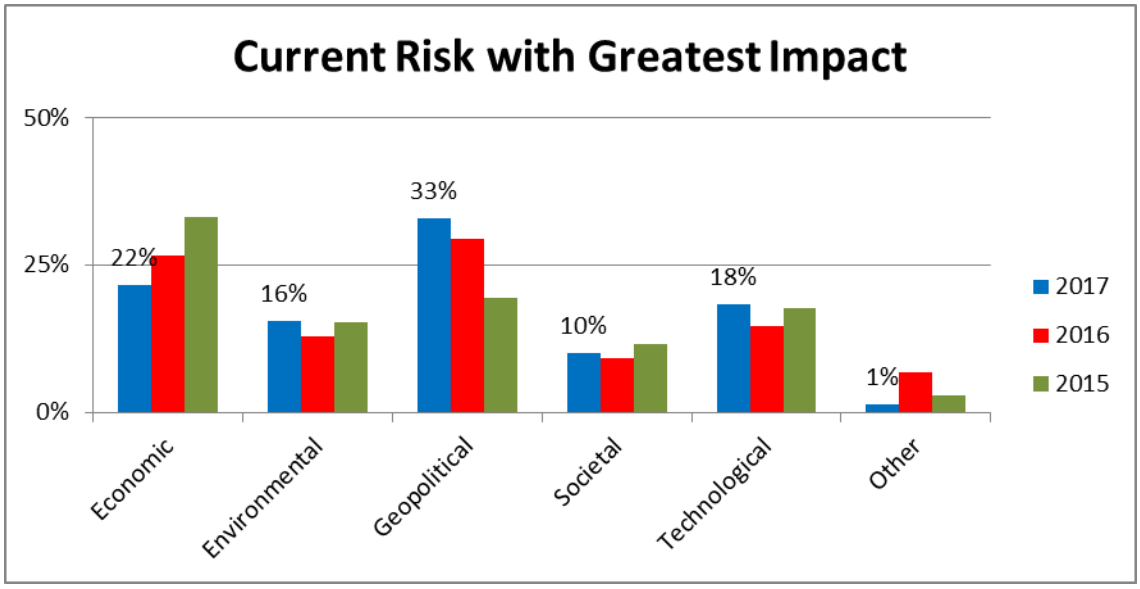
22. *Cyber/interconnectedness of infrastructure*
23. *Technology*

4.4 CURRENT RISK

Each year a benchmarking question is asked about the top current risk. When the respondents answer this question, they are reminded of recency cognitive bias, an anchoring effect identified in prior surveys. In the field of behavioral finance, it is thought that recognizing our shortcomings will help us overcome them.

Changes to risk names and definitions since the original WEF-defined risks are documented in Appendix I. The 23 emerging risks used in this iteration of the survey were reviewed. Names were changed for two risks and seven risks had their definitions updated. Some of the changes were to make the wording around natural catastrophe risks more inclusive (e.g., replacing "earthquake(s)/volcanic eruptions" with "earthquake(s)/seismic activity"). *Retrenchment from globalization* and *Demographic shift* were updated to reflect the two-sidedness of risk.

Figure 15: Current Risk with Greatest Impact



The distribution of results by category follows, along with prior year results.

- Economic 22%/27%/33% (2017/2016/2015 surveys)[6]
- Environmental 16%/13%/15%
- Geopolitical 33%/29%/19%
- Societal 10%/9%/12%
- Technological 18%/15%/18%
- Other 1%/7%/3%

As shown in Figure 15, the Geopolitical category maintained its top ranking for the risk currently having the greatest impact, increasing 4%. All of the categories except Economic (and Other) increased this year. The Economic category fell by another 5%, while Environmental grew by 3% (due primarily to natural catastrophe risks). The Societal category increased by 1%, with the Technological category rebounding to 18%. *Cyber/interconnectedness of infrastructure* took over the top spot with 13% from *Financial volatility*, which fell to fourth position. The top gainer was *Regional instability* (increase from 0% to 5%). *Globalization shift* fell the most, from 8% to 4%.

All risks except *Natural catastrophe: extreme weather* were chosen as the top current risk by at least one respondent.

The top five current risks chosen were

1. *Cyber/interconnectedness of infrastructure* (13%)
2. *Climate change* (11%)
3. *Asset price collapse* (10%)
4. *Financial volatility* (9%)
5. *Terrorism* (6%)

4.5 SECTION A: EMERGING RISKS

4.5.1 Top Five: Geopolitical Risks Surge

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 WEF suggests a reasonable time horizon of 10 years, but that is not required here. The data is compared across surveys and considers recent events as part of the analysis. Each survey has come at a unique time in history.

While 85% of respondents chose the full complement of five risks, the average remained at 4.73. 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 Geopolitical category increased its lead, the Technological category took over second place from the Economic category, and the Environmental category moved up to fourth. The results distributed by category (using percentages of total responses) are:

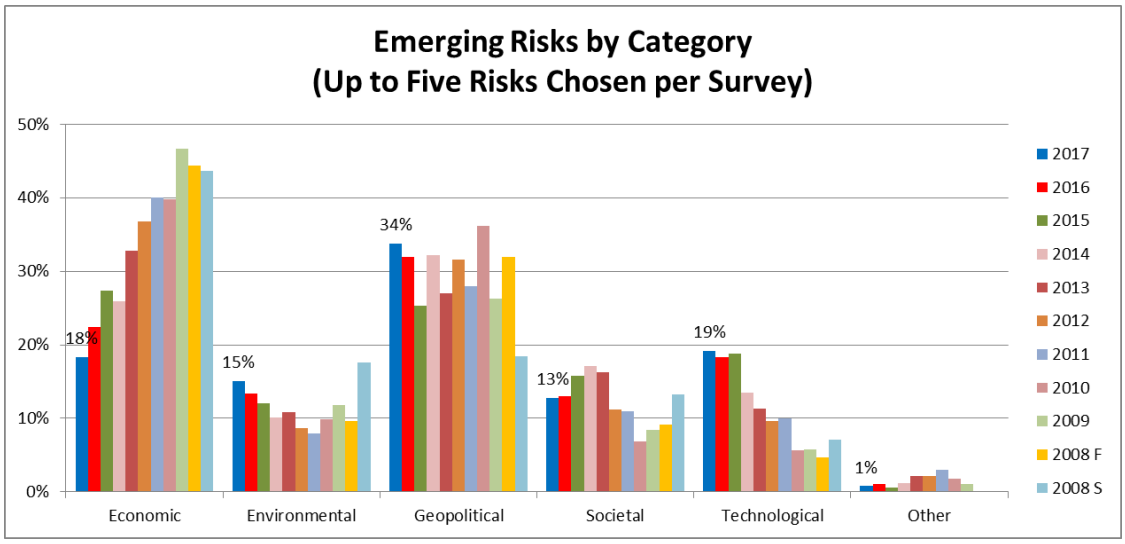
[6] All tables include the most recent results, starting with the current survey and working backward, as shown here.

1. Geopolitical 34%/32%/25% (2017/2016/2015 surveys)
2. Technological 19%/18%/19%
3. Economic 18%/22%/27%
4. Environmental 15%/13%/12%
5. Societal 13%/13%/16%/17%

The Geopolitical category increased by 2%. Previously it had surged in even-numbered years, presumably due to the U.S. election cycle, but continued to increase in the first year of the Trump administration. The Economic category continued its decline, down 4% from the last survey. The Environmental category was up 2%.

As Figure 16 shows, each category has its own story across the history of the survey. Technological risks have grown materially over time, recently stabilizing, and Economic risks have received less attention of late, while Environmental, Geopolitical and Societal risks have their own cycles.

Figure 16: Emerging Risks by Category (up to Five Risks Chosen per Survey)



There were material increases in several individual risks. *Weapons of mass destruction* increased from 9% to 21%, *Natural catastrophes: tropical storms* doubled from 8% to 16% and *Regional instability* increased from 26% to 31%.

The top five specific responses were spread across the Economic, Geopolitical 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%. The top five total 193% as each was listed on at least 30% of the surveys.

1. 53%/53% (2017/2016) *Cyber/interconnectedness of infrastructure*
2. 41%/39% *Terrorism*
3. 38%/34% *Technology*
4. 31%/26% *Regional instability*
5. 30%/26% *Asset price collapse*

The Economic category had two risks that decreased by 5% or more. *Energy price shock* (from 10% to 5%) and *Financial volatility* (from 43% to 29%) each had material decreases. Two other risks showed large drops: *Failed and failing states* (from 21% to 14%) and *Globalization shift*, which dropped from 30% to 20% after a large increase in the previous survey.

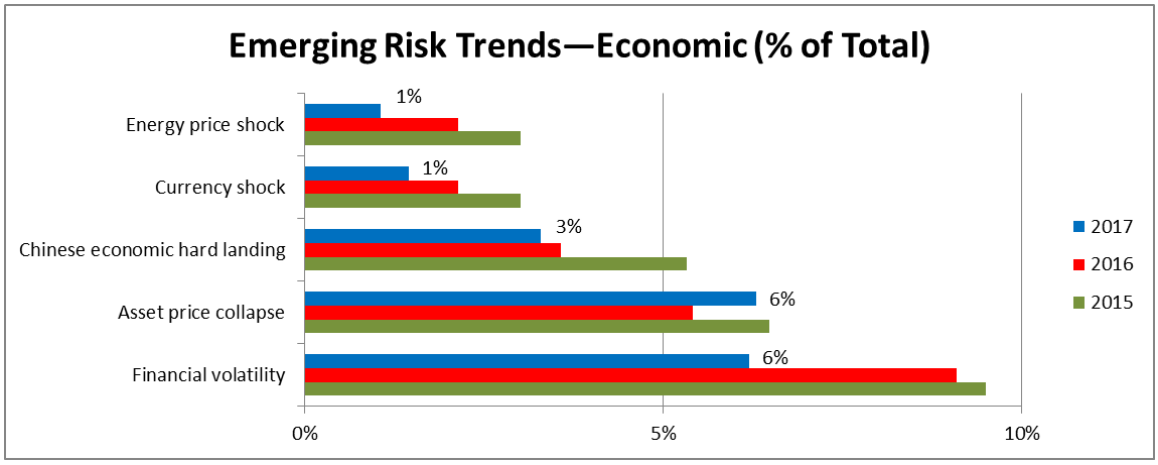
Trends of at least two consecutive years may act as a leading indicator. Increasing trends include *Climate change* (four years), *Loss of freshwater services* and *Natural catastrophes: tropical storms* (three years), *Terrorism*, *Weapons of mass destruction*, *Transnational crime and corruption* and *Technology* (two years). Decreasing trends include *Chinese economic hard landing* (seven years), *Pandemics/infectious diseases* (three years), and *Energy price shock*, *Currency shock*, and *Financial volatility* (two years).

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 was analyzed as a percentage of all responses. Four of the five primary categories were higher than their average over the 11 survey cycles. Environmental (15% vs. 12% average), Geopolitical (34% vs. 29% average), Societal (13% vs. 12% average) and Technological (19% vs. 11% average) each satisfied this criterion, while only Economic (18% vs. 34% average) was lower. Among individual risks, 12 of the 23 had above-average results. The greatest positive differential was 5% for *Technology.* Several other risks were above average by more than 1%, with *Cyber/interconnectedness of risks* higher by 3% and *Terrorism* up by 2%. Nine trended below average, led by 5% for *Energy price* shock, *Currency shock*, and *Financial volatility.* All five risks in the Economic category were again below their long-term average, while the Geopolitical category had six out of seven above their longer-term average.

Figures 17 through 21 show recent trends when five emerging risks are chosen. The denominator in the percentages is the total number of responses received rather than the number of respondents. This allows a comparison to the top current and emerging risk categories.

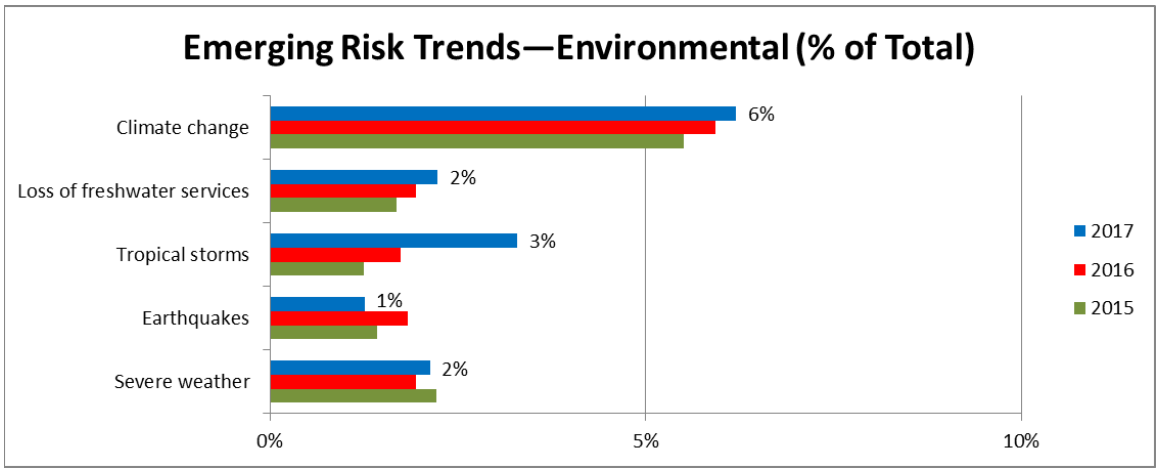
Economic risks were lower than in the previous survey, except for *Asset price collapse*, as shown in Figure 17.

Figure 17: Emerging Risk Trends—Economic (% of Total)



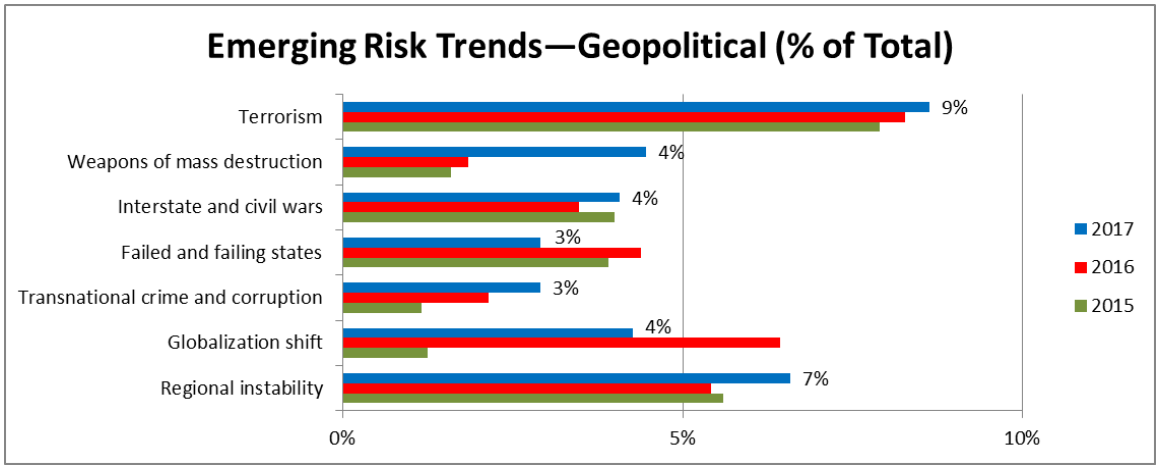
As shown in Figure 18, Environmental risks were up except for *Natural catastrophe: earthquakes.*

Figure 18: Emerging Risk Trends—Environmental (% of Total)



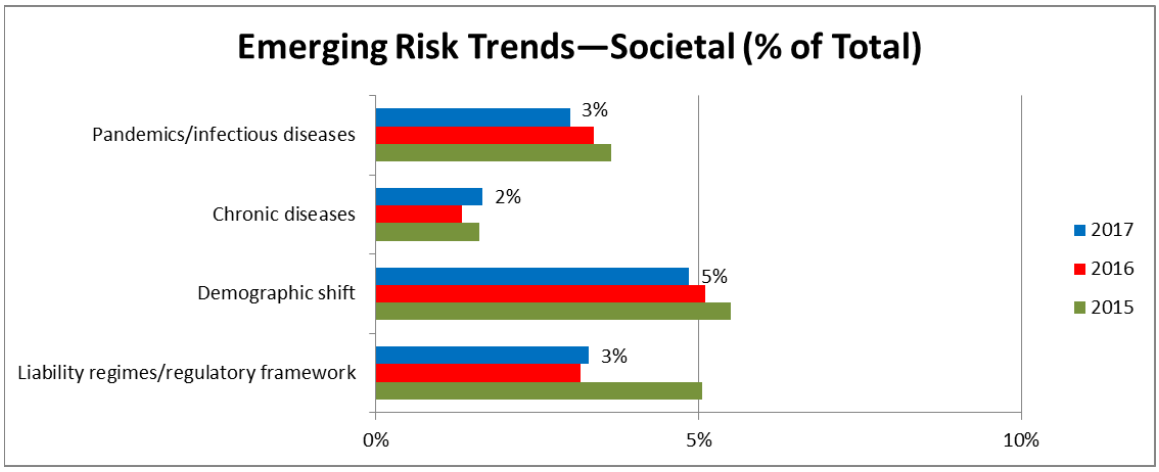
While five of seven risks increased, and some materially, both *Failed and failing states* and *Globalization shift* fell within the Geopolitical category, as shown in Figure 19.

Figure 19: Emerging Risk Trends—Geopolitical (% of Total)



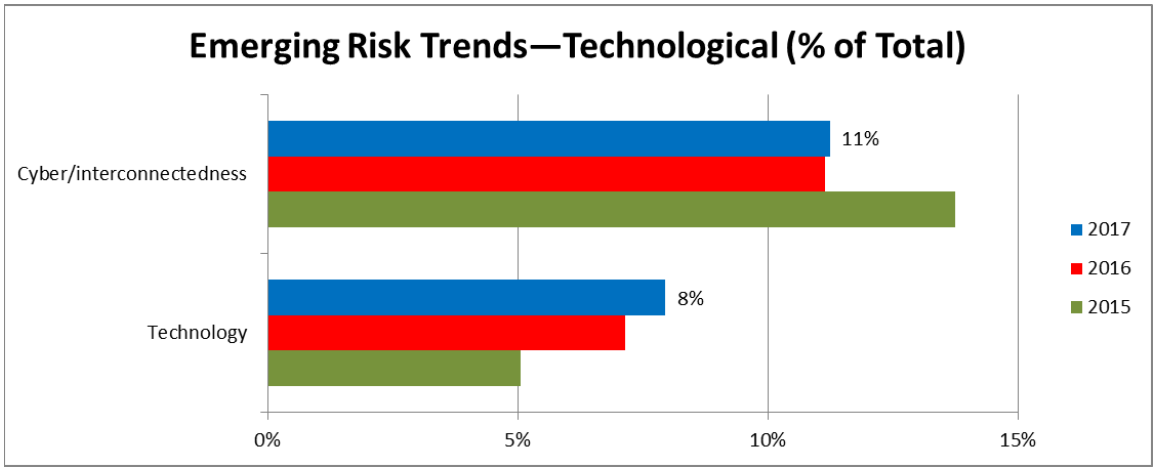
It was a mixed bag for the Societal risks, as two of the four increased and the other two decreased, as shown in Figure 20.

Figure 20: Emerging Risk Trends—Societal (% of Total)



Technological risks both increased, and *Technology* joined *Cyber/interconnectedness of infrastructure* in the top three overall selections.

Figure 21: Emerging Risk Trends—Technological (% of Total)



Some of the changes over time are highlighted in Figure 22 and Figure 23. It is interesting to see how certain risks have become more or less popular among respondents over various periods of time.

Figure 22: Top Emerging Risks (Choose up to Five)

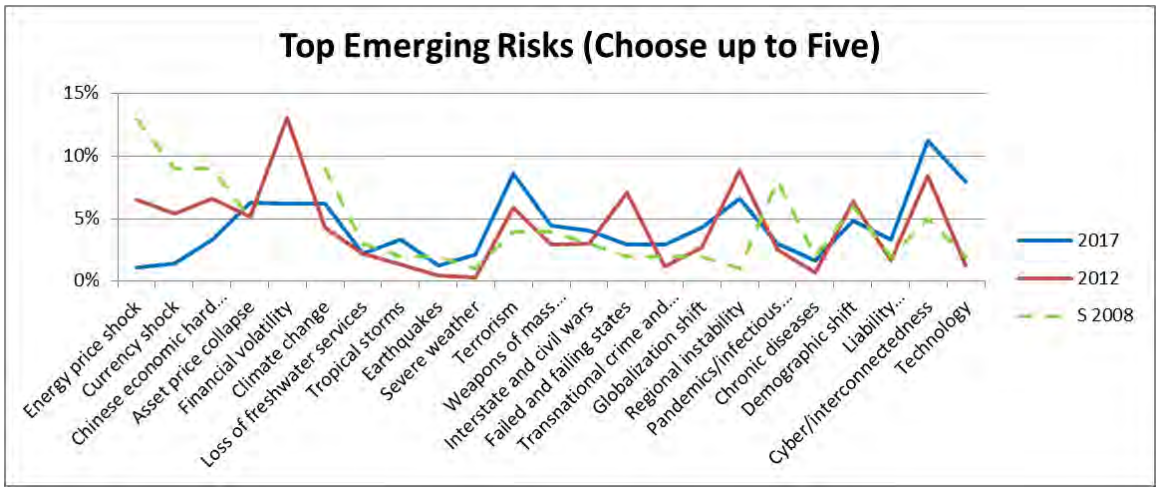


Figure 23: Year-Over-Year Emerging Risks (up to Five Risks Chosen per Survey)

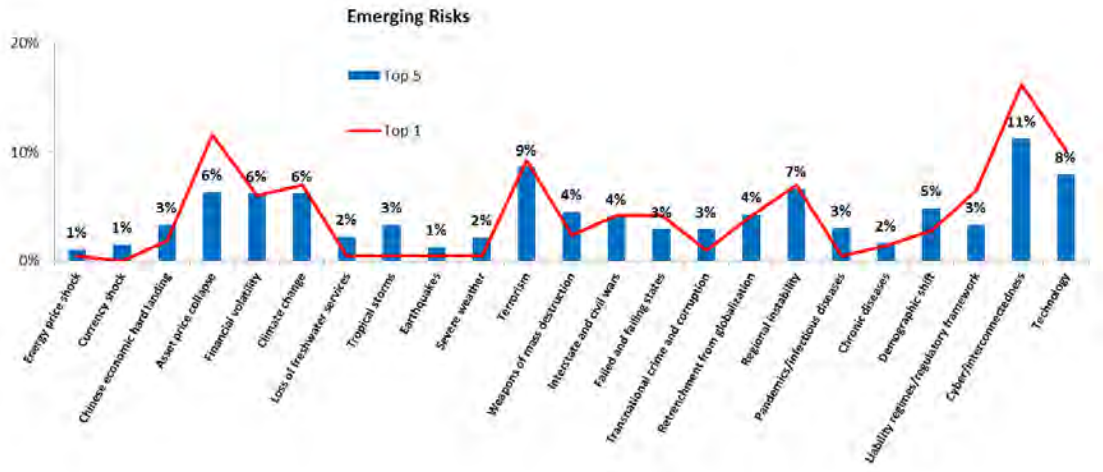
4.5.2 Top Emerging Risk: *Cyber/Interconnectedness of Infrastructure*

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 a recency bias based on events from the recent past. Overall, the Geopolitical category increased its lead from the prior survey with 32%, with the Technological category passing a retreating Economic category for second place. All categories except Economic rose from the prior survey. *Terrorism* rose from 3% to 9%, while *Financial volatility* fell from 13% to 6% and *Globalization shift* fell from 10% to 4% (was 0% in the 2015 survey).

1. 32%/29%/22% Geopolitical
2. 26%/24%/28% Technological
3. 20%/27%/30% Economic
4. 11%/8%/10% Societal
5. 9%/8%/8% Environmental

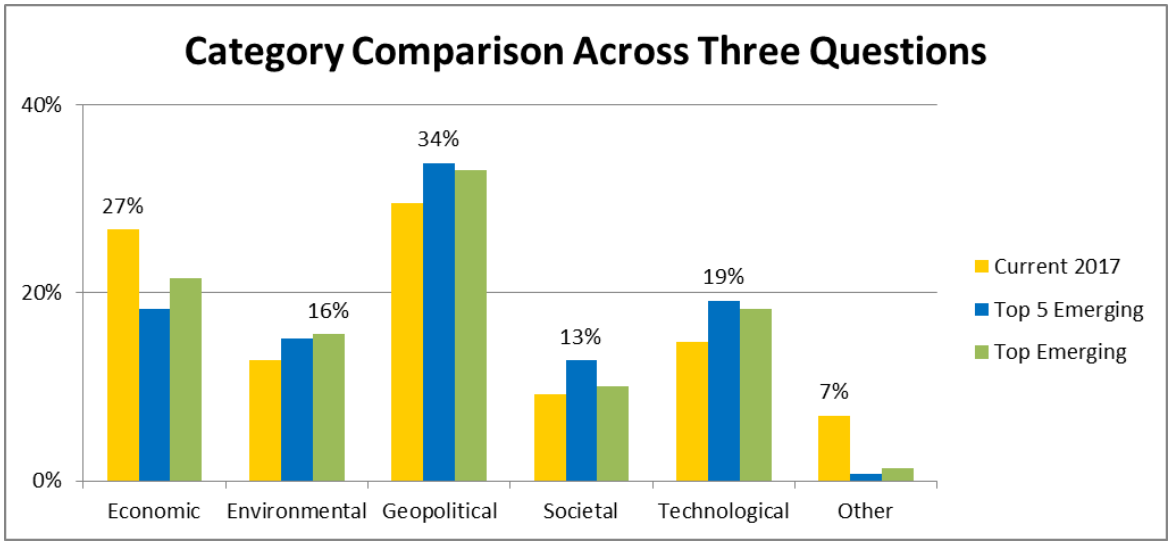
As seen in Figure 24, several risks vary in their importance between the top five and overall top emerging risks. With the highest positive differential, so marking the importance of being the top overall risk relative to inclusion in the top five list, were *Asset price collapse* and *Cyber/interconnectedness of infrastructure*, both at 5% (unchanged from the prior survey, where they switched positions while both maintained a 5% differential). The highest negative differential was *Natural disaster: tropical storms* at –3%.

Figure 24: Emerging Risks



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, as shown in Figure 25. The Economic and Other categories reflect current risks as the highest; Societal, Technological and Geopolitical have the highest percentage as the top five risks; the Environmental category has the top emerging risk.

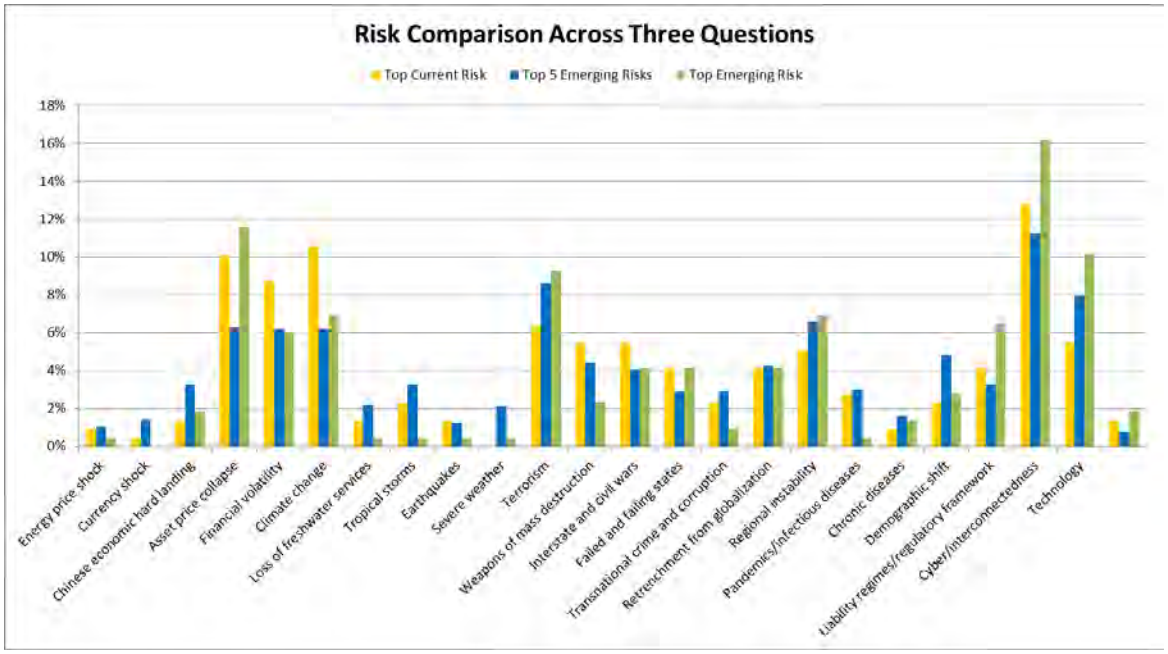
Figure 25: Category Comparison Across Three Questions



While the top five choices might be thought to come from a different distribution, both the top current risk and top emerging risk can be compared to see which risks are expected to be relatively more important in the future. The largest positive differential (current greater than top emerging risk) remains *Climate change*, with 4%, followed by *Weapons of mass destruction* and *Financial volatility*. The largest negative differentials, indicating higher risk in the future, were *Technology* at 5% and *Cyber/interconnectedness of infrastructure* at 3%. The risks that have higher concentration risk, meaning their top five score is materially lower than their top emerging risk scores in this year's survey, are *Asset price collapse* and *Cyber/interconnectedness of infrastructure*.

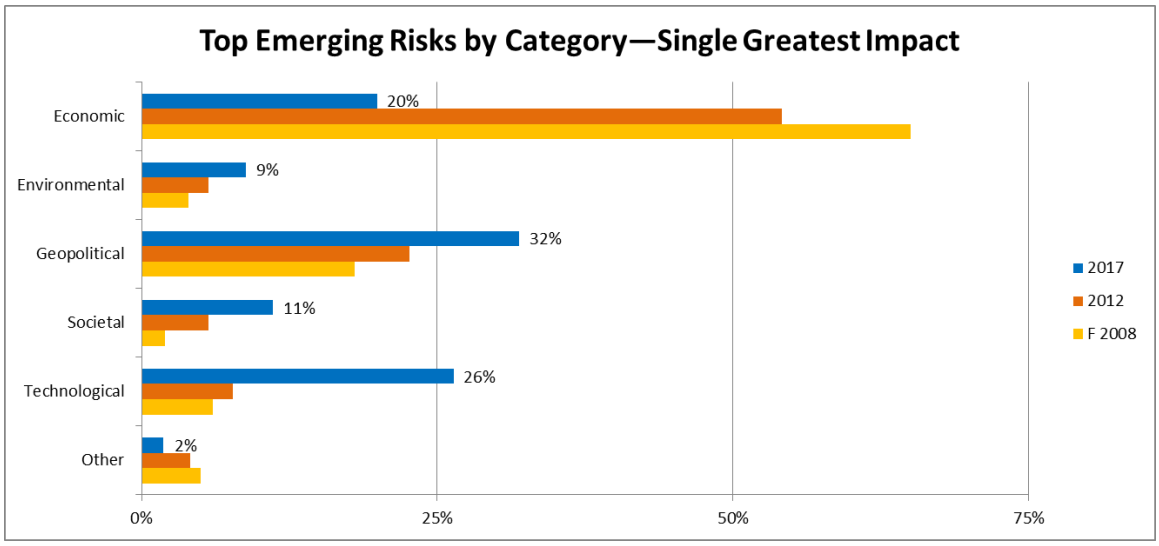
Another interesting characteristic is when the top five response is the highest of the three. This could reflect a risk that respondents are worried about but they cannot quite get their heads around it being the most important risk. These could also be risks seen more in combination with others. As shown in Figure 26, this characteristic is seen with 11 risks: *Energy price shock*, *Currency shock*, *Chinese economic hard landing*, *Loss of freshwater services*, *Natural catastrophes: tropical storms*, *Natural catastrophes: severe weather*, *Transnational crime and corruption*, *Globalization shift*, *Pandemics/infectious diseases*, *Chronic diseases* and *Demographic shift.* Dropping off this list were *Natural catastrophes: earthquakes*, *Terrorism*, *Regional instability* and *Liability regimes/regulatory framework*. Added to the list were *Globalization shift* and *Pandemics/infectious diseases*.

Figure 26: Risk Comparison Across Three Questions



In Figure 27, the top emerging risks from the fall 2008, 2012 and 2017 surveys are compared. The chart shows each category in the selected years to show how the top risk has evolved since the financial crisis.

Figure 27: Top Emerging Risks by Category—Single Greatest Impact



For the top emerging risk, *Cyber/interconnectedness of infrastructure* continues as the top choice. The major risk increases were *Terrorism* and *Regional instability*. Drops were recorded by *Financial volatility* (reflecting the low rate of perceived risk in the market) and *Globalization shift.*

Figures 28 through 32 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 demonstrate the data and is not consistent between categories.[7]

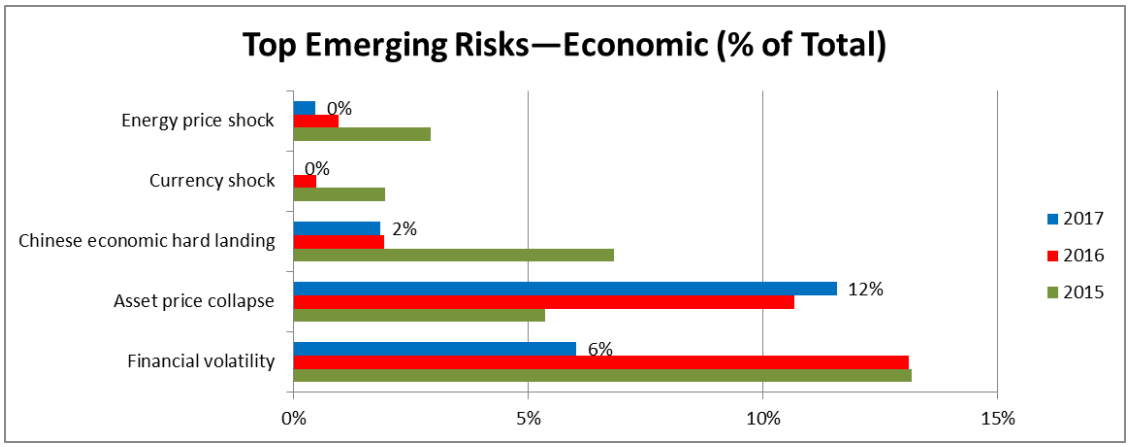
Here are the leading responses:

1.	16%/17%/23%	*Cyber/interconnectedness of infrastructure*
2.	12%/11%/5%	*Asset price collapse*
3.	10%/7%/5%	*Technology*
4.	9%/3%/6%	*Terrorism*
5T.	7%/3%/6%	*Regional instability*
5T.	7%/6%/6%	*Climate change*

[7] Data labels are rounded to the nearest percentage point, and are generally shown for the most recent survey.

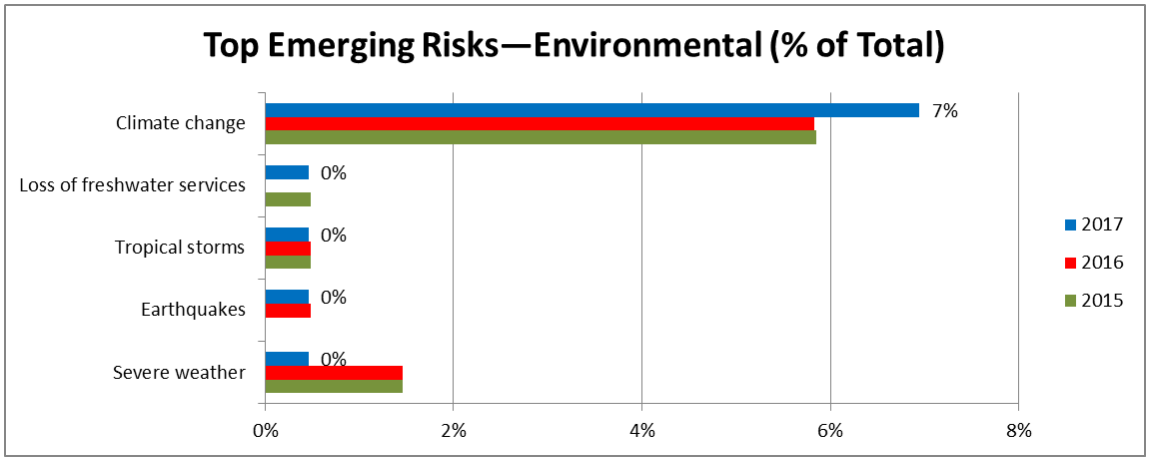
As shown in Figure 28, the Economic category shows generally decreasing responses in recent years among all risks except *Asset price collapse*, reflecting a general view that prices of many asset classes were high.

Figure 28: Top Emerging Risks—Economic (% of Total)



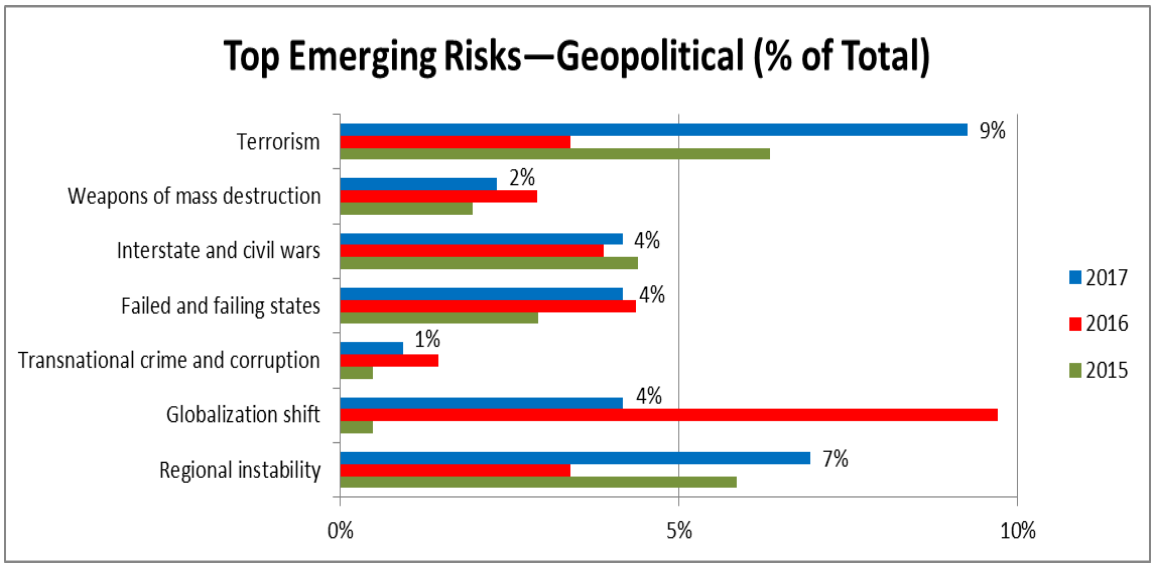
As shown in Figure 29, Environmental category risks remained small except for *Climate change*, which increased.

Figure 29: Top Emerging Risks—Environmental (% of Total)



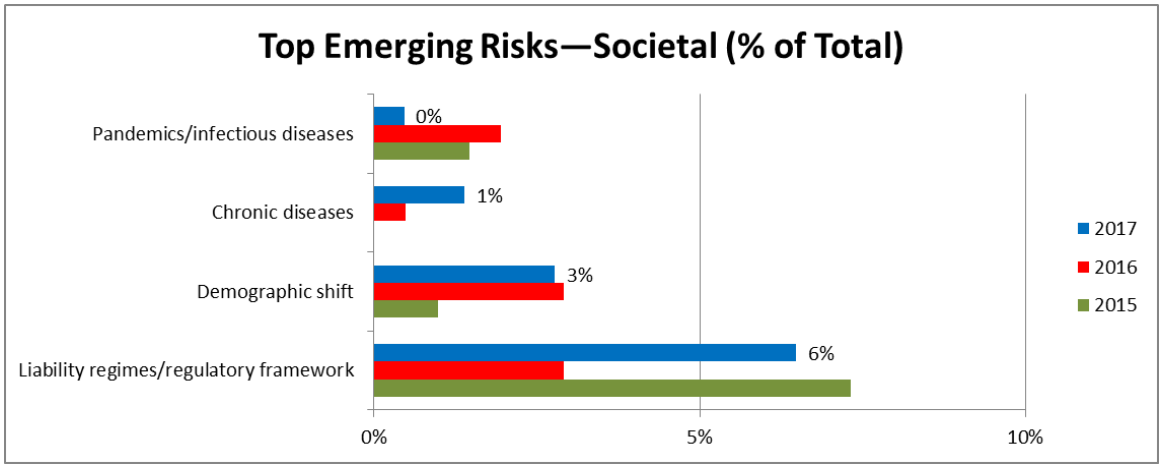
Geopolitical risks tend to be the most volatile in the survey, so it is not surprising to see *Terrorism* and *Regional instability* rebound while *Weapons of mass destruction* and *Globalization shift* decrease.

Figure 30: Top Emerging Risks—Geopolitical (% of Total)



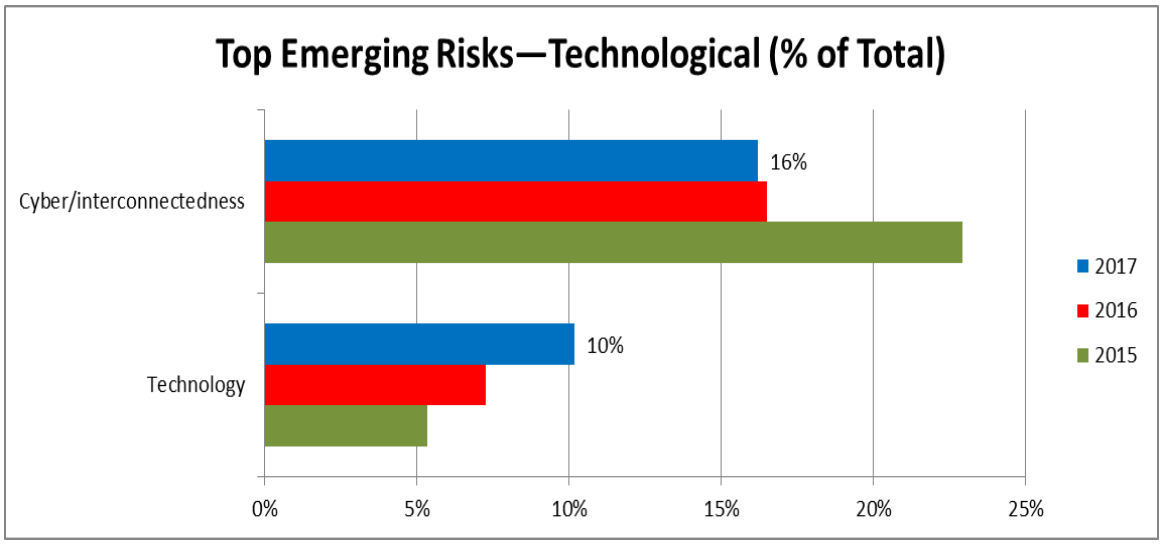
The change in Societal category results were driven by an upward trend in *Liability regimes/regulatory framework*, shown in Figure 31. The *Chronic diseases* risk rebounded, remaining at low levels.

Figure 31: Top Emerging Risks—Societal (% of Total)



Cyber/interconnectedness of infrastructure was stable, remaining the top overall choice, as shown in Figure 32. *Technology* is now third overall.

Figure 32: Top Emerging Risks—Technological (% of Total)



4.5.3 Risk Combinations

Risks do not occur in a vacuum. For example, increasing network interactions due to the internet of things can combine with terrorism to make events on vulnerable targets have a much greater impact. Other risks do not interact in linear ways, and higher-order interactions that are not always apparent in advance will tend to have unintended consequences. As geopolitical tensions and financial risks remain high, direct impacts may seem obvious but indirect impacts will also be felt.

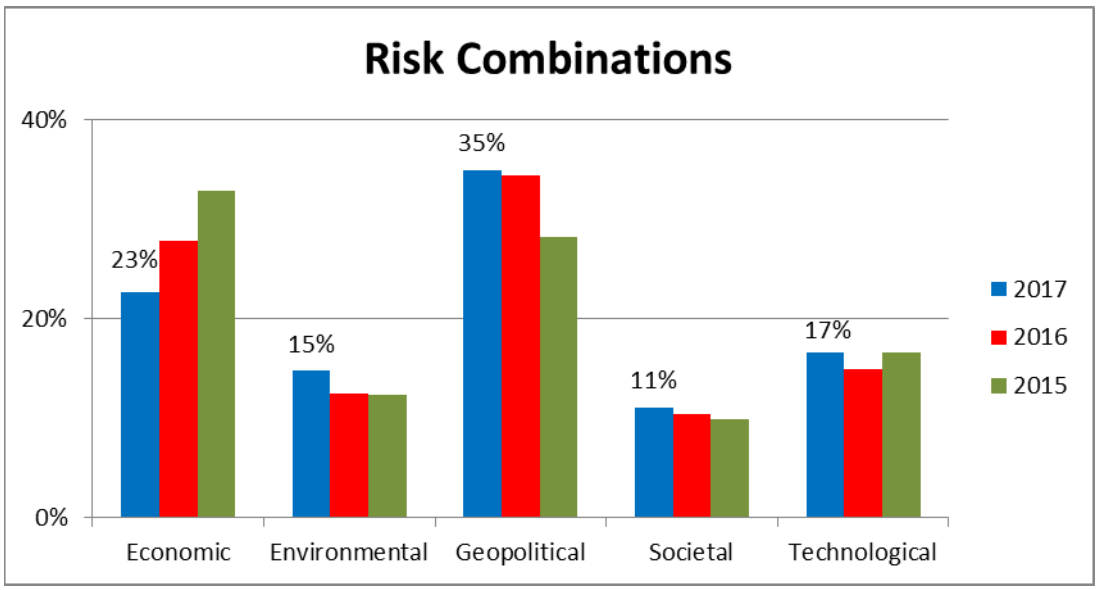
Combinations of emerging risks interact in ways that often are not fully understood. Risk combinations can happen simultaneously or sequentially. For example, the Environmental risk *Loss of freshwater services* could sequentially drive the Geopolitical category's *Regional instability*. Concurrent emerging risks could exacerbate a scenario, as in 2011 when the Japanese earthquake and tsunami, followed immediately by the Fukushima Daiichi nuclear disaster, led to a scenario that stressed the supply chain for many products, in addition to the human toll that followed.

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 distribution of individual risks chosen. The Geopolitical and Economic categories remain the most frequent response categories, with Economic falling for the sixth consecutive year. See Figure 33 for a graphical representation of the results that follow.

1. 35%/34%/28% Geopolitical
2. 23%/28%/33% Economic
3. 17%/15%/17% Technological
4. 15%/12%/12% Environmental
5. 11%/10%/10% Societal

Figure 33: Risk Combinations



Individual risks were led by *Cyber/interconnectedness of infrastructure* as it recaptured first place from *Financial volatility* (which dropped from 11% to 8%). *Climate change* and *Weapons of mass destruction* each increased by 2%.

1.	10%/10%/12%	*Cyber/interconnectedness of infrastructure*
2.	8%/11%/12%	*Financial volatility*
3.	8%/9%/8%	*Terrorism*
4.	7%/6%/5%	*Regional instability*
5.	7%/7%/8%	*Asset price collapse*

The top risk combinations chosen continue to show a broad dispersion. The difference drops off quickly when combinations are ranked based on the percentage choosing them.

Leading combinations among the 608 responses were as follows (top five are listed):

1. 7%, No. 2 in prior survey
   Cyber/interconnectedness of infrastructure
   Technology

2. 6%, No. 4
   Asset price collapse
   Financial volatility

3. 5%, No. 1
   Terrorism
   Cyber/interconnectedness of infrastructure

4. 3%, unranked in prior survey
   Terrorism
   Regional instability

5. 3%, No. 7
   Climate change
   Natural catastrophe: severe weather

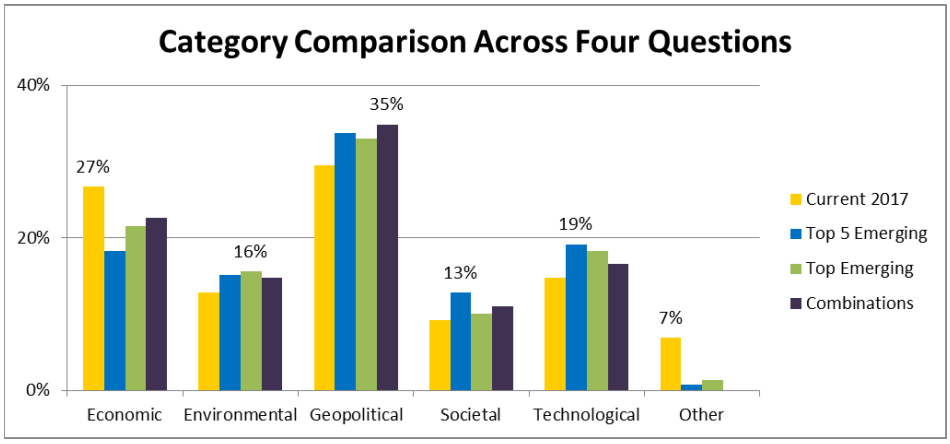
The major category combinations were (with percentages from the current and previous survey)

20%/19%	Geopolitical–Geopolitical
13%/14%	Economic–Economic
13%/11%	Geopolitical–Technological
10%/15%	Economic–Geopolitical
9%/8%	Environmental–Environmental
7%/5%	Technological–Technological
4%/3%	Environmental–Geopolitical
4%/4%	Environmental–Societal
4%/3%	Societal–Societal
4%/6%	Economic–Societal
4%/4%	Economic–Technological
4%/2%	Geopolitical–Societal
2%/4%	Societal–Technological
2%/2%	Economic–Environmental
1%/1%	Environmental–Technological

Geopolitical, Societal and Technological risks continued their rise. The primary reductions were tied to the Economic category combinations.

By category, respondents generally do not vary by a large amount when viewed across the four major questions. As seen in Figure 34, exceptions occur for the Economic category (top five emerging risks is low and current risk is high) and Societal (top five emerging risks is high).

Figure 34: Category Comparison Across Four Questions



Risk by risk there is much more variation, as shown in Figure 35.

Top current risk is highest for

- *Financial volatility*
- *Climate change*
- *Natural catastrophe: earthquakes*
- *Weapons of mass destruction*
- *Interstate and civil wars*

Top five emerging risks is highest for

- *Chinese economic hard landing*
- *Loss of freshwater services*
- *Natural catastrophe: tropical storms*
- *Demographic shift*

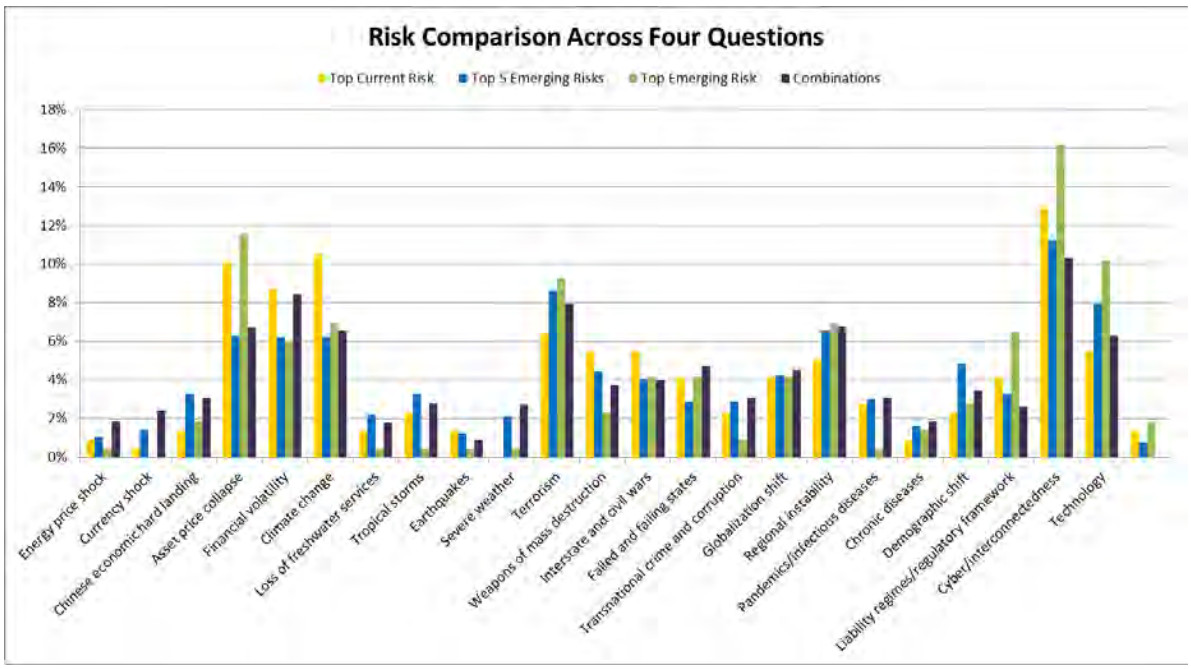
Top emerging risk is highest for

- *Asset price collapse*
- *Terrorism*
- *Regional instability*
- *Liability regimes/regulatory framework*
- *Cyber/interconnectedness of infrastructure*
- *Technology*

Combinations is highest for

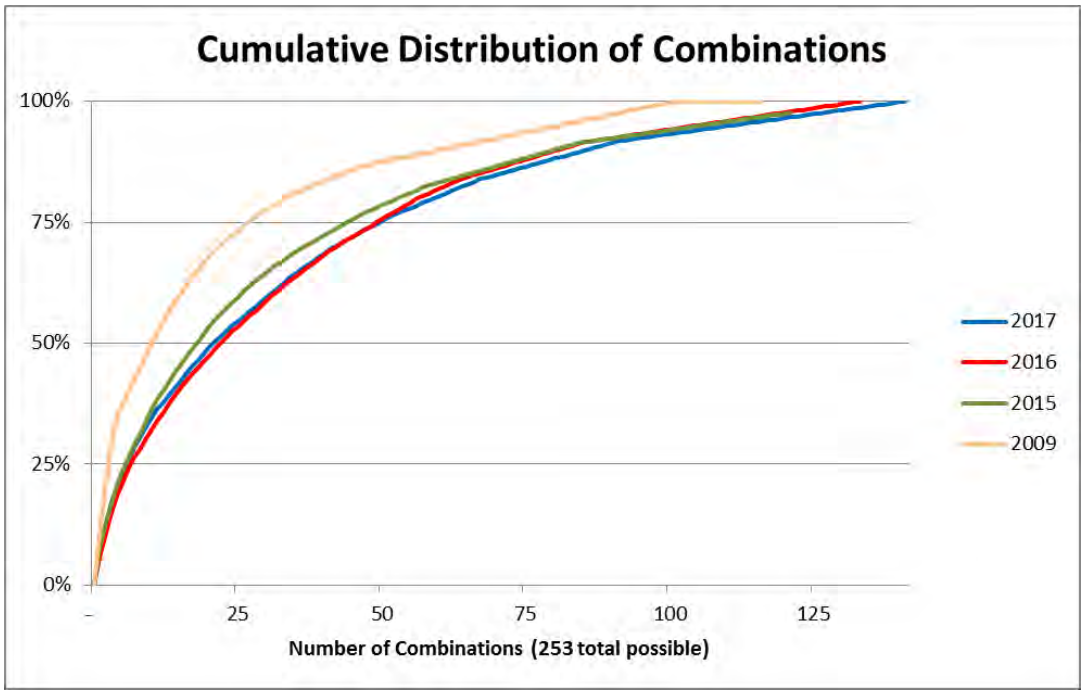
- *Energy price shock*
- *Currency shock*
- *Natural catastrophe: severe weather*
- *Failed and failing states*
- *Globalization shift*
- *Pandemics/infectious diseases*
- *Chronic diseases*
- *Transnational crime and corruption*

Figure 35: Risk Comparison Across Four Questions



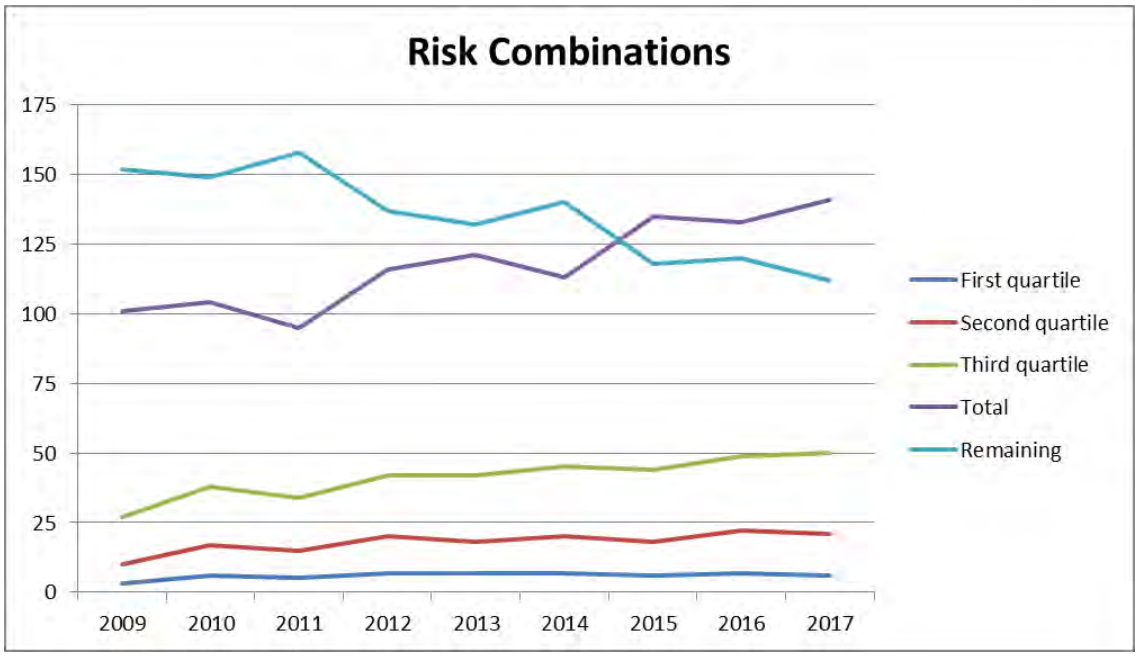
There are 253 possible risk combinations. Following the financial crisis in 2008–2009, results have moved toward reduced concentration. That trend continued during this survey, especially for the leading 100 combinations, as shown in Figure 36.

Figure 36: Cumulative Distribution of Combinations



With data listed cumulatively and the first quartile representing the most frequent responses, results are presented in Figure 37. An evolving trend is present in the past three surveys of broader consideration of risks, especially in the third and fourth quartile results, which will continue to be monitored and analyzed. More than half of the possible two-risk combinations were again selected.

Figure 37: Risk Combinations



The broad representation may be an indicator of the current risk environment, with each quartile being considered against the extreme example of 2009. Shown in Figure 38, this year's risk concentration ratio of 51% is one of the lowest recorded to date (but higher than last year's historical minimum).

Figure 38: Risk Concentration (Ratio Base 2009 = 100%)

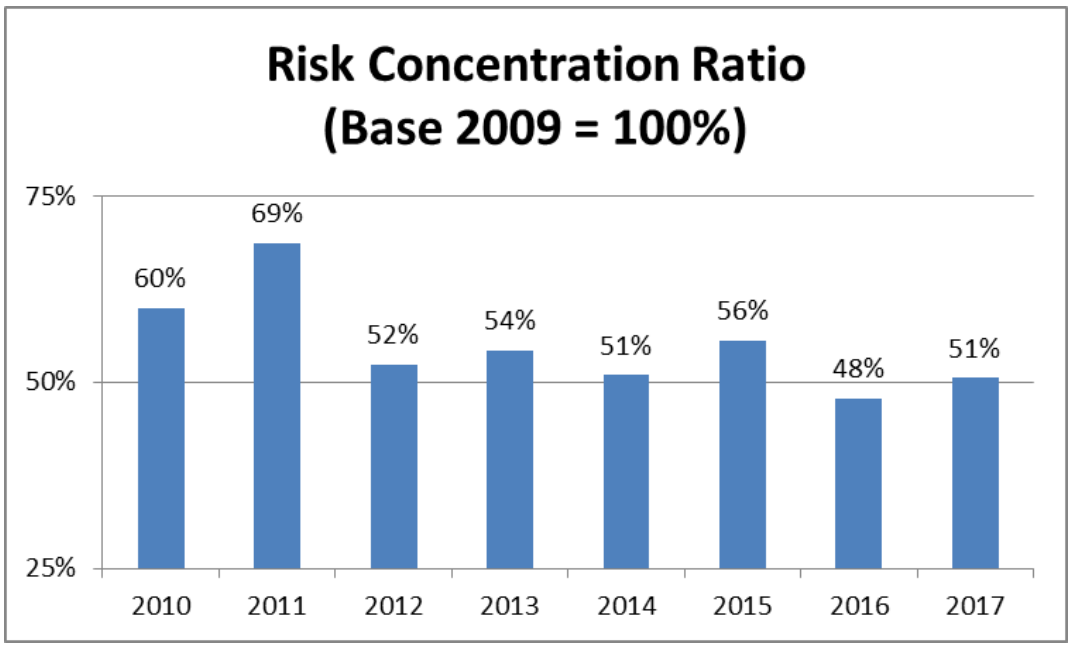


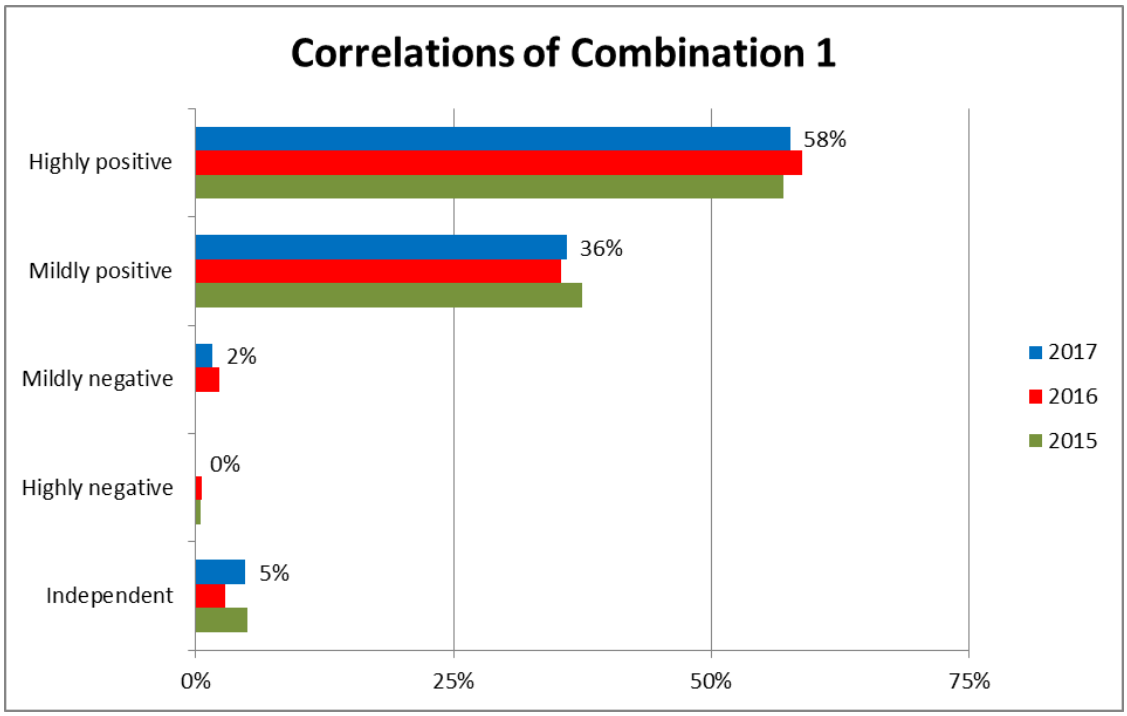
Table 2 shows the responses in the order they were chosen (three two-risk combinations were requested). A follow-up question referred to Combination 1, so it is reasonable to assume that it is the risk manager's top combination choice. The Economic category is more commonly included in the first option, and the Environmental and Societal categories are more likely as a second or third option.

Table 2: 2017 Mix by Primary Versus Secondary Combination

Combination Splits by Category		Combo 1	Combo 2/3	Overall
Economic	Economic	16%	11%	13%
Economic	Environmental	1%	3%	2%
Economic	Geopolitical	9%	11%	10%
Economic	Societal	4%	4%	4%
Economic	Technological	4%	3%	4%
Environmental	Environmental	6%	10%	9%
Environmental	Geopolitical	5%	4%	4%
Environmental	Societal	4%	4%	4%
Environmental	Technological	2%	1%	1%
Geopolitical	Geopolitical	20%	20%	20%
Geopolitical	Societal	3%	4%	4%
Geopolitical	Technological	15%	11%	13%
Societal	Societal	2%	5%	4%
Societal	Technological	2%	2%	2%
Technological	Technological	7%	7%	7%

It is very hard to anticipate unintended consequences when multiple risks are stressed concurrently or in rapid succession. Respondents were asked to describe the type and level of correlation for the risk combination selected first. As shown in Figure 39, nearly all (94%) reported either a highly or a mildly positive correlation. 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 identify the first of correlated risks that are sequential as a leading indicator.

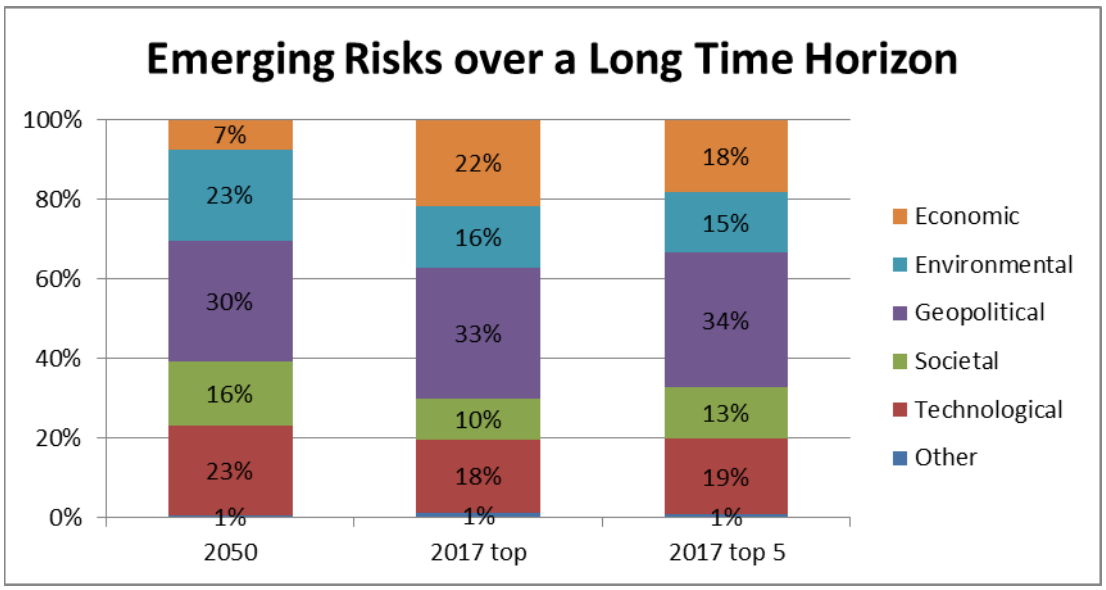
Figure 39: Correlations of Combination 1



This survey includes a rotating question allowing a choice of up to three risks that fit the criteria. In this survey, respondents were asked, "Time horizon length is likely a driver of emerging risk analysis. If you look out a generation, to 2050, what emerging risks do you think will have played the greatest role between now and then?" Figure 40 shows that comparing results from this question to the two emerging risk questions (top five and top overall) leads to several interesting observations. The Economic category is only 7% when looking out to 2050 versus 18% when looking at the top five. The Environmental (up from 15% to 23%), Societal (up from 13% to 16%) and Technological (up from 19% to 23%) were all higher.

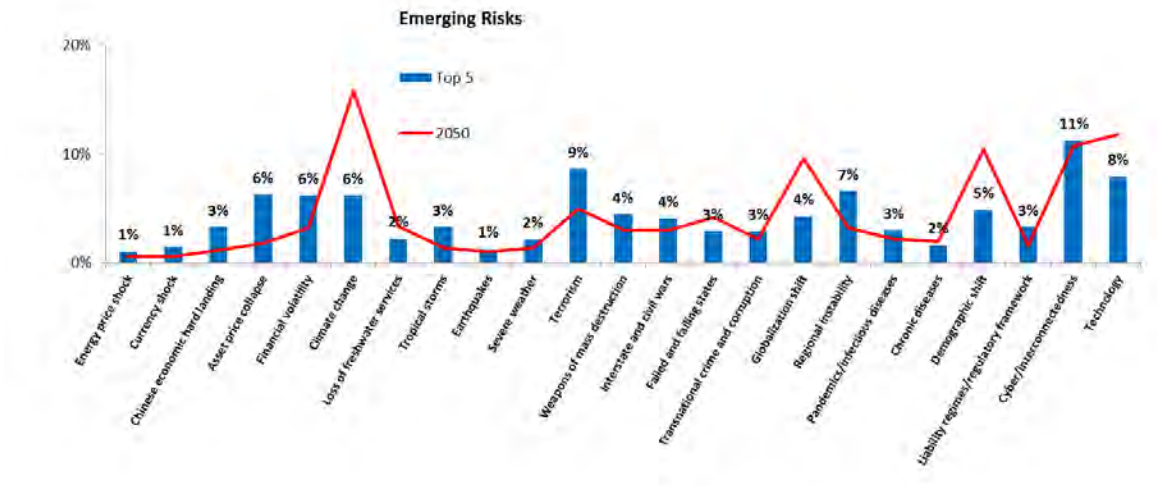
1. 30% Geopolitical
2. 23% Environmental
3. 23% Technological
4. 16% Societal
5. 7% Economic

Figure 40: Emerging Risks over a Long Time Horizon



The top overall choices were *Climate change* (16%), *Technology* (12%), *Cyber/interconnectedness of infrastructure* (11%), *Demographic shift* (10%) and *Globalization shift* (10%). One interpretation of these results is to assume that risks in the Economic and Geopolitical categories tend to cycle and will even out over time, while Environmental and Societal risks trend and take longer to stabilize. Several of the leading individual risks follow that pattern too, with *Climate change*, *Globalization shift*, *Demographic shift* and *Technology* having higher results when considering a 2050 time horizon.

Figure 41: Emerging Risks



4.5.4 Risk as Opportunity

Many risk managers view risk as two-sided, with opportunities drawn from the same tools and data sets 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:[8]

- *Longevity*
- *Demographic shift*
- *Collapses in asset prices as a buying opportunity*
- *Technology and an easier way to do business with existing customers*
- *Renewable resources*
- *"Tier Zero" old-age solutions (live with family; cooperative communities, part-time work/bartering of skills, tontine arrangements)*
- *Cryptocurrencies*
- *College degrees are a mispriced commodity, but I don't know how to "short" that market*
- *Growth in Asian population plus increased wealth*
- *Genetic testing, artificial intelligence*
- *I should buy put options on Miami real estate*
- *Cyber-related insurance*

This question was asked right after the one about emerging risks by 2050, so it is no surprise that longer time horizons seem to have been used in the responses. Longevity, demographics and technology are all risks with opportunities attached. Cyber risk will be insured by many, so is an opportunity for those willing to write it.

A new question in this evolution of the survey asked if the respondents had identified bubbles in today's environment. Some believe there is no such thing as a bubble, but Canadians looking at housing seemed to have found one in their minds (over half of comments from FCIA- and ACIA-credentialed respondents). Several of these markets (e.g., cryptocurrencies, low volatility) already seem to have "popped." Some took alternate sides of the same issue; for example, arguing both for and against the risks associated with climate change.

- *Cryptocurrency*
- *Real estate prices*
- *Real Estate bubble in China—Ghost cities*
- *State and governmental pensions*
- *Asset prices*
- *We are in a bubble of refusing to pay attention to climate change until it burst eventually in a catastrophic manner*
- *Low volatility in equity markets*
- *Interest rates are artificially low, subsidizing certain aspects of the economy*
- *Climate change funding and hysteria*
- *College tuition*
- *Tech boom, with ventures burning through cash/*
- *Junk bonds, collectibles (e.g., art), anything something trying to get out of yuan could buy (so more likely places with a direct flight from Beijing), some real estate, FAANG*

[8] Direct comments from respondents have been slightly edited throughout the paper.

- *U.S. dollar*
- *"Everything" bubble (all assets)*

Another new question asked the respondent to share an unknown known, where there is historical data but it is not predictive, along with how it is managed. Several referred to managing resiliency, as it was not clear how to directly manage the risk until it is better known.

- *Earthquakes*
- *Asteroid strike or eruptions of super Volcanos*
- *Cyber—managed through exclusions*
- *Data security risk—the risk is ever evolving, so historical trends are not predictive. The risk is managed through continuous monitoring and modifications to our defenses, and increased focus on how to quickly respond to an event*
- *Mortality improvement—mortality hedging*
- *Changes in mortality to the side of higher deaths*
- *LTC claim costs*
- *We have attempted to quantify 5 different scenarios based on historical information. We can manage the risk by reviewing concentrations, policyholder contract exemptions and having a reaction plan*
- *The effect of medical advances on disabled lives—does it extend the lifetime disabled or will it result in recovery? We have adjusted benefit periods, definitions of disability and management of claims*
- *Asset value degradation as populations become predominantly unproductive (dependency ratios)*
- *Wars—invest in companies that produce weapons and fossil fuel energy*
- *Going from volume-to-value based care in health care*
- *Wildfire—research and educate individuals on wildfires, study what is known and understand that we don't know enough, track history and continue to study and educate*
- *Opioids*
- *Car insurance should use miles driven*
- *Pandemics have been very impactful in the past. We use stress testing to manage capital adequacy*
- *Policyholder behavior, e.g., lapse and utilization of benefits*

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

- *Societal breakdown*
- *Changing demand for labor*
- *Interplanetary instability*
- *Mass immigration*
- *Opiate addiction*
- *Pension burdens*
- *School debt*
- *Intergenerational strife*
- *Loss of Unifying Cultural Identity*
- *Model Risk*
- *Peer-to-Peer companies disrupt the traditional marketplace*
- *Health care technological advances (such as a cure for diabetes)*
- *Human mutations*
- *Reduction in People's ability to think for themselves*

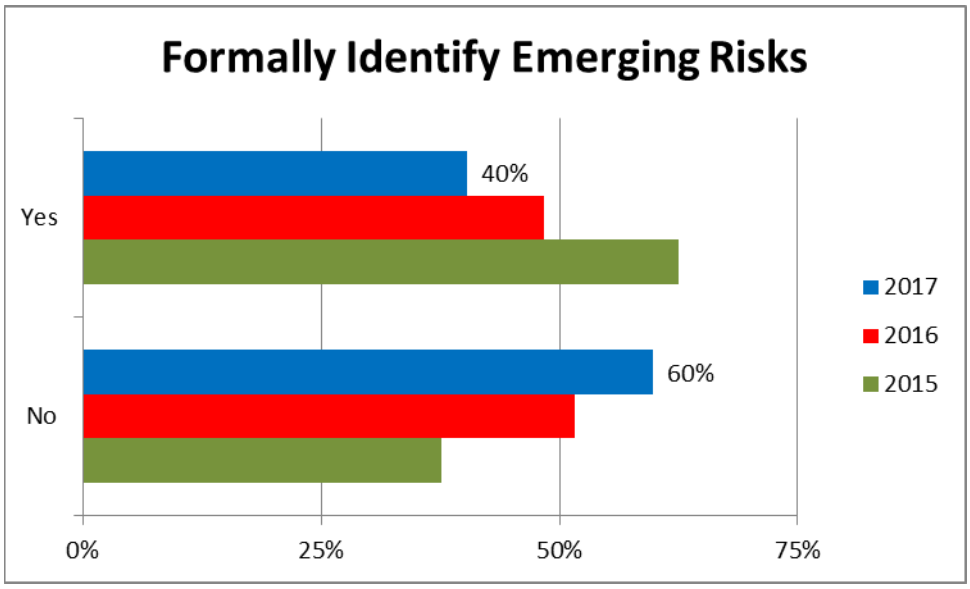
- *Fundamental change in the nature of work due to technology*
- *Overpopulation—strained resources generally*
- *Remove China hard landing*

4.6 SECTION B: LEADING INDICATORS

Leading indicators of emerging risks are metrics, or events (e.g., when a new piece of legislation is enacted), indicating that an emerging risk is likely to materialize. This allows actions to be adjusted 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 (lagging indicators: e.g., income statement, number of employees hired) but attempt to identify drivers of future performance. Trending indicators like gross domestic product (GDP) or consumer price index can provide macroeconomic KRIs, as can revenue and expenses for a firm. These measure historical results. Leading indicators, by contrast, provide information earlier in the process. For example, a lower unemployment rate would drive expectations of higher collected taxes. A leading indicator could be an event that becomes a Boolean indicator, acting as 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 for a sports franchise. The survey asked about the use of leading indicators that provided a firm with actionable information.

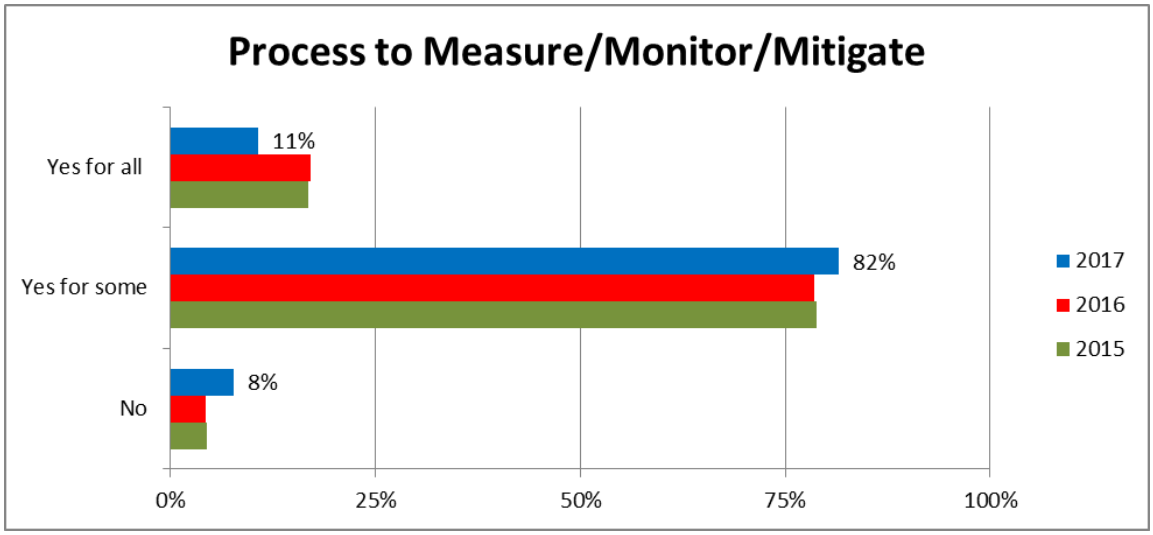
As shown in Figure 42, 40% of respondents formally identified emerging risks, a decrease of 8% from the previous survey. This version of the survey was distributed to a wider group of practice areas than previously. Among those stating a practice area of life or property/casualty, the number who say they formally identify emerging risks remains at 50%. However, that identification is less prevalent in the pension and health practice area respondents (23%).

Figure 42: Formally Identify Emerging Risks



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. Figure 43 shows that nearly all (93%) responded that they did this for some or all of their identified emerging risks. Only 8% reported having no process in place, an increase from the prior survey.

Figure 43: Process to Measure/Monitor/Mitigate

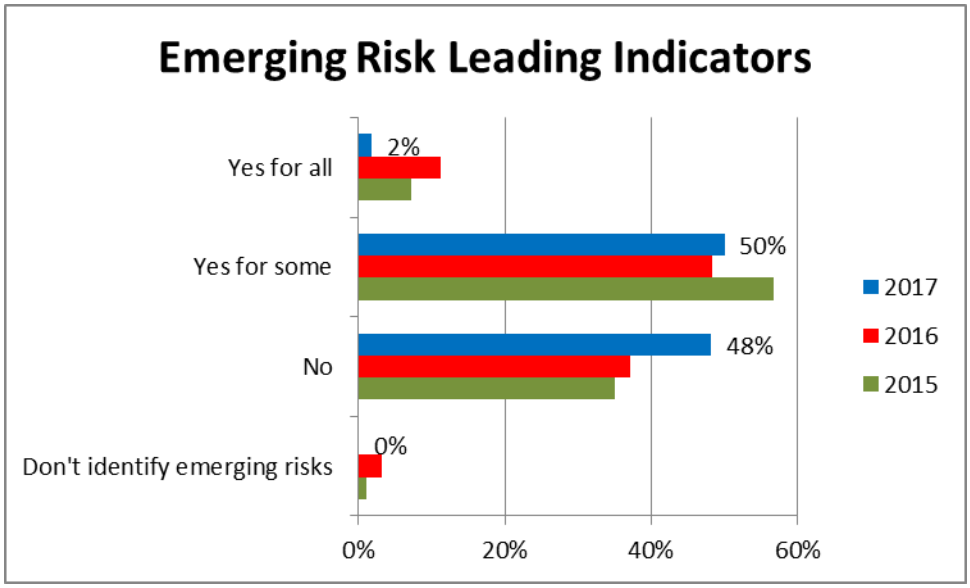


Most of the comments about actual processes used talked about their activities to measure, monitor and mitigate the risk. This shows progress is being made. Here are a few of the risks being followed and how the information is shared:

- *Monthly risk dashboard*
- *Scenario testing done for each emerging risk*
- *Policyholder behaviour*
- *Cyber*
- *Chronic conditions*
- *Medical advances and their impact on recovery from disabilities*
- *Artificial Intelligence*
- *Electrical Grid Vulnerability*
- *Opioid Usage*
- *Digital currencies*

In a follow-up question—"Once an emerging risk is identified, do you select leading indicators to measure changing likelihoods?"—as shown in Figure 44, 2% of respondents noted that they had leading indicators for all identified emerging risks and 50% had them for some. Nearly half, 48%, stated that they had no emerging risk leading indicators, up 11% from the prior survey. This is a surprising trend since only those with a formal process for identifying emerging risks would have answered this question, and may reflect the difficulty of working with leading indicators.

Figure 44: Emerging Risk Leading Indicators

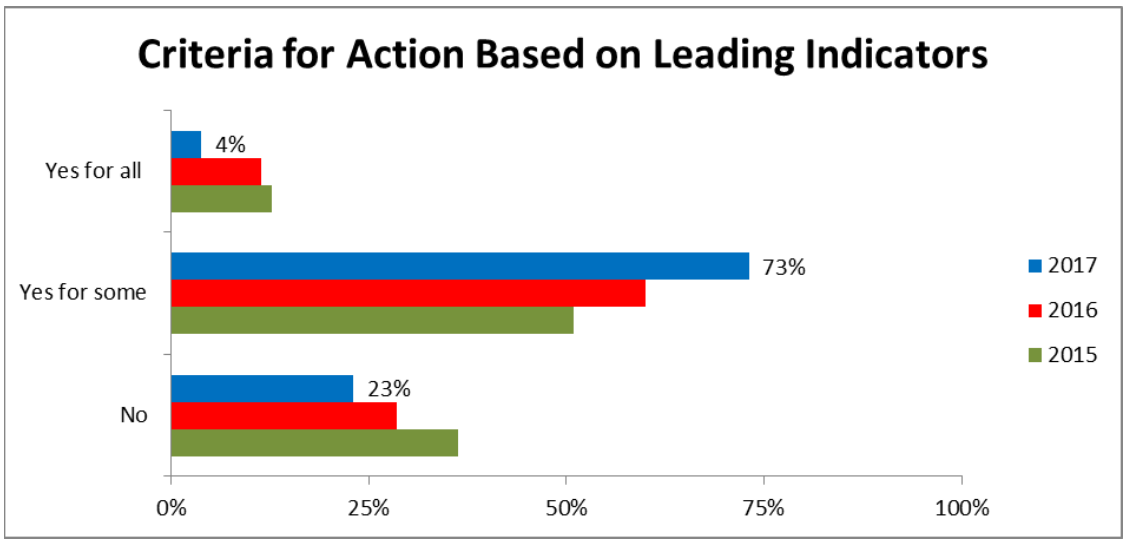


The specific examples shared about leading indicators being collected and monitored are interesting. The broader group of respondents allows the survey to include additional practices. Here are a few of the responses:

- *Unemployment by region*
- *Valuation metrics on housing. Bond issuance volume. Market volatility*
- *Dependency ratios, income replacement rates*
- *We use a qualitative risk assessment scale*
- *Cybersecurity—Monitor patch management and press-reported incidents*
- *Number of articles discussing the issues*

The survey asked whether these leading indicators included criteria that would lead to an action to mitigate or accept the risk. Almost three-quarters (77%, up from 71%) stated that criteria exist for some or all of their emerging risks, as seen in Figure 45. This is an evolving practice, but the positive trend is encouraging.

Figure 45: Criteria for Action Based on Leading Indicators



When respondents were asked for examples, they shared some specific actions and triggers. Some good examples are as follows:

- *Low valuation levels relative to historical norms is a buy indicator*
- *Key is to be aware of identified risks, but only spend time on those that affect costs since we have finite resources*
- *Trigger hedging at defined combinations of interest rate/equity levels/rates/trends*

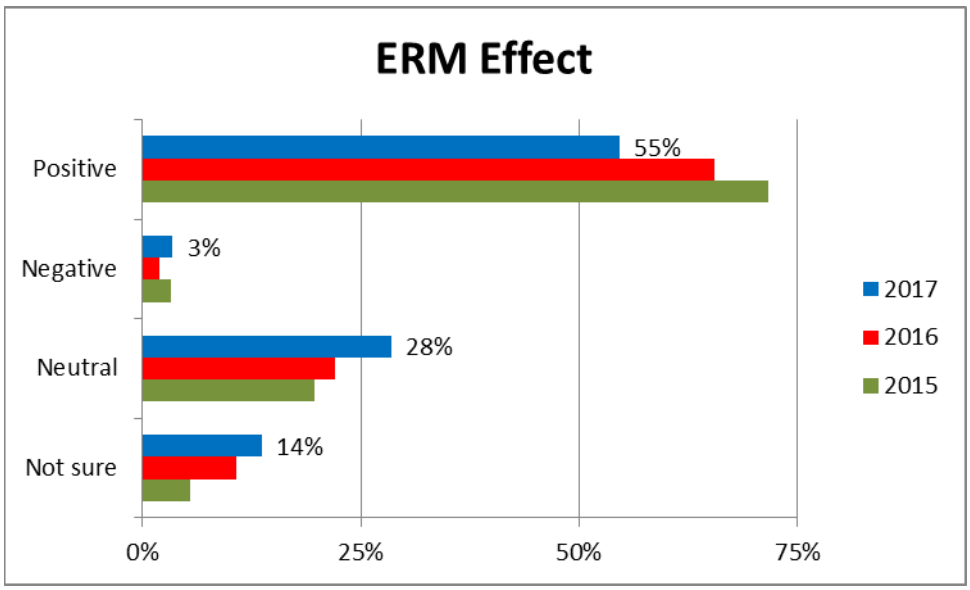
Emerging risk analysis will have varying levels of sophistication as the process matures, often starting with qualitative analysis and moving toward quantifying the risks. Velocity is joining impact/severity and likelihood/probability as a key factor in this type of analysis. This describes how fast a risk can move from benign to critical (e.g., seismic activity can happen quickly, allowing little time to plan, whereas a demographic shift may occur slowly over many years).

4.7 SECTION C: METHODOLOGY

This section solicits input on the overall health of ERM. The open-ended questions complement the emerging risk trends asked about in Section A. Each risk management program is at a unique point on a maturity scale. The reader's experience will differ from the researcher, so each will pick out and interpret comments in unique ways. The reader is encouraged to at least scan the comments in Appendix II. This will suggest possible future development paths of an ERM process.

The first question in this section asked respondents whether "enterprise risk management had a positive, negative or neutral effect in your company/industry." As Figure 46 shows, very few (3%) said it had a negative effect, and a majority (55%, down from 65%) responded that the effect was positive. The high, and increasing, number of *Neutral* or *Not sure* responses is also telling. An ERM process can fall victim to a poor risk culture, and bureaucracies and politics sometimes get in the way.

Figure 46: ERM Effect

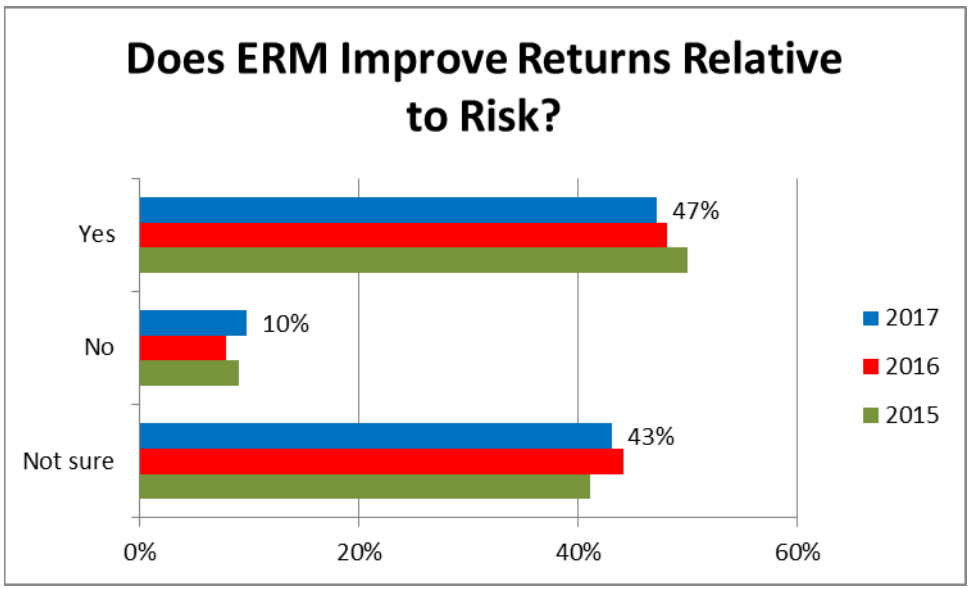


In a new, open-ended question, respondents were asked to share an example from the past year where another company used ERM in a positive way. The comments included the following:

- *Use of immigration flow data*
- *A healthcare carrier actively targeted the sicker population, and set adequate pricing. Some others who targeted healthier segments found their prices too low*
- *Used ERM to identify the effectiveness of their cyber security program*
- *Hedging annuity guarantee risks*
- *FEMA purchased flood insurance for the first time*
- *Review of retention level for CAT reinsurance coverage*
- *Organization aligned assets across all companies to identify correlations and diversification opportunities*
- *The local power company beefed up its IT security because the risk of regulation and the possibility of fines became greater than their perception of (1) it won't happen to us, and (2) it's too costly*
- *HOOPP asset liability matching* [Ed. note: HOOPP is Healthcare of Ontario Pension Plan]

As a risk manager it is important to strive toward achieving the desired balance between risk and return. The survey asked, "Does implementing ERM improve company returns relative to the amount of risk?" Results as shown in Figure 47 are similar to the previous survey, with *Not sure* responses (43%) continuing to take votes from both *Yes* (47%) and *No* (10%) responses. This will be interesting to trend in future surveys.

Figure 47: Does ERM Improve Returns Relative to Risk?



Among those stating that ERM does improve returns relative to risk, comments included transparency and better methods of decision making and allocating capital.

- *It helps to evaluate all the risks together and study interactions*
- *Provides a framework for classification of risk and identification of acceptable risk levels*
- *Better response to significant changing situations*
- *It puts more attention on how risk rolls up at the "top of the house." Other than the time and expense necessary to do these calculations, there is no downside to the extra transparency and can only help to improve risk-adjusted returns*
- *ERM includes understanding underlying risks and quantification of what these might be. Risk adjusted rates of return steer capital to where the returns are higher based on the real risk assumed*
- *Perhaps not from one day/week/month to the next, but all it takes is one (two?) major intentional, lazy or incompetent blowups to destroy an organization, with collateral damage to many linked industries*
- *You can make more calculated risks, you focus resources on the right activities and you reduce the likelihood of known losses that drive costs and from shocks you didn't know about. Plus, once people think this way, it changes how they think about risks, and makes them do their jobs better by understanding where to focus on not making mistakes that have consequences. Externally, being aware of what has happened to others and then learning from their mistakes*
- *Usually the upside is much smaller than the downside, so searching for those large downside risks keep the company better prepared to act*
- *We have used it to recommend efforts that yield the same return while reducing risk*
- *Being aware of risks and making them transparent to decision makers allows them to better allocate capital*
- *Transparency around decision making*

Respondents in firms with specifically poor ERM experience drove the comments of those who said ERM does not improve returns relative to risk or who were not sure. Comments included the following:

- *Poor implementation*
- *ERM restricts innovation. If ERM had been in use Apple, Inc. would never have developed any of the i-products because the risk would have outweighed the potential rewards. ERM is a retardant for business, not an aid to increased returns*
- *The cost outweighs the benefits*
- *ERM is too conservative. I think ERM practices tend to overestimate the amount of additional risk, making the risk:reward look too high*
- *ERM hasn't created any new technology or methods. The same risks as measured now in insurance have always existed. Those who ignored or rationalized them before will continue to do so*

For those who were not sure if ERM added value, the comments included:

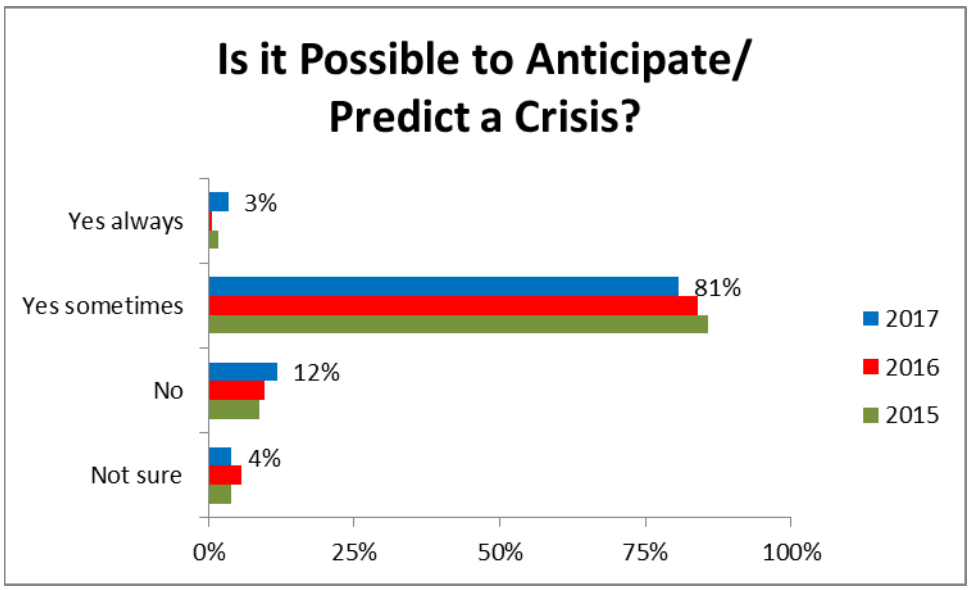
- *If ERM is integrated within business decision making, it will have a positive impact. However, if too much focus is placed on building overly complex models, ERM will have limited value, and will be viewed solely as a compliance exercise. Much of the ERM literature is too focused on highly complex model building, with limited focus on how to embed it in business decisions*
- *It can depend on the type of people involved. Implementing an ERM program should involve someone who is willing to accept more risk, not just risk averse folks*

This last comment is extremely important. A risk team needs to have a balance of thinkers to balance those developing products and those whose focus is entirely risk. If a firm takes no risk, it is unlikely to earn much if anything in return.

4.8 SECTION D: PREDICTIONS

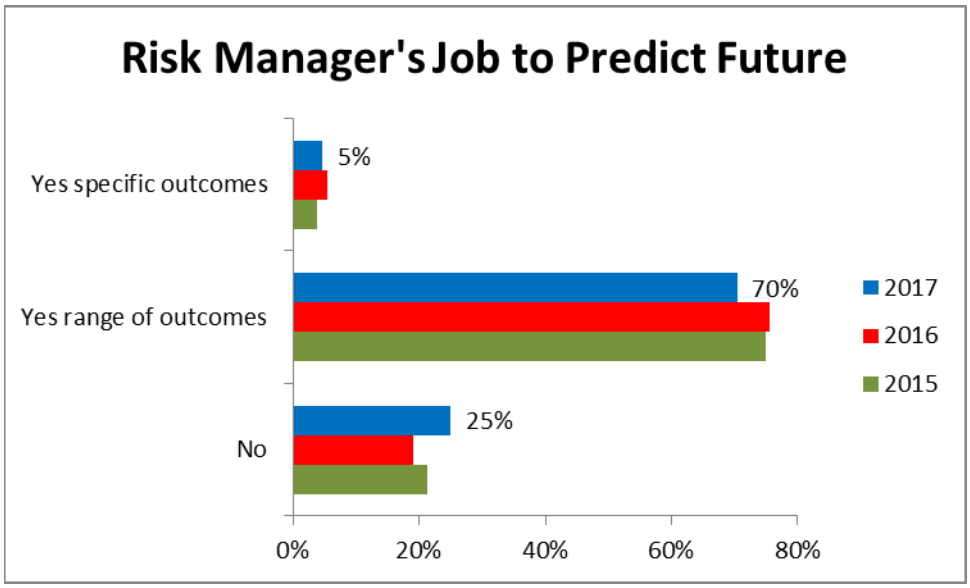
Risk managers are becoming increasingly involved with tactical and strategic planning, and a part of that is developing scenarios. Consistent with past surveys, developing a range of outcomes is considered more important than getting a single scenario correct. As risk managers become more aware of cognitive biases, they become more aware of potential bubbles and underpriced cash flow streams. When asked whether it is possible to anticipate/predict a crisis, most respondents (84%) stated that it was possible at least sometimes, as seen in Figure 48.

Figure 48: Is it Possible to Anticipate/Predict a Crisis?



As shown in Figure 49, a majority (70%) felt it was part of their job to predict a range of outcomes, with 5% saying they were asked to predict specific outcomes.

Figure 49: Risk Manager's Job to Predict Future

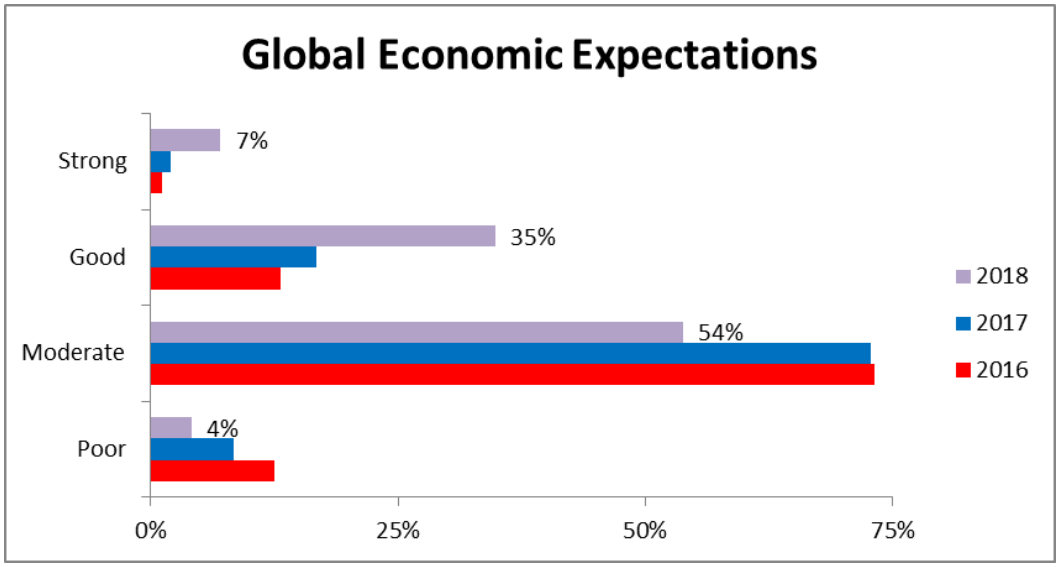


4.9 SECTION E: CURRENT TOPICS

A decade after the event, the 11th survey in this series allows reflection on the period since the global crisis. The Current Topics section reflects this, showing how expectations have evolved and risk projects and staffing have changed over time.

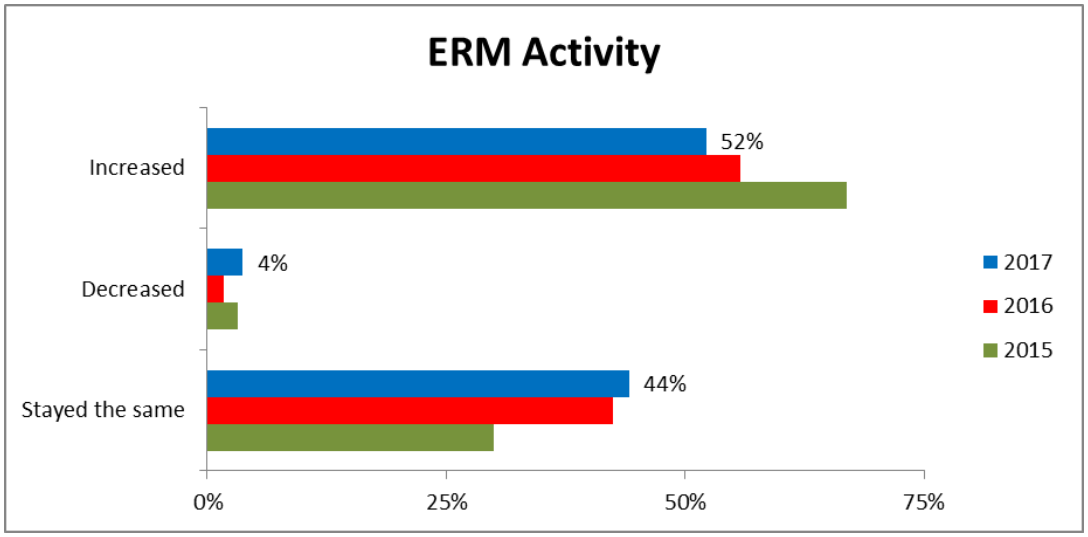
Global economic expectations have improved this year. As shown in Figure 50, respondents were quite a bit more positive for 2018, with 54% having a moderate and 35% a good outlook (7% had strong economic expectations). Only 4% (down from 8%) had poor expectations.

Figure 50: Global Economic Expectations



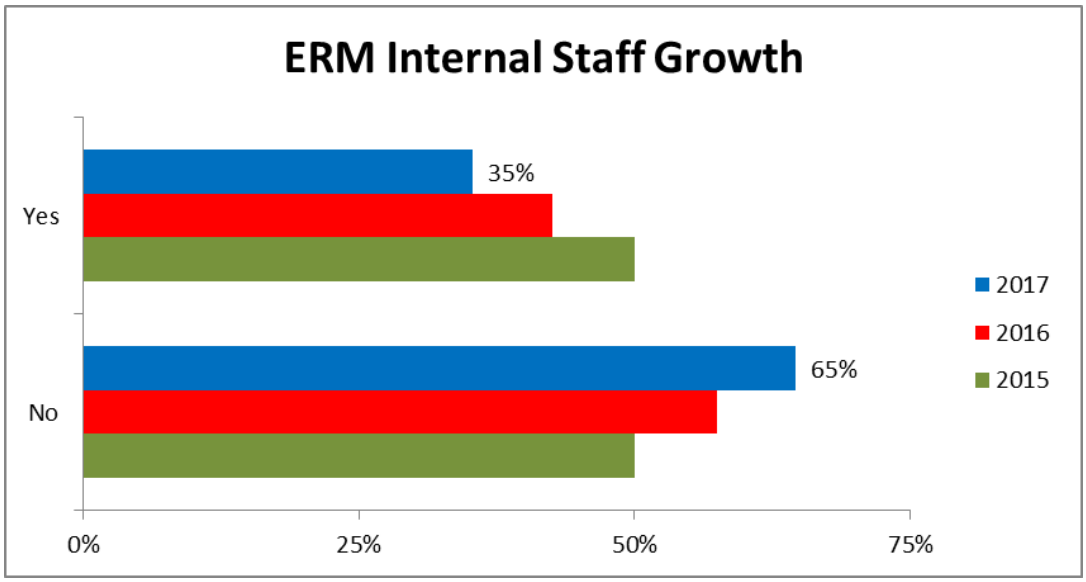
Risk managers continued to see increased ERM activity (52%) in 2017, while 4% saw decreased activity, as shown in Figure 51.

Figure 51: ERM Activity



Higher ERM activity led to internal staff growth for 35% of the respondents in 2017, as shown in Figure 52. We may be entering an era where ERM is considered a cost center with a goal to reduce its size, at least until the next Minsky Moment[9] transparently shows where risks have previously been hidden in the dark.

Figure 52: ERM Internal Staff Growth



In an effort to determine what types of activities were being added, the survey asked just that question. While some referred to regulatory requirements, others talked about data science approaches and deeper dives into business units and risk categories. Other common activities looked across complex organizations and model governance issues. Some looked to be more efficient so they could add more ERM duties. Some of the interesting comments included

- *Capital modeling at the divisional level*
- *More financial monitoring and governance/oversight*
- *Operational ERM analysis, development of more predictive dashboards and monitoring*
- *A risk appetite based regimen*
- *Focus on employee accountability, retention, recruitment. We added a recruiting manager to help us get better at finding the right people*
- *More activities focused on regulatory & rating agency pressure*
- *Technology solutions are being implemented to create efficiencies, allowing us to expand our ERM functionality*
- *Formalized risk management framework, and imbedding that framework into the day-to-day culture. Attempt to have ERM formally considered within strategic alternatives*
- *Model validation*
- *ORSA*
- *Lifetime valuations of all customers, employees, partners, etc.*

[9] A Minsky Moment is a period of great instability following relative stability that causes complacency. Examples include the Great Depression following the Roaring '20s, the dot com crash and the 2008 financial crisis.

- *Focus on $$$ measurements, rather than just a "feel" for what the impact would be*
- *More deep dive reviews, more model validations*

Figures 53 and 54 show how expectations have evolved for risk activity and risk funding over the most recent three years.

Figure 53: Future Expectations—Activity

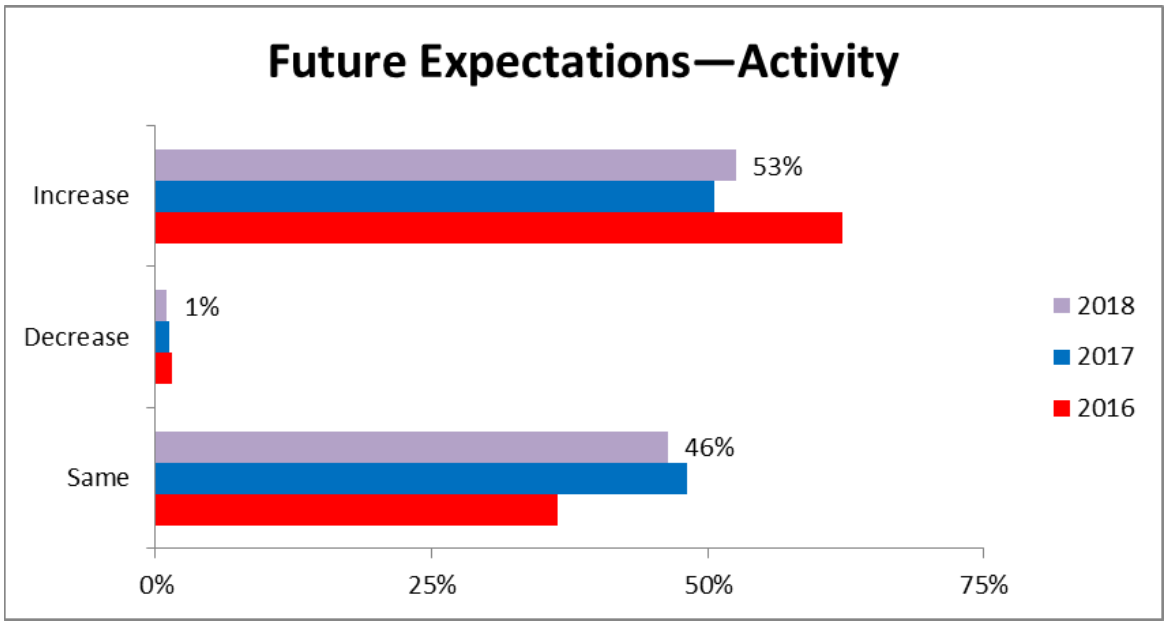


Figure 54: Future Expectations—Funding

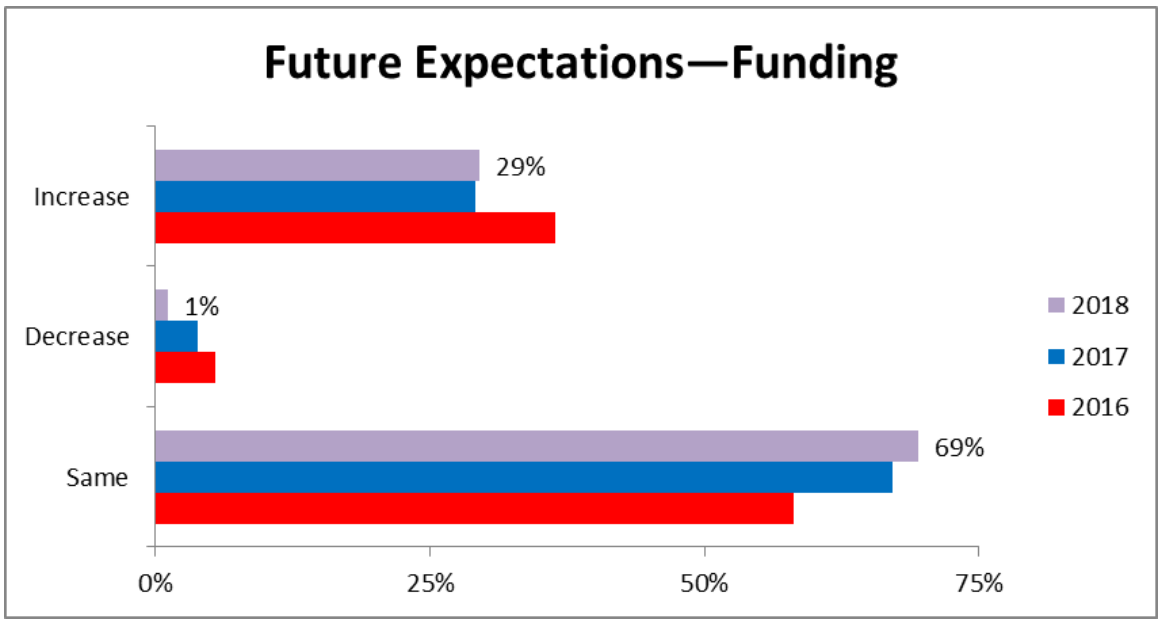
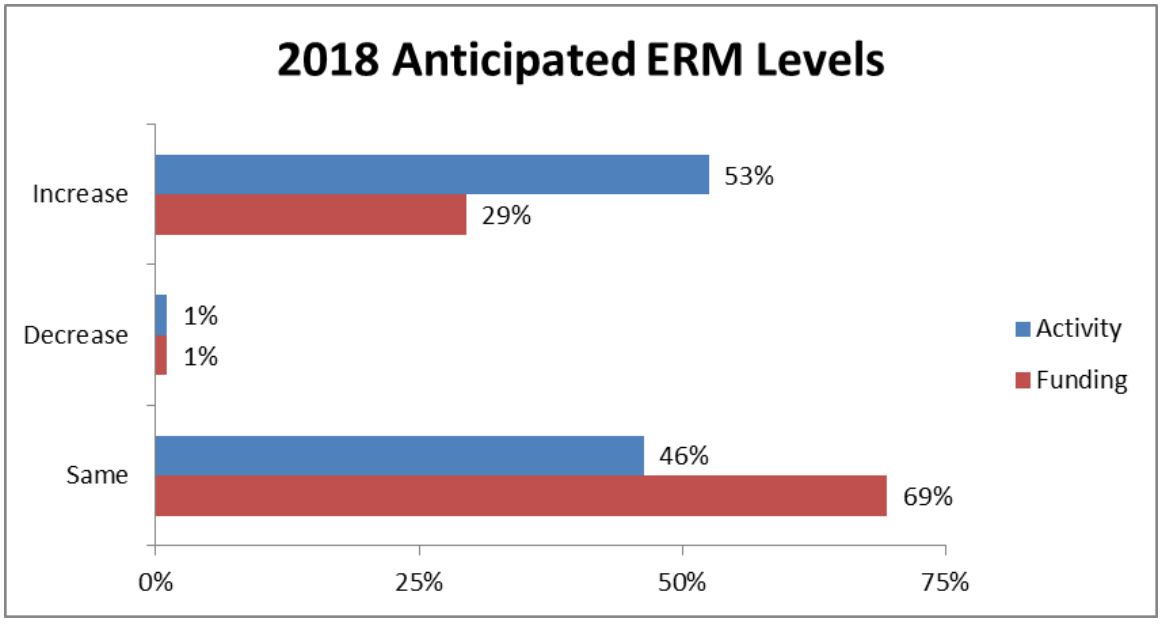


Figure 55 combines the activity and funding responses for the next year.

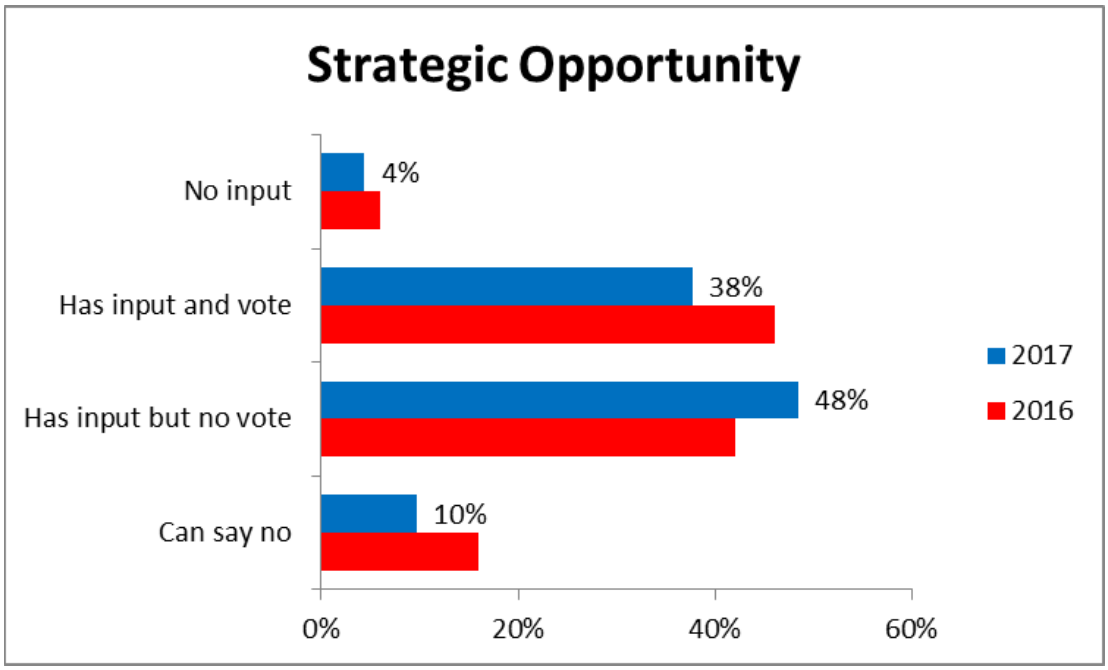
Figure 55: 2018 Anticipated ERM Levels



The survey asked how the ERM team is used when a strategic opportunity is presented to a firm. As illustrated in Figure 56, while 96% (including overlap) of respondents could either say no to a strategic opportunity (10%) and/or had input (86%), 4% still had no input. Companies are still trying to figure out the

proper role of the risk manager, and it will likely vary based on the manager's skill set and the firm's risk culture. Best practice incorporates the risk manager in decision making, as part of the senior team.

Figure 56: Strategic Opportunity



Respondents were asked to share examples where the ERM department was recognized following a risk event, either in a positive or negative way. Some examples showed proactive mitigation, while other times the team stepped up at a stressful time. Some teams were also castigated for not identifying an issue earlier.

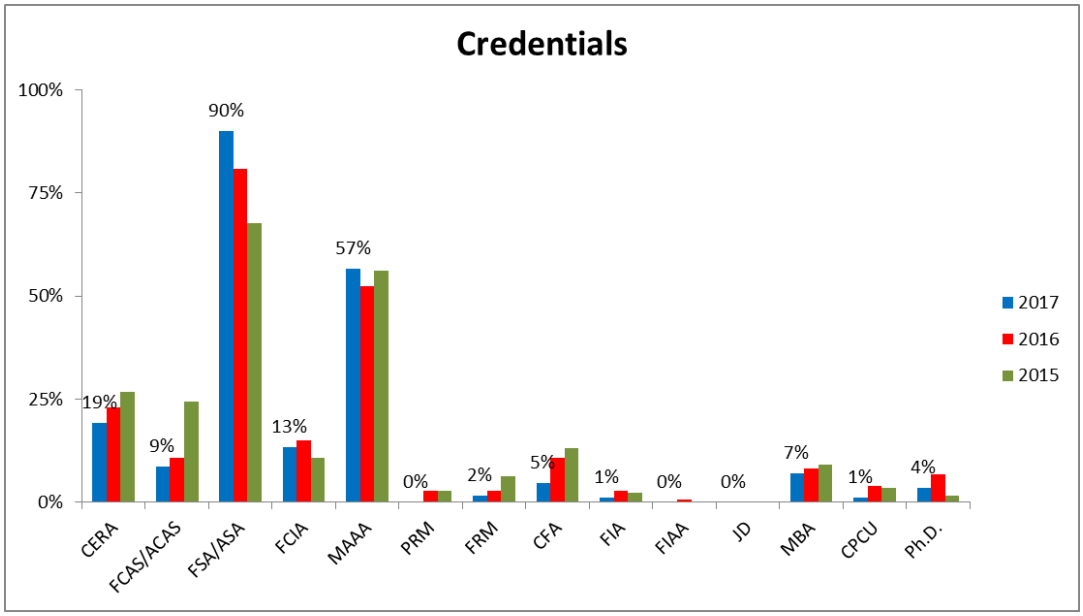
- *Oil risk identified, and hedges put on before oil severely declined*
- *In the discussion regarding a new product offering, the decision was made not to pursue that product line due to ERM input*
- *ERM coordinated the company impact data following the hurricanes*
- *Our education on cyber risks has been acknowledged regularly in making our firm better at managing that risk, first by quantifying how big the exposure was, followed by other research and market examples well before our industry has become a target*
- *Recent hurricanes showed good ERM practices by having smaller loss amounts than peers when scaled*
- *Anticipation of negative interest rates and the possible actions employed to mitigate were positively received*
- *Recent creation of a risk taxonomy (library) that spans audit, risk and compliance. Created a common language for all of us to use*
- *ERM took the lead on developing a new reinsurance strategy in response to some adverse claims experience. Board appreciated increased clarity and alignment with risk appetite*

4.10 SECTION F: DEMOGRAPHICS

Each year the *Survey of Emerging Risks* is distributed using targeted emails and social media. As noted elsewhere, pension and health practitioners were targeted in this survey for the first time. For this survey,

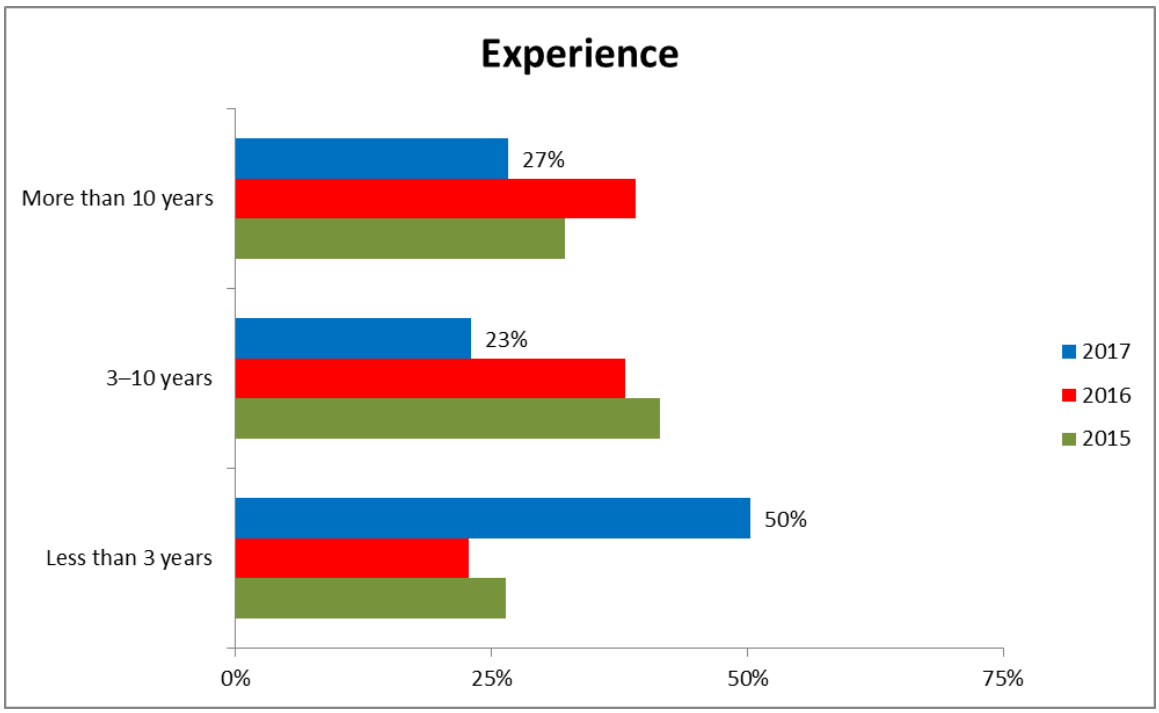
40% reported filling out the survey in the past. The sponsor, the JRMS, was well represented in the survey, with 90% of respondents holding a credential from the SOA, 9% from the CAS and 13% from the CIA. Other groups strongly represented were CFA charter holders (5%), those with a master's degree in business administration (7%) and those with a Ph.D. (4%). Many respondents held multiple credentials, as shown in Figure 57.

Figure 57: Credentials



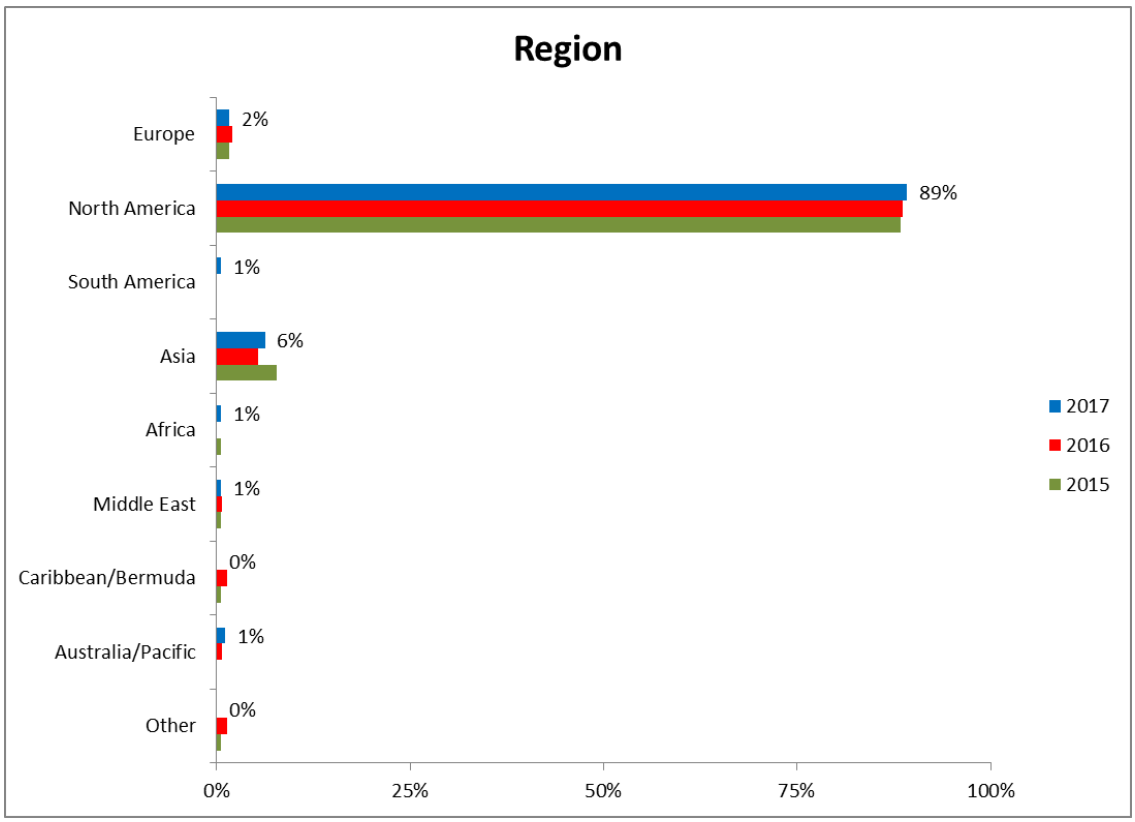
This year's survey was completed by fewer experienced practitioners, with 27% having more than 10 years of experience as risk managers (see Figure 58). The researcher is again indebted to respondents who share their experiences. Most respondents work at an insurer/reinsurer (60%) or consulting firm (21%).

Figure 58: Experience



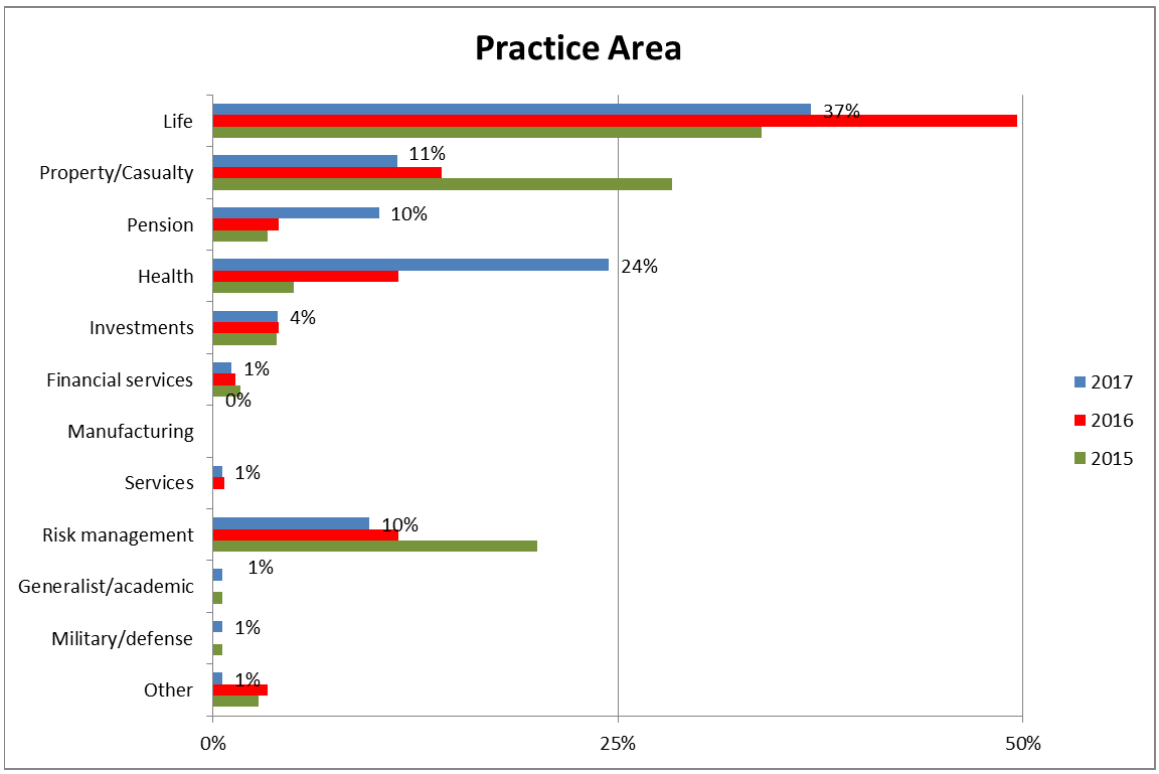
As shown in Figure 59, the survey continued to be dominated by North Americans (89%), with a significant minority coming from Asia. This year surveys were also completed by risk managers in the European, Middle Eastern, Australian/Pacific, South American, Caribbean/Bermuda and African regions.

Figure 59: Region



As illustrated in Figure 60, the primary areas of practice this year varied from the previous survey with less life insurance (37%), more health (24%) and fewer property/casualty insurance (11%), followed by risk management (10%), pension (10%) and investment (4%) practitioners.

Figure 60: Practice Area



The survey was sent directly to all JRMS and INARM members, some targeted social media groups on LinkedIn and Twitter, and to the members of several SOA sections. 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 shared newspapers, magazines (e.g., *The Economist*, *The Atlantic*, *National Geographic*), reinsurer and consultant publications, rating agency reports, seminars, blogs, professional actuarial organizations (e.g., the CAS, SOA and CIA) and the Risk Management Society. Some of the most interesting comments reflected reading science fiction, the Berkshire Hathaway annual report, and daily briefings from *The Hill*. The *Survey of Emerging Risks* was referenced as a good source, meeting the hopes of the researcher.

4.11 WEF GLOBAL RISKS REPORT 2018[10]

Numerous emerging risk surveys are being published, both by academics and consultants. One of the longest running is *The Global Risks Report 2018*, now in its 13th edition. Its respondents are less financially focused than are those for this survey, and there is more analysis by the authors. This makes it a nice companion piece to our survey. The survey portion is completed in the first quarter of one year and published in January of the following year, thus providing a different time stamp. It is a thought-provoking survey, providing potential solutions and scenarios, but does not trend results.

[10] World Economic Forum, *The Global Risks Report 2018: 13th Edition*, 2018. https://www.weforum.org/reports/the-global-risks-report-2018

The current WEF paper provides several highlights that are useful for risk managers to consider. Here are a few:

- The WEF survey is presented in four sections; one reflecting the survey; one considering challenges due to financial instability following stability (Minsky Moment), a series of "Future Shocks" and geopolitical risks; a look back at risks written up five years ago; and guest articles about resilience in complex organizations and cognitive bias.
- The report seemed to move toward analysis of systemic risks based on complex systems that tend to cascade rather than diversify using feedback loops and threshold effects (similar to a tipping point). Cascading can be runaway collapse or an abrupt transition to a new, suboptimal status quo. There is nothing smooth about the shift, and unintended consequences result from uncertain effects of interactions.
- Monoculture practices, with 75% of the world's food from 12 plants and five animal species, make agricultural practices vulnerable and broad famine possible.
- Plastic waste is finding its way into humans through seafood and tap water.

The Risk Reassessment[11] provided two authors to discuss a favorite topic, and they did not disappoint. Roland Kupers discussed the Resilience Action Initiative and nine resilience lenses that help a risk manager navigate through a minefield of higher-order interactions that are Boolean rather than probabilistic or normally distributed. Michele Wucker (author of *Gray Rhino*) shared her ideas about how to integrate cognitive bias recognition into risk management practices and make them part of everyday operations. She encouraged further tracking of projections to aid accountability for both businesses and governments.

[11] Ibid. page 53.

Section 5: 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 seek to 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 the POG and respondents:

- *Add a question in section 2 that asks what terms are being used—* frequency/severity/likelihood/impact/velocity
- *Can we make it so all of the 23 risks appear on one screen? Can we show a progress bar?*
- *When asking about risks not included, reference the glossary—many of the suggestions are already included*
- *Review Section 1 Question 9 for medical costs and medical advances, tying in mortality and morbidity*
- *Risks to consider: race, inequality, low interest rates*
- *Add antimicrobial to infectious disease definition*
- *Move the questions at the end of Section 1 about opportunities to Section 5 after question about strategic opportunity*
- *What are the types of scenarios being used for cyber modeling? And other risks*
- *Consider deleting the correlation of combinations question*
- *Rotating question—consider causes of famine*
- *Consider using the term* network *in the cyber risk instead of interconnectedness of infrastructure*
- *Rotating question: as a follow-up from the 2050 question, ask a multiple choice like, "For your top long term risk, would you expect to start acting in 5, 10, 15, 20, 25 years?"*
- *Review chronic disease definition*

Appendix I—Glossary of Risks

Initially 23 core risks were defined by the WEF in *Global Risks 2007: A Global Risk Network Report*. An active link for the report can be found at https://www.mccombs.utexas.edu/~/media/Files/MSB/Centers/CRMI/GlobalRisks2007.pdf. What follows is an updated version for the *Survey of Emerging Risks* with a description of the current 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 and extremes of sectors, including commodities, equities or interest rates.

Environmental Risks

- Climate change—Change in climate patterns generates both extreme events and gradual changes, impacting infrastructure, agricultural yields and human lives. (Drivers include, but are not limited to, space weather and human influence.)
- Loss of freshwater services—Water shortages impact agriculture, businesses and human lives.
- Natural catastrophe: tropical storms—Hurricanes and typhoons lead to disruption, catastrophic economic losses, and/or high human loss of life.
- Natural catastrophe: earthquakes—Strong earthquake(s)/seismic activity lead to disruption, catastrophic economic losses and/or high human loss of life.
- Natural catastrophe: severe weather (except tropical storms)—Meteorological phenomena lead to disruption, catastrophic economic losses, and/or high human loss of life. Includes inland flooding, tornados, thunderstorms, drought, wildfires, high winds, snowstorms and dust storms.

Geopolitical Risks

- Terrorism—Attacks lead to disruption, catastrophic economic losses, and/or high human loss of life.
- Weapons of mass destruction—Nuclear, biological, radiological or chemical technologies are held by unstable groups, leading to disruption, catastrophic economic losses, and/or high human loss of life.
- 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.
- Globalization shift—Preference changes to imports and immigration. Countries retrench and become more nationalistic and protectionist, or open up their economies to outsiders.
- 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—Diseases such as obesity, diabetes and cardiovascular become widespread.

- Demographic shift—Evolving populations (e.g., age, size, migration trends) drive changes in economic growth and levels of government intervention.
- Liability regimes/regulatory framework—Costs increase faster than GDP, with the spread of litigiousness and speed of regulatory revisions.

Technological Risks

- Cyber/interconnectedness of infrastructure—A major disruption of the availability, reliability and resilience of critical information infrastructure caused by cyber risks, terrorist attack or technical failure. Results are felt in major infrastructure: power distribution, water supply, transportation, telecommunication, emergency services and finance.
- Technology—Unintended consequences of technology lead to disruption and/or catastrophic economic losses (e.g., drones, self-driving cars, additive manufacturing, the internet of things, exposure to nanoparticles).

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 an attempt is made to maintain trends and simplify

- Moved *Fiscal crises caused by demographic shift* from Economic to Societal category and renamed it *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

2016—Changes to the names of two risks and updates to the definitions of eight risks, mainly to adopt a consistent method of describing the negative results of a risk. Definition changes were meant to add clarity. Specifically, *Demographic shift* added migration as a specific factor

- Changed definition of *Natural catastrophe: tropical storms* from "A hurricane or typhoon passes over heavily populated areas, leading to catastrophic economic losses and/or high human death tolls" to "A hurricane or typhoon leads to disruption, catastrophic economic losses, and/or high human loss of life."
- Changed *Natural catastrophe: earthquakes* from "Strong earthquake(s) occurs in heavily populated areas" to "Strong earthquake(s)/volcanic eruptions lead to disruption, catastrophic economic losses and/or high human loss of life."
- Changed *Natural catastrophe: severe weather (except tropical storms)* from "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" to "Meteorological phenomena lead to disruption, catastrophic economic losses, and/or high human loss of life. Includes inland flooding, tornados, thunderstorms, drought, wildfires, high winds, snowstorms and dust storms."
- Changed *Terrorism* from "Attacks disrupt economic activity, causing major human and economic losses" to "Attacks lead to disruption, catastrophic economic losses, and/or high human loss of life."
- Changed both name and definition—from *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" to *Weapons of mass destruction*—"Nuclear, biological, radiological and chemical technologies are held by unstable groups, leading to disruption, catastrophic economic losses, and/or high human loss of life."
- Changed *Demographic shift* from "Aging populations in developed economies drive economic stagnation by forcing governments to raise taxes or borrow" to "Evolving populations (e.g., age, size, migration trends) drive economic stagnation and government interventions."
- Changed both name and definition from *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" to *Cyber/interconnectedness of infrastructure*—"A major disruption of the availability, reliability and resilience of critical information infrastructure caused by cyber risks, terrorist attack or technical failure. Results are felt in major infrastructure: power distribution, water supply, transportation, telecommunication, emergency services, and finance." Previous surveys had noted that cybersecurity did not cover all cyber risks
- Changed *Technology* from "Health is impaired due to exposure to nanoparticles or unintended consequences of technology" to "Includes drones, self-driving cars, additive manufacturing (3-D printing), the internet of things, exposure to nanoparticles, or other unintended consequences of technology that lead to disruption and/or catastrophic economic losses."

2017—Changes to the names of two risks and update to the definitions of seven risks, partly to show risk as two-sided

- Changed both name and definition from *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 include space weather and human influence.)" to *Climate change*—"Change in climate patterns generates both extreme events and gradual changes, impacting infrastructure, agricultural yields and human lives. (Drivers include, but are not limited to, space weather and human influence.)"
- Changed the definition of *Natural catastrophe: tropical storms* from "A hurricane or typhoon leads to disruption, catastrophic economic losses, and/or high human loss of life" to "Hurricanes and typhoons lead to disruption, catastrophic economic losses, and/or high human loss of life."
- Changed the definition of *Natural catastrophe: earthquakes* from "Strong earthquake(s)/volcanic eruptions lead to disruption, catastrophic economic losses, and/or high human loss of life" to

"Strong earthquake(s)/seismic activity lead to disruption, catastrophic economic losses, and/or high human loss of life."

- Changed the definition of *Weapons of mass destruction* from "Nuclear, biological, radiological and chemical technologies are held by unstable groups, leading to disruption, catastrophic economic losses, and/or high human loss of life" to "Nuclear, biological, radiological or chemical technologies are held by unstable groups, leading to disruption, catastrophic economic losses, and/or high human loss of life."
- Changed both the name and definition from "*Retrenchment from globalization*—Rising concerns about cheap imports and immigration sharpen protectionism in developed countries. Countries become more nationalistic and state-oriented" to "*Globalization shift*—Preference changes to imports and immigration. Countries retrench and become more nationalistic and protectionist, or open up their economies to outsiders."
- Changed the definition of *Demographic shift* from "Evolving populations (e.g., age, size, migration trends) drive economic stagnation and government interventions" to "Evolving populations (e.g., age, size, migration trends) drive changes in economic growth and levels of government intervention."
- Changed the definition of *Technology* from "Includes drones, self-driving cars, additive manufacturing (3-D printing), the internet of things, exposure to nanoparticles, or other unintended consequences of technology that lead to disruption and/or catastrophic economic losses" to "Unintended consequences of technology leads to disruption and/or catastrophic economic losses (e.g., drones, self-driving cars, additive manufacturing, the internet of things, exposure to nanoparticles)."

Appendix II—11th Survey Results (Compiled Fall 2017)

This appendix includes the survey as well as the responses. There were 222 respondents. Not all respondents answered every question. The percentages 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. The following text introduced the survey to recipients.

The Joint Risk Management Section, sponsored by the Casualty Actuarial Society, the Canadian Institute of Actuaries and the Society of Actuaries, is conducting an online survey to help understand individual risk managers' perspectives on emerging risks. We value your insights and invite you to participate in this annual survey.

Please complete this survey by Nov. 20. It should take about 15 minutes to complete. We hope you will share your thoughts and experiences in comment boxes. Responses from more than one risk manager within the same company are encouraged. All responses are anonymous.

If you have questions about the survey, please contact Jan Schuh at jschuh@soa.org.

Thank you for your participation.

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Note: Occasionally a comment is highlighted to reflect those the researcher found particularly thought-provoking. Comments have been very lightly edited in Appendix II and are identified using *italics*. When a respondent leaves multiple comments for the same question, they are separated by /.

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
end of September	Fall 2011	1,131.42	78.93	1.34
	Fall 2012	1,440.67	92.18	1.29
end of September	Fall 2013	1,681.55	102.36	1.35
end of September	Fall 2014	1,972.29	91.17	1.26
end of October	Fall 2015	2,079.36	46.60	1.10
end of October	Fall 2016	2,126.15	46.83	1.10
end of October	Fall 2017	2,575.26	54.36	1.16

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 (source: Yahoo Finance), the price of a barrel of oil was $113.70 (source: 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 (source: 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 (the cognitive shortcoming known as recency bias). 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 inaugural 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, despite a stated time horizon of 10 years, and the current report includes 30 risks. The *Survey of Emerging Risks* 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?

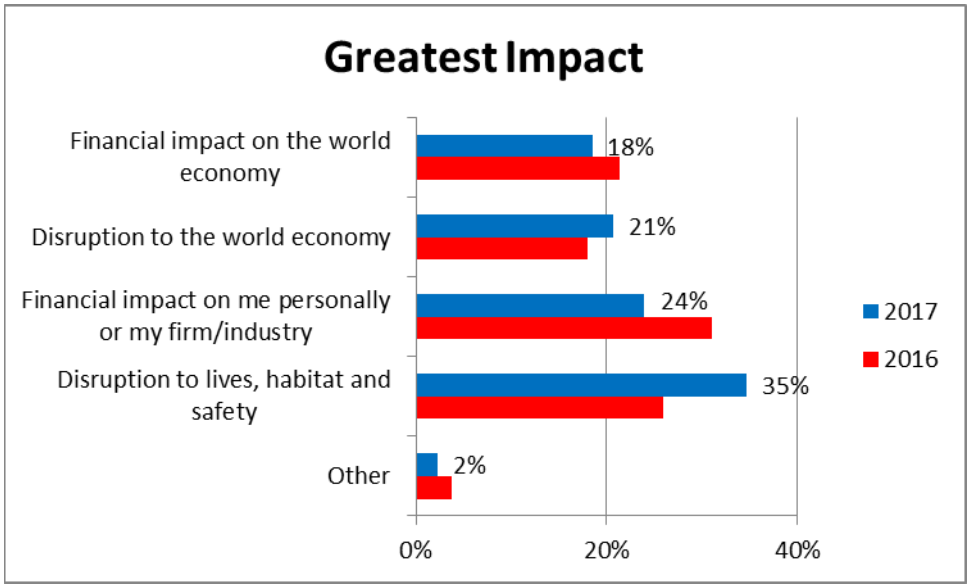
222 total responses[12]

- 41 responses (18% in current survey/21% in most recent previous survey) Financial impact on the world economy
- 46 responses (21%/18%) Disruption to the world economy
- 53 responses (24%/31%) Financial impact on me personally or my firm/industry
- 77 responses (35%/26%) Disruption to lives, habitat and safety
- 5 responses (2%/4%) Other

    - *We all die*
    - *Impact to our risk tolerance levels*
    - *It depends. In my function as a risk manager with a re/insurance company, it is about financial impact on my firm/industry. No personal impact is assessed. But the WEF GRR has not an industry perspective, but assesses risk to the world*
    - *Combination of disruption and financial impact to my industry*

[12] All tables include the most recent results, starting with the current survey and working backward, as shown here.

- *Disruption to the world order*



Question 2. What is the risk that currently has the greatest impact? (Please select one.)

The 23 risks shown have evolved from those developed by the WEF in 2007. (Ed. note: Detailed definitions of these risks can be found in Appendix I, along with how the definitions have evolved over time.)

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

218 total responses

Economic—47 responses (22%/27%/33%/39%)

• 2 responses	(1%/2%/4%/4%)[13]		Energy price shock
• 1 response	(0%/0%/2%/1%)		Currency shock
• 3 responses	(1%/2%/4%/4%)		Chinese economic hard landing
• 22 responses	(10%/10%/10%/17%)	3	Asset price collapse
• 19 responses	(9%/12%/12%/14%)	4	Financial volatility

Environmental—34 responses (16%/13%/15%/10%)

• 23 responses	(11%/10%/8%/6%)	2	Climate change

[13] In Appendix II results are often provided for past surveys as well as the current one. They consistently show the current survey first, then prior surveys are listed with most recent first.

• 3 responses	(1%/1%/2%/1%)		Loss of freshwater services
• 5 responses	(2%/0%/1%/1%)		Natural catastrophe: tropical storms
• 3 responses	(1%/0%/1%/1%)		Natural catastrophe: earthquakes
• 0 responses	(0%/1%/3%/2%)		Natural catastrophe: severe weather

Geopolitical—72 responses (33%/29%/19%/24%)

• 14 responses	(6%/6%/6%/8%)	5	Terrorism
• 12 responses	(6%/4%/2%/1%)		Weapons of mass destruction
• 12 responses	(6%/4%/4%/2%)		Interstate and civil wars
• 9 responses	(4%/5%/2%/5%)		Failed and failing states
• 5 responses	(2%/1%/0%/0%)		Transnational crime and corruption
• *9 responses*	*(4%/8%/1%/1%)*		*Globalization shift*
• 11 responses	(5%/0%/4%/7%)		Regional instability

Societal—22 responses (10%/9%/12%/15%)

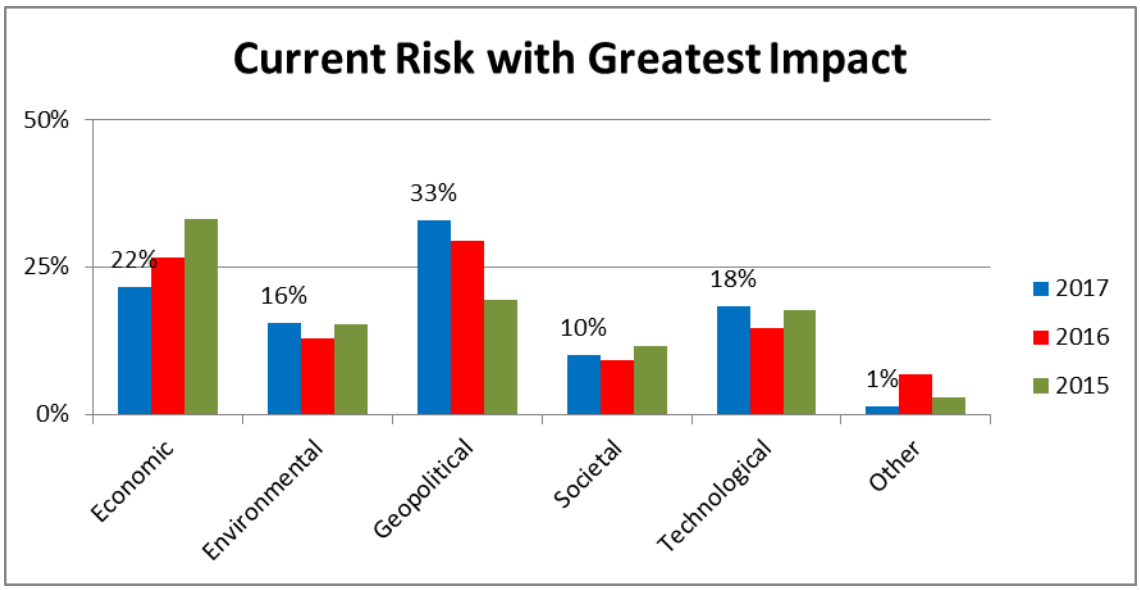
• 6 responses	(3%/4%/3%/8%)		Pandemics/infectious diseases
• 2 responses	(1%/0%/0%/0%)		Chronic diseases
• 5 responses	(2%/2%/3%/2%)		Demographic shift
• 9 responses	(4%/3%/5%/5%)		Liability regimes/regulatory framework

Technological—40 responses (18%/15%/18%/6%)

• 28 responses	(13%/11%/15%/6%)	1	Cyber/interconnectedness of infrastructure
• 12 responses	(6%/4%/3%/0%)		Technology

Other—3 responses (1%/7%/3%/6%)

- *Worldwide shift from USD as currency of choice to some other currency, with resulting impacts to US economy*
- *Human intolerance and ignorance*
- *Unsupportable debt*



The categories of risks having the current greatest impact were:

- Economic 22%/27%/33%/39% in 2017/2016/2015/2014
- Environmental 16%/13%/15%/10%
- Geopolitical 33%/29%/19%/24%
- Societal 10%/9%/12%/15%
- Technological 18%/15%/18%/6%
- Other 1%/7%/3%/6%

Section A: Emerging Risks

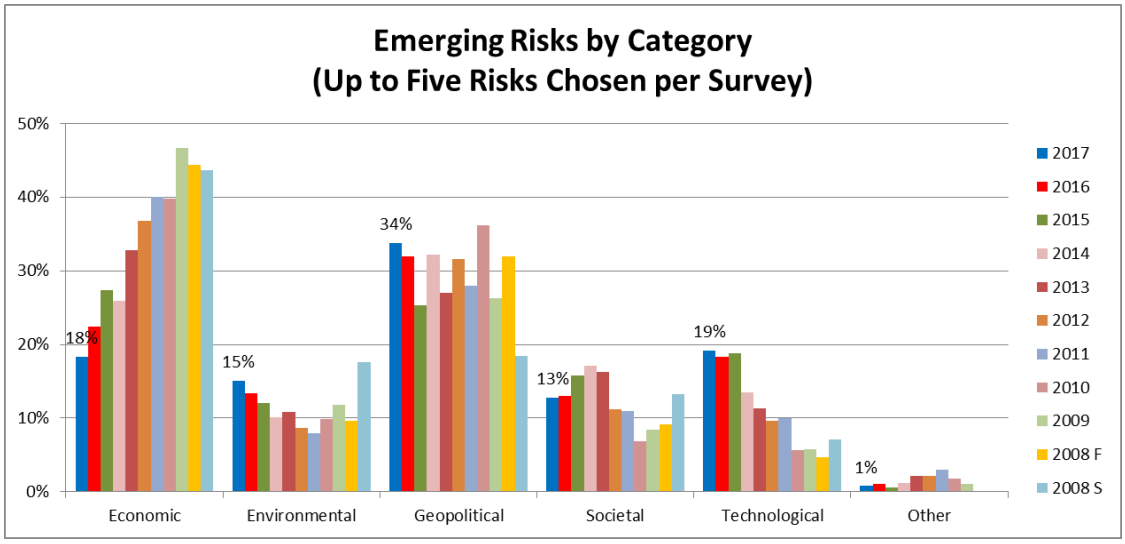
Question 1. Please choose up to five (5) emerging risks that you feel will have the greatest impact over the next few years.

1,032 total responses from 218 surveys—average 4.73 (same as prior survey)

Divisor in percentages for major categories is 1,032—for individual risks it is 218

Number of responses (up to 5)

- 1–3 surveys 1%
- 2–2 surveys 1%
- 3–5 surveys 5%
- 4–28 surveys 8%
- 5–169 surveys 85%



Economic—189 responses (18%/22%/27%/26%/33%/37%/40%/40%/47%/44%/44% in November 2017, November 2016, November 2015, October 2014, October 2013, October 2012, October 2011, October 2010, December 2009, November 2008, April 20082017/2016/2015/2014/2013/2012/2011/2010/2009/F2008/S2008)

• *11 responses*	*(5%/10%/14%/13%/7%/31%/32%/40%/45%)*		*Energy price shock*
• 15 responses	(7%/10%/14%/7%/27%/26%/25%/49%/66%)		Currency shock
• 34 responses	(16%/17%/25%/27%/28%/31%/32%/41%/33%)		Chinese economic hard landing
• 65 responses	(30%/26%/31%/31%/30%/24%/22%/31%/49%)	5	Asset price collapse
• *64 responses*	*(29%/43%/45%/44%/59%/62%/68%)*		*Financial volatility*

Environmental—156 responses (15%/13%/12%/10%/11%/9%/8%/10%/12%/10%/18%)

• 64 responses	(29%/28%/26%/19%/16%/20%/14%/25%/27%)	Climate change
• 23 responses	(11%/9%/8%/8%/9%/11%/6%/9%/10%)	Loss of freshwater services
• **34 responses**	**(16%/8%/6%/5%/8%/6%/5%/4%/8%)**	**Natural catastrophe: tropical storms**
• 13 responses	(6%/9%/7%/5%/6%/2%/6%/5%/7%)	Natural catastrophe: earthquakes
• 22 responses	(10%/9%/10%/11%/11%/1%/4%/2%/5%)	Natural catastrophe: severe weather

Geopolitical—349 responses (34%/32%/25%/32%/27%/32%/28%/36%/26%/32%/18%)

• 89 responses	(41%/39%/37%/41%/27%/28%/20%/43%/30%)	2	Terrorism
• 46 responses	**(21%/9%/8%/9%/5%/14%/9%/18%/14%)**		**Weapons of mass destruction**
• 42 responses	(19%/16%/19%/19%/13%/14%/10%/10%/9%)		Interstate and civil wars
• *30 responses*	*(14%/21%/18%/28%/29%/33%/42%/38%/18%)*		*Failed and failing states*
• 30 responses	(14%/10%/5%/10%/8%/5%/3%/12%/7%)		Transnational crime and corruption
• *44 responses*	*(20%/30%/6%/8%/13%/13%/11%/25%/18%)*		*Globalization shift*
• 68 responses	**(31%/26%/26%/37%/29%/42%/32%/25%/28%)**	**4**	**Regional instability**

Societal—132 responses

(13%/13%/16%/17%/16%/11%/11%/7%/8%/9%/13%)

• 31 responses	(14%/16%/17%/30%/19%/12%/13%/22%/30%)		Pandemics /infectious diseases
• 17 responses	(8%/6%/8%/5%/3%/3%/2%/4%/4%)		Chronic diseases
• 50 responses	(23%/24%/26%/23%/30%/30%/30%/26%/27%)		Demographic shift
• 34 responses	(16%/15%/24%/22%/23%/8%/7%/6%/6%)		Liability regimes/regulatory framework

Technological—198 responses (19%/18%/19%/14%/11%/10%/10%/6%/6%/5%/7%)

• 116 responses	(53%/53%/65%/58%/47%/40%/38%/23%/21%)	1	Cyber/interconnectedness of infrastructure
• 82 responses	(38%/34%/24%/5%/5%/6%/5%/4%/7%)	3	Technology

Other—8 responses (1%/1%/1%/1%/2%/2%/3%/2%/1%/4%/4%)

- *Lack of attention to importance of early diagnosis and management as risks evolve*
- *Global impact of Trump's foreign policy*
- *Corruption and worse by Democrats (US)*
- *Proliferation of opioids*
- *Unsupportable debt*
- *Artificial Intelligence, digital currencies, social media*
- *Life extension to unimagined age by improvement in medicine particularly cell therapy resulting in massive overpopulation*
- *Trump*

Another way to review this data is as a percentage of the total responses. For example, *Climate change* had 64 responses in this survey. In the previous analysis just shared, 64/218 = 29%. In the next section we will look at 64/1032 = 6% and compare the results with the average from previous surveys and against other

questions in the current survey. Bold signifies higher than the average in the current survey and italics signifies lower than the average. [14]

Economic (34% average—18%/22%/27%/26%/33%/37%/40%/40%/47%/43%/42% in 2017/2016/2015/2014/2013/2012/2011/2010/2009/F2008/S2008)

- *6%—1%/2%/3%/3%/2%/6%/7%/9%/10%/8%/13%* *Energy price shock*
- *6%—1%/2%/3%/1%/6%/5%/6%/10%/14%/10%/9%* *Currency shock*
- *6%—3%/4%/5%/6%/6%/7%/7%/9%/7%/6%/9%* *Chinese economic hard landing*
- *7%—6%/5%/6%/7%/7%/5%/5%/6%/10%/14%/5%* *Asset price collapse*
- *11%—6%/9%/9%/9%/13%/13%/15%* *Financial volatility*

Environmental (12%—15%/13%/12%/10%/11%/9%/8%/10%/12%/9%/17%)

- **5%—6%/6%/6%/4%/4%/4%/3%/5%/6%/5%/9%** **Climate change**
- 2%—2%/2%/2%/2%/2%/2%/1%/2%/2%/2%/3% Loss of freshwater services
- **2%—3%/2%/1%/1%/2%/1%/1%/1%/2%/1%/2%** **Natural catastrophe: tropical storms**
- 1%—1%/2%/1%/1%/1%/0%/1%/1%/1%/1%/2% Natural catastrophe: earthquakes
- **1%—2%/2%/2%/2%/2%/0%/1%/0%/1%/0%/1%** **Natural catastrophe: severe weather**

Geopolitical (29%—34%/32%/25%/32%/27%/32%/28%/36%/26%/31%/18%)

- **7%—9%/8%/8%/9%/6%/6%/4%/9%/6%/6%/4%** **Terrorism**
- **3%—4%/2%/2%/2%/1%/3%/2%/4%/3%/3%/4%** **Weapons of mass destruction**
- **3%—4%/3%/4%/4%/3%/3%/2%/2%/2%/2%/3%** **Interstate and civil wars**
- *5%—3%/4%/4%/6%/6%/7%/9%/8%/4%/6%/2%* *Failed and failing states*
- **2%—3%/2%/1%/2%/2%/1%/1%/3%/2%/2%/2%** **Transnational crime and corruption**
- **3%—4%/6%/1%/2%/3%/3%/2%/5%/4%/5%/2%** **Globalization shift**
- **6%—7%/5%/6%/8%/6%/9%/7%/5%/6%/7%/1%** **Regional instability**

Societal (12%—13%/13%/16%/17%/16%/11%/11%/7%/8%/9%/12%)

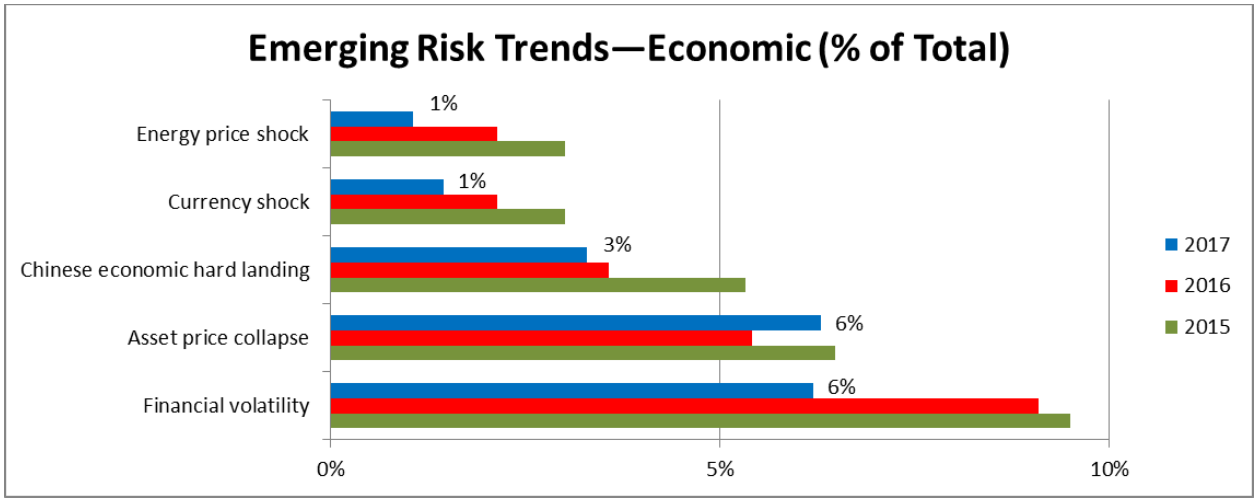
- *5%—3%/3%/4%/6%/4%/3%/3%/5%/6%/7%/8%* *Pandemics/infectious diseases*

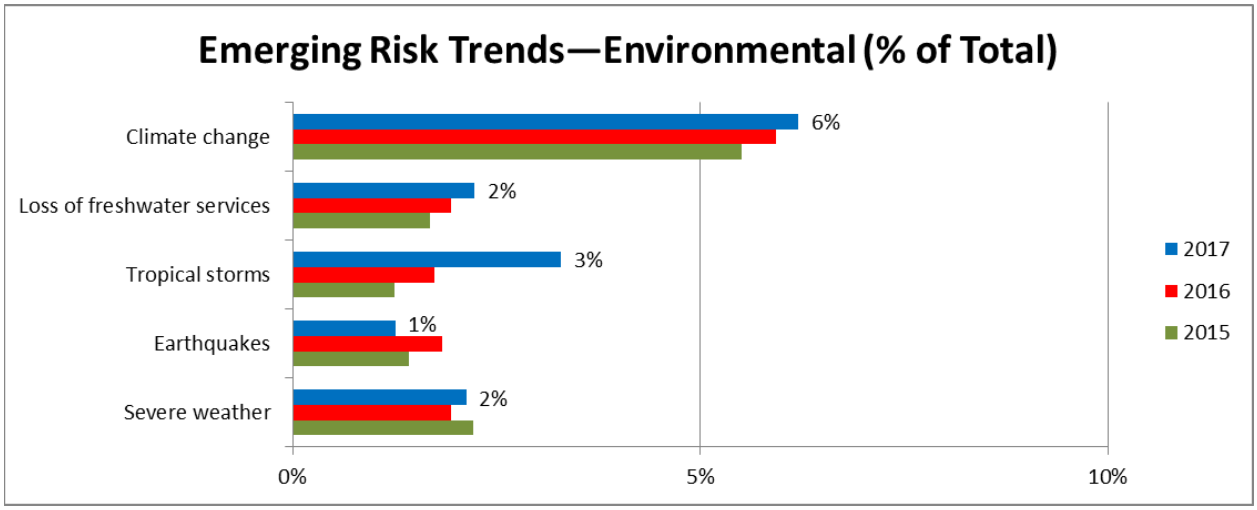
[14] Note that charts show actual results, while labels are rounded to the near percentage point. In some instances the bar in the graph has positive length but the label says 0%.

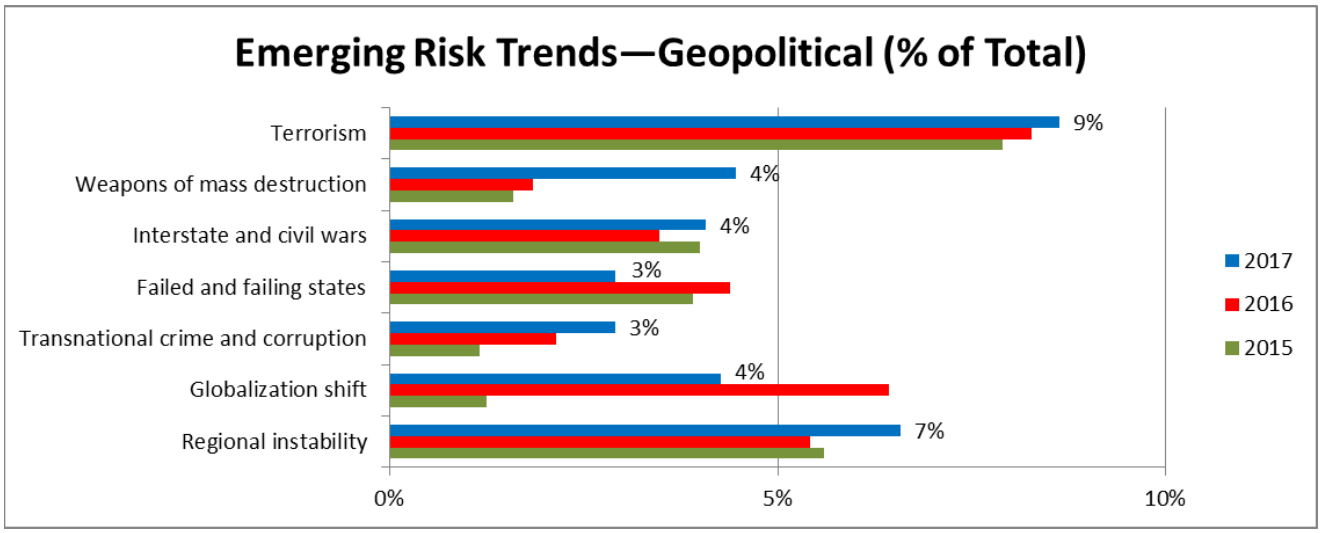
- 1%—2%/1%/2%/1%/1%/1%/2%/1%/1%/1%/2% Chronic diseases
- *6%—5%/5%/6%/5%/6%/6%/7%/6%/6%/5%/6% Demographic shift*
- 3%—3%/3%/5%/5%/5%/2%/2%/1%/1%/1%/2% Liability regimes/regulatory framework

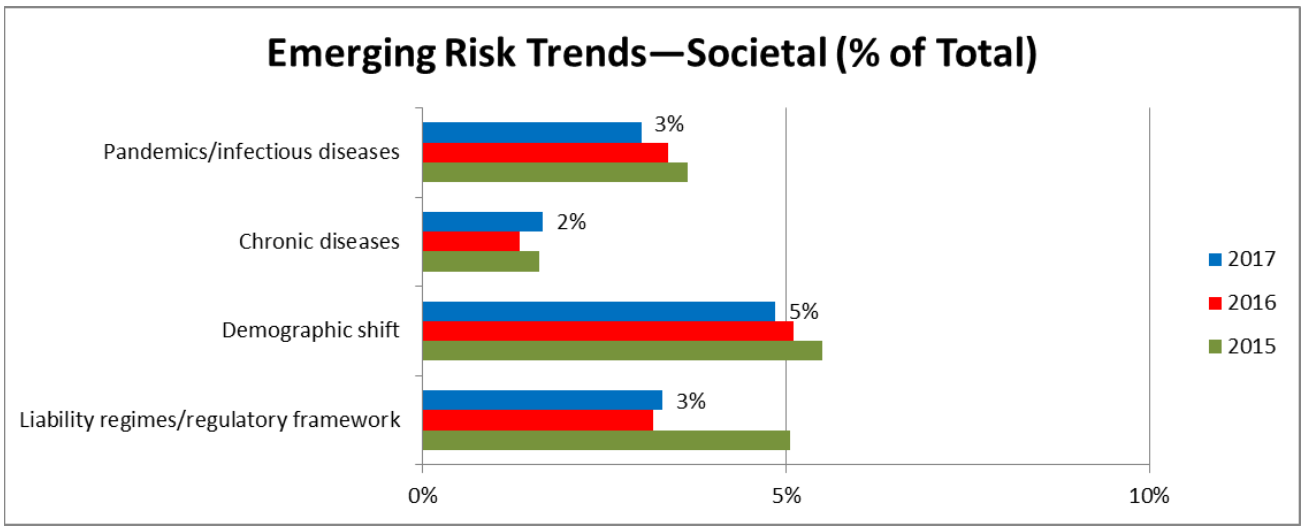
Technological (11%—19%/18%/19%/3%/11%/10%/10%/6%/5%/4%/7%)

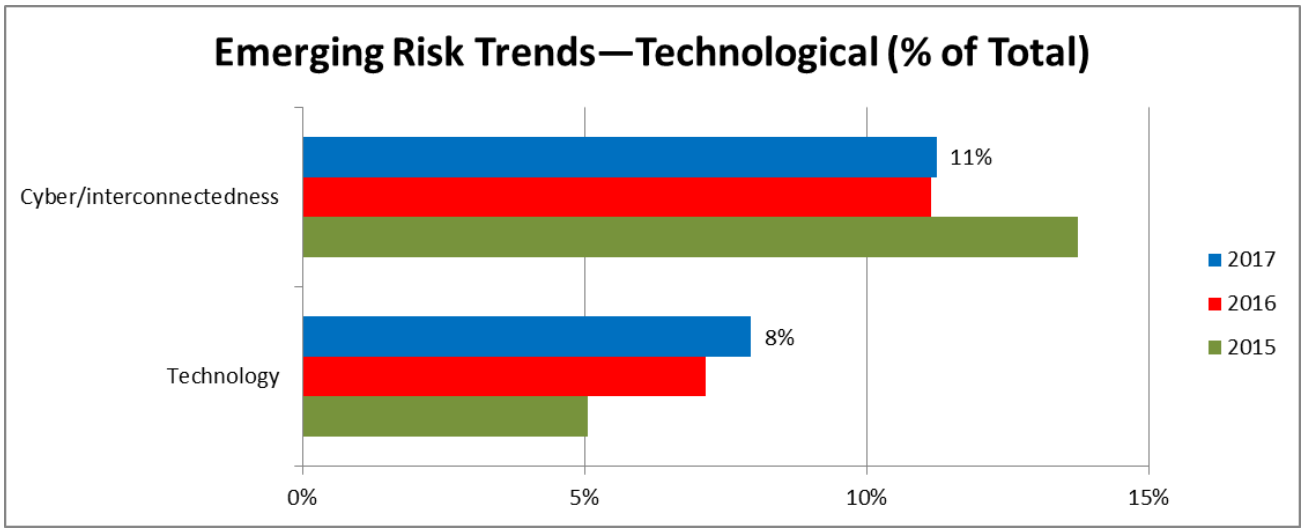
- 8%—11%/11%/14%/12%/10%/8%/8%/5%/4%/3%/5% Cyber/interconnectedness of infrastructure
- 3%—8%/7%/5%/1%/1%/1%/1%/1%/1%/1%/2% Technology



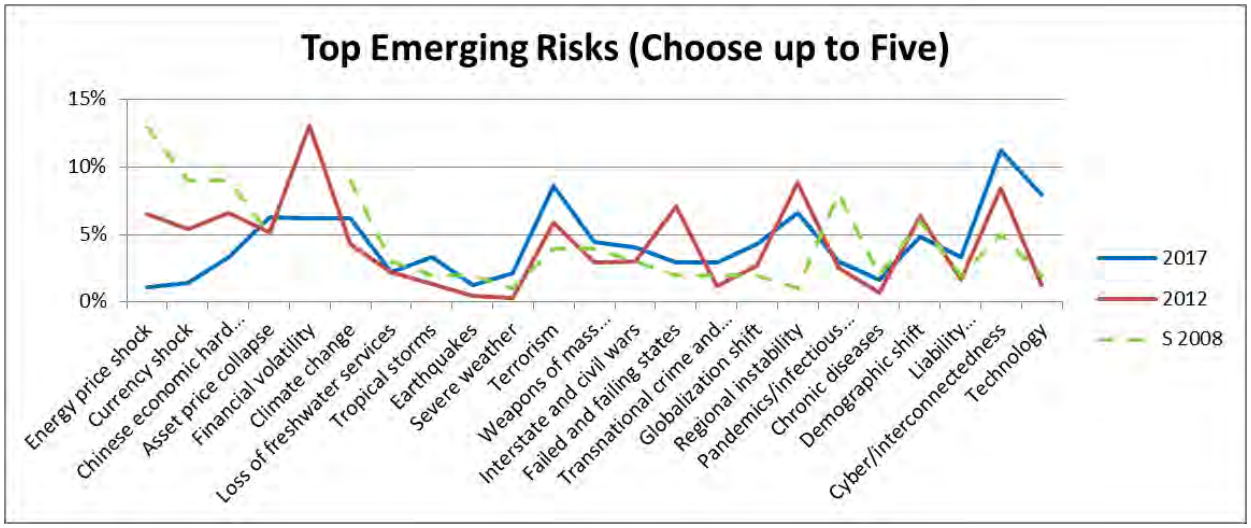




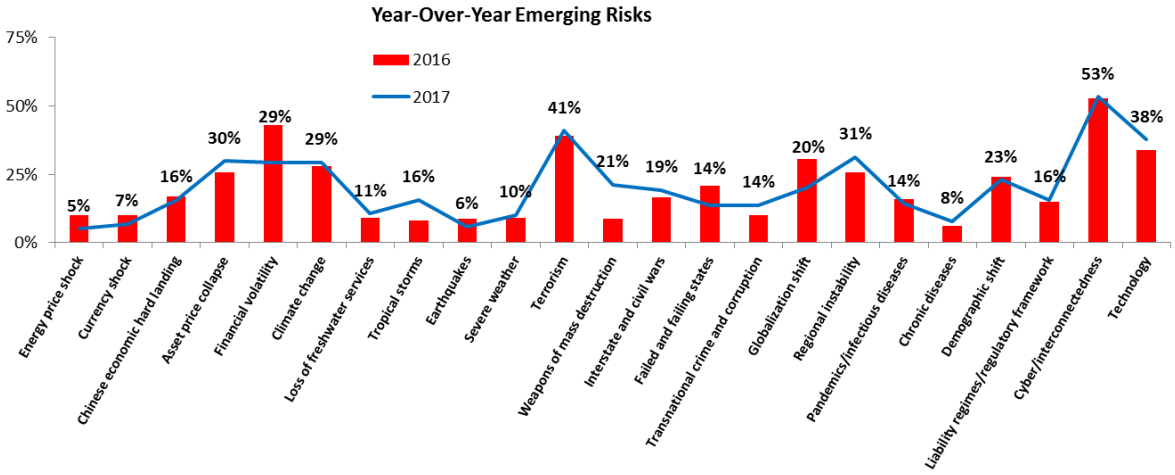


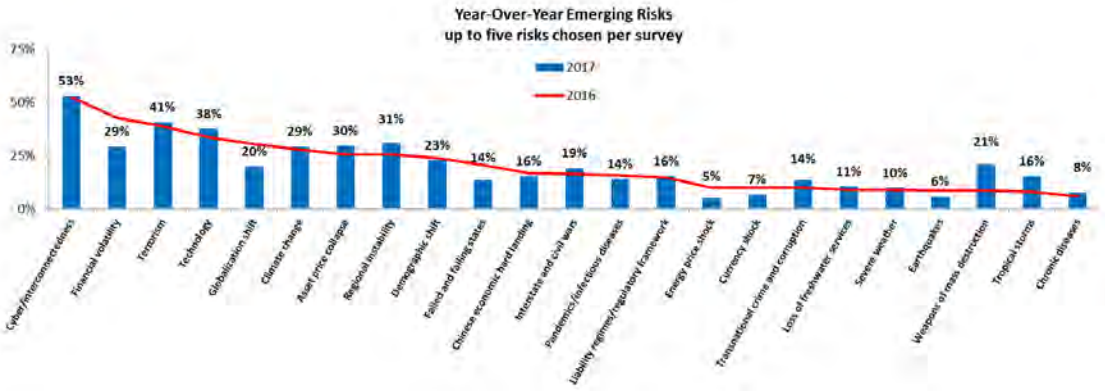


Five Top Emerging Risks as percentage of total (not by number of surveys)													
		2017	2016	2015	2014	2013	2012	2011	2010	2009	F 2008	S 2008	Average
1	Energy price shock	1%	2%	3%	3%	2%	6%	7%	9%	10%	8%	13%	6%
2	Currency shock	1%	2%	3%	1%	6%	5%	6%	10%	14%	10%	9%	6%
3	Chinese economic hard landing	3%	4%	5%	6%	6%	7%	7%	9%	7%	6%	9%	6%
4	Asset price collapse	6%	5%	6%	7%	7%	5%	5%	6%	10%	14%	5%	7%
5	Financial volatility	6%	9%	9%	9%	13%	13%	15%					11%
6	Climate change	6%	6%	6%	4%	4%	4%	3%	5%	6%	5%	9%	5%
7	Loss of freshwater services	2%	2%	2%	2%	2%	2%	1%	2%	2%	2%	3%	2%
8	Tropical storms	3%	2%	1%	1%	2%	1%	1%	1%	2%	1%	2%	2%
9	Earthquakes	1%	2%	1%	1%	1%	0%	1%	1%	1%	1%	2%	1%
10	Severe weather	2%	2%	2%	2%	2%	0%	1%	0%	1%	0%	1%	1%
11	Terrorism	9%	8%	8%	9%	6%	6%	4%	9%	6%	6%	4%	7%
12	Weapons of mass destruction	4%	2%	2%	2%	1%	3%	2%	4%	3%	3%	4%	3%
13	Interstate and civil wars	4%	3%	4%	4%	3%	3%	2%	2%	2%	2%	3%	3%
14	Failed and failing states	3%	4%	4%	6%	6%	7%	9%	8%	4%	6%	2%	5%
15	Transnational crime and corruption	3%	2%	1%	2%	2%	1%	1%	3%	2%	2%	2%	2%
16	Retrenchment from globalization	4%	6%	1%	2%	3%	3%	2%	5%	4%	5%	2%	3%
17	Regional instability	7%	5%	6%	8%	6%	9%	7%	5%	6%	7%	1%	6%
18	Pandemics/infectious diseases	3%	3%	4%	6%	4%	3%	3%	5%	6%	7%	8%	5%
19	Chronic diseases	2%	1%	2%	1%	1%	1%	2%	1%	1%	1%	2%	1%
20	Demographic shift	5%	5%	6%	5%	6%	6%	7%	6%	6%	5%	6%	6%
21	Liability regimes/regulatory framework	3%	3%	5%	5%	5%	2%	2%	1%	1%	1%	2%	3%
22	Cyber/interconnectedness	11%	11%	14%	12%	10%	8%	8%	5%	4%	3%	5%	8%
23	Technology	8%	7%	5%	1%	1%	1%	1%	1%	1%	1%	2%	3%
24	Other	1%	1%	1%	1%	2%	2%	3%	2%	1%	4%	4%	2%



What follows are two versions of the same chart, with the second one sorted based on the prior survey's results.





Question 2. Out of these five, what one emerging risk would you rank number one as having the greatest impact? (**up 3%** *down 3%*)

216 total responses

Economic—43 responses (20%/27%/30%/31%/44%/54%/56%/48%/63%/65%)

• 1 response	(0%/1%/3%/2%/1%/5%)	Energy price shock
• 0 responses	(0%/0%/2%/1%/5%/7%)	Currency shock
• 4 responses	(2%/2%/7%/5%/6%/5%)	Chinese economic hard landing
• 25 responses	(12%/11%/5%/10%/8%/9%) 2	Asset price collapse
• *13 responses*	*(6%/13%/13%/14%/24%/28%)*	*Financial volatility*

Environmental—19 responses (9%/8%/8%/5%/6%/6%/4%/7%/12%/4%)

• 15 responses	(7%/6%/6%/3%/4%/5%)	5T	Climate change
• 1 response	(0%/0%/0%/0%/0%/0%)		Loss of freshwater services
• 1 response	(0%/0%/0%/1%/0%/1%)		Natural catastrophe: tropical storms
• 1 response	(0%/0%/0%/0%/0%/0%)		Natural catastrophe: earthquakes
• 1 response	(0%/1%/1%/1%/0%)		Natural catastrophe: severe weather

Geopolitical—69 responses (32%/29%/22%/31%/17%/23%/22%/28%/14%/18%)

• 20 responses	**(9%/3%/6%/8%/4%/1%)**	**4**	**Terrorism**
• 5 responses	(2%/3%/2%/2%/1%/1%)		Weapons of mass destruction
• 9 responses	(4%/4%/4%/3%/2%/3%)		Interstate and civil wars
• 9 responses	(4%/4%/3%/8%/4%/8%)		Failed and failing states
• 2 responses	(1%/1%/0%/0%/1%/0%)		Transnational crime and corruption
• 9 responses	*(4%/10%/0%/2%/1%/3%)*		*Globalization shift*
• 15 responses	**(7%/3%/6%/8%/4%/7%)**	**5T**	**Regional instability**

Societal—24 responses (11%/8%/10%/16%/13%/6%/5%/4%/2%/2%)

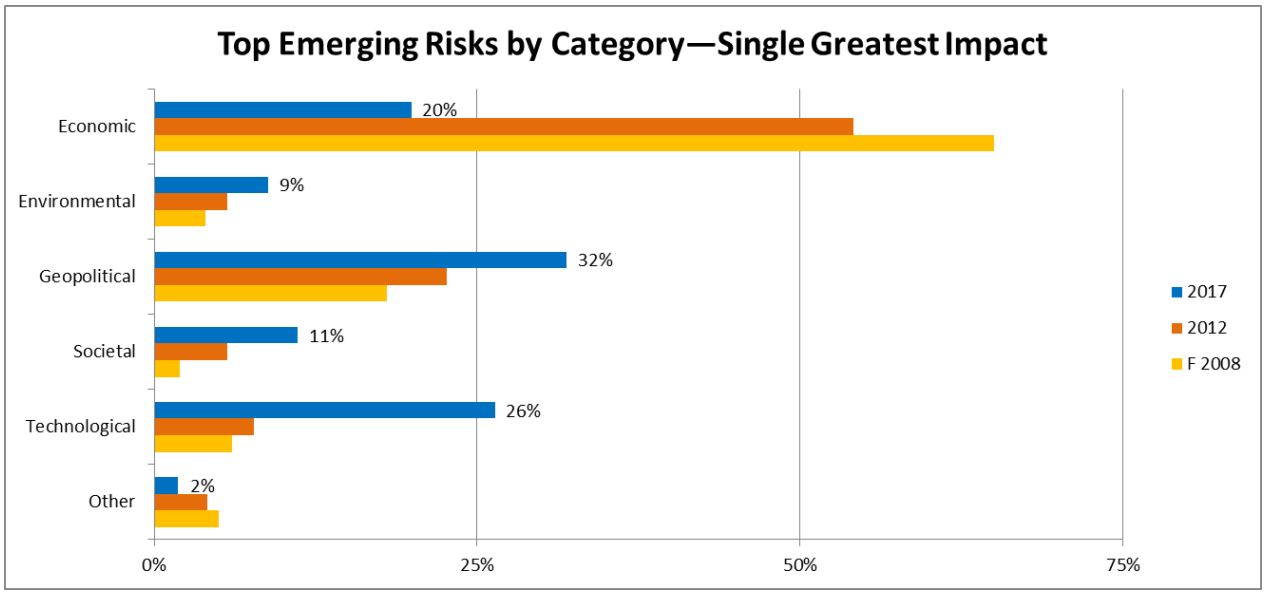
• 1 response	(0%/2%/1%/3%/1%/1%)	Pandemics/infectious diseases
• 3 responses	(1%/0%/0%/0%/0%/1%)	Chronic diseases
• 6 responses	(3%/3%/1%/4%/3%/2%)	Demographic shift
• 14 responses	**(6%/3%/7%/9%/10%/2%)**	**Liability regimes/regulatory framework**

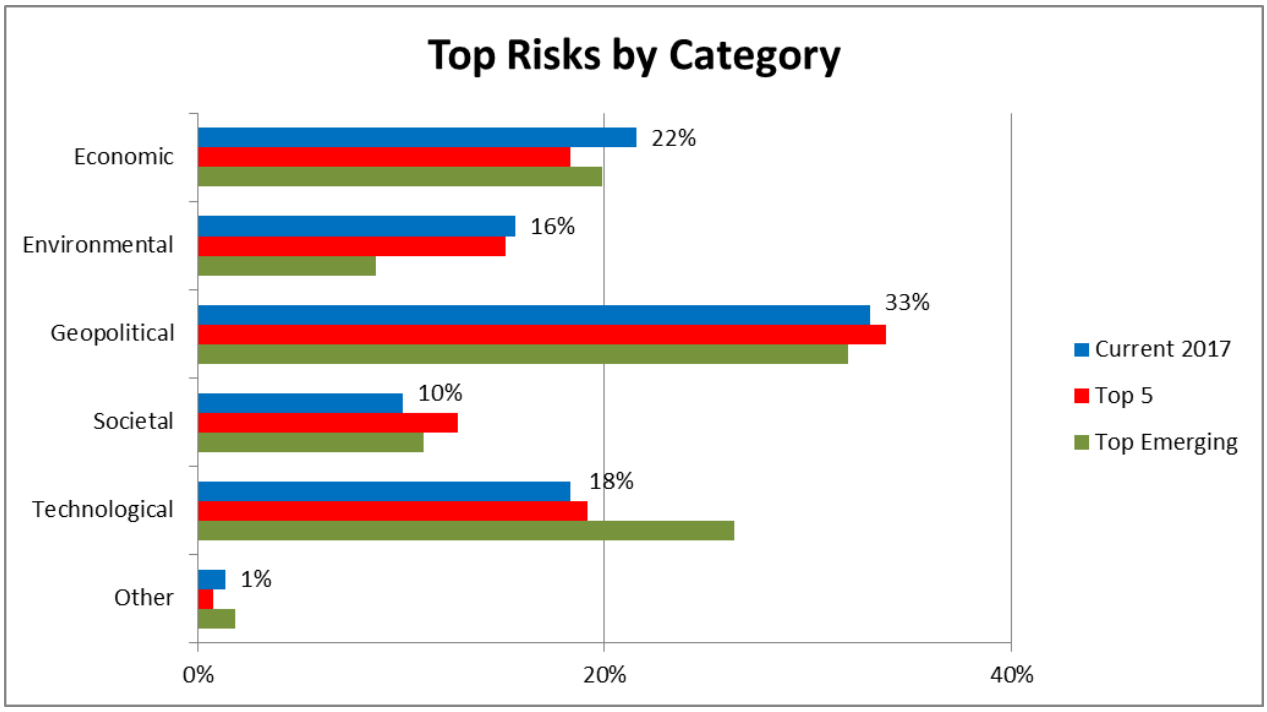
Technological—57 responses (26%/24%/28%/15%/15%/8%/8%/9%/6%/6%)

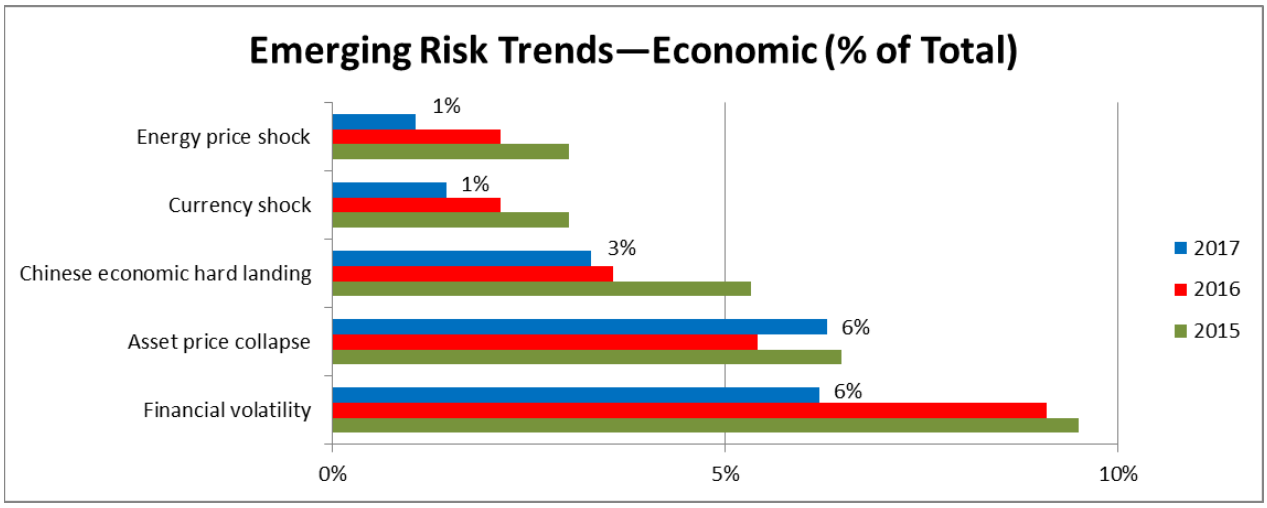
• 35 responses	(16%/17%/23%/14%/14%/7%)	1	Cyber/interconnectedness of infrastructure
• 22 responses	**(10%/7%/5%/1%/1%/1%)**	**3**	**Technology**

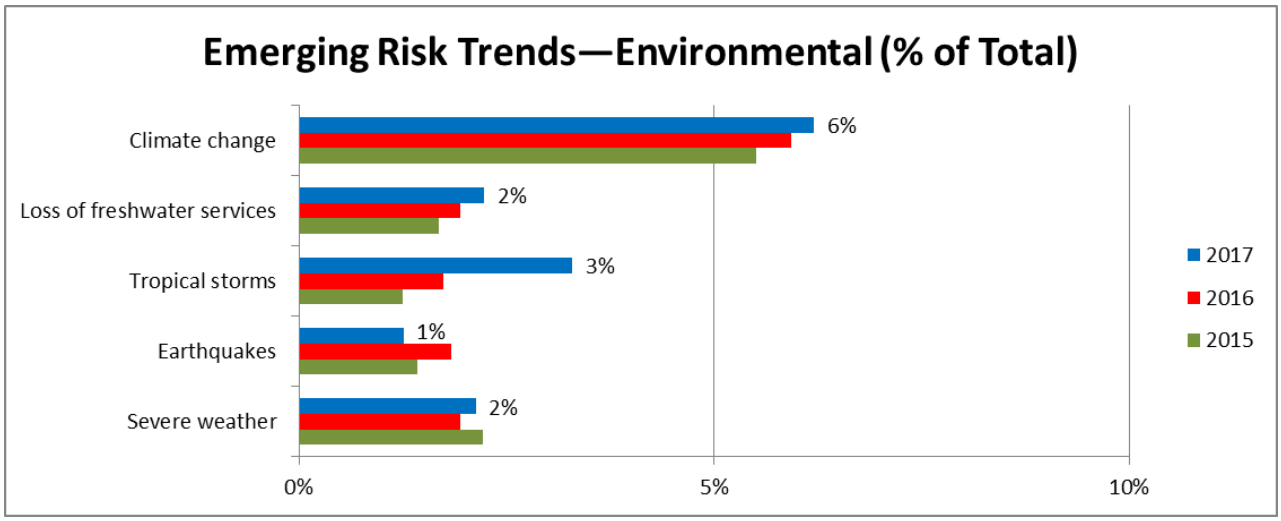
Other—4 responses (2%/3%/1%/2%/6%/4%/5%/3%/3%/3%)

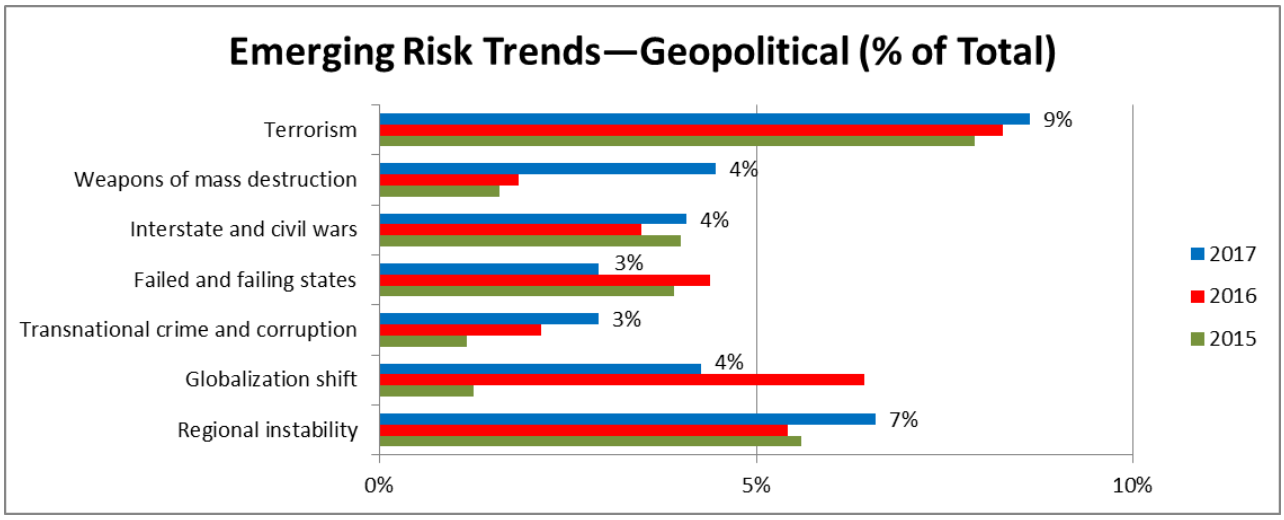
- *Lack of attention to importance of early diagnosis and management as risks evolve*
- *Unsupportable debt*
- *Life extension to unimagined age by improvement in medicine particularly cell therapy resulting in massive overpopulation*
- *Trump*

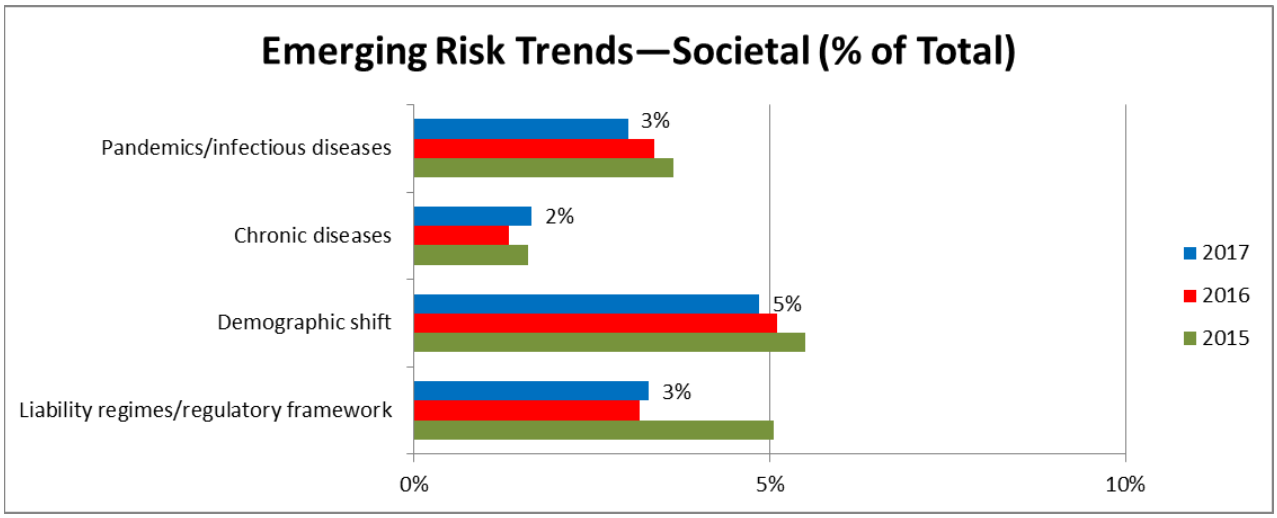


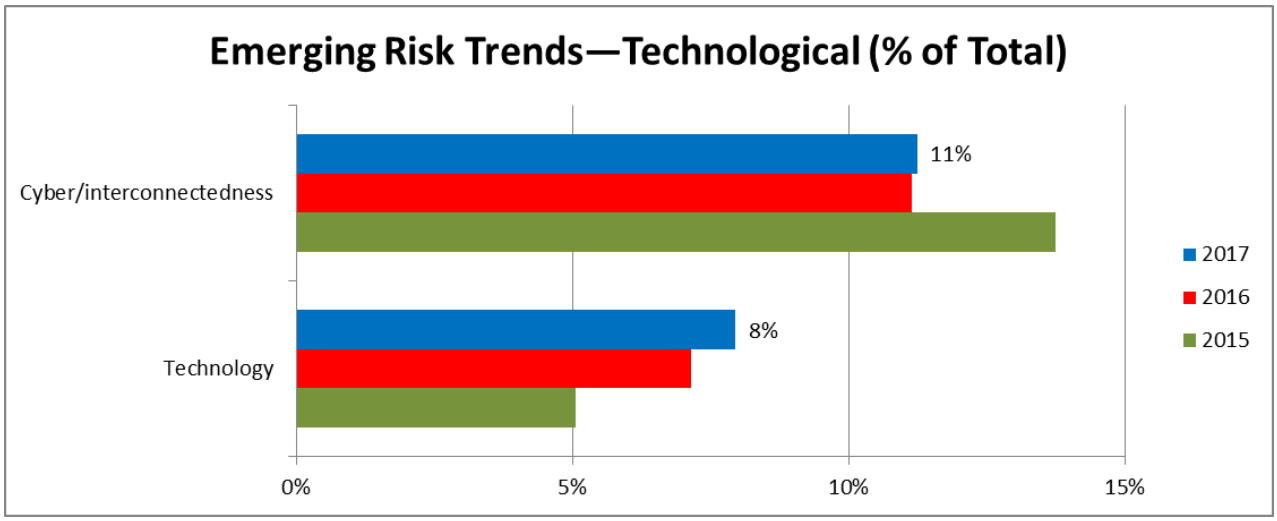


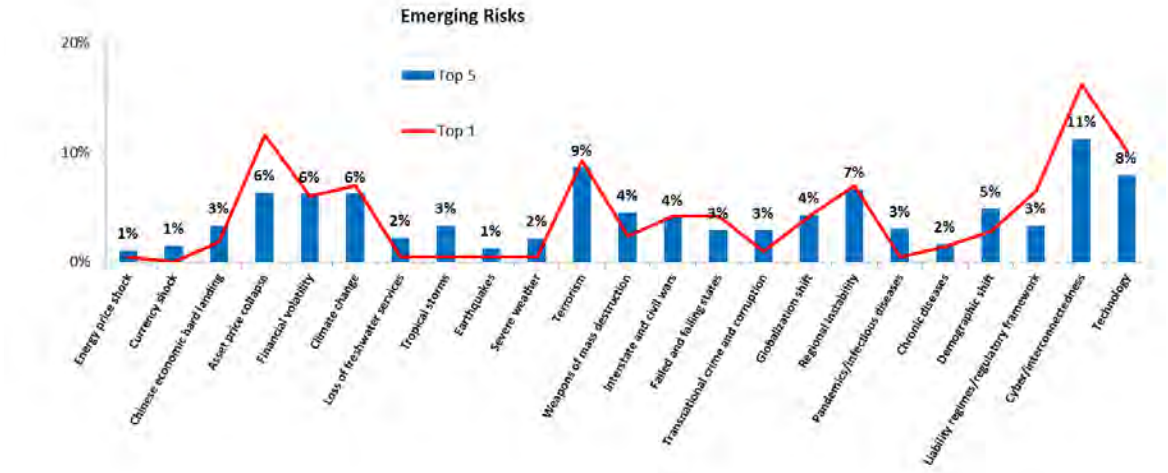


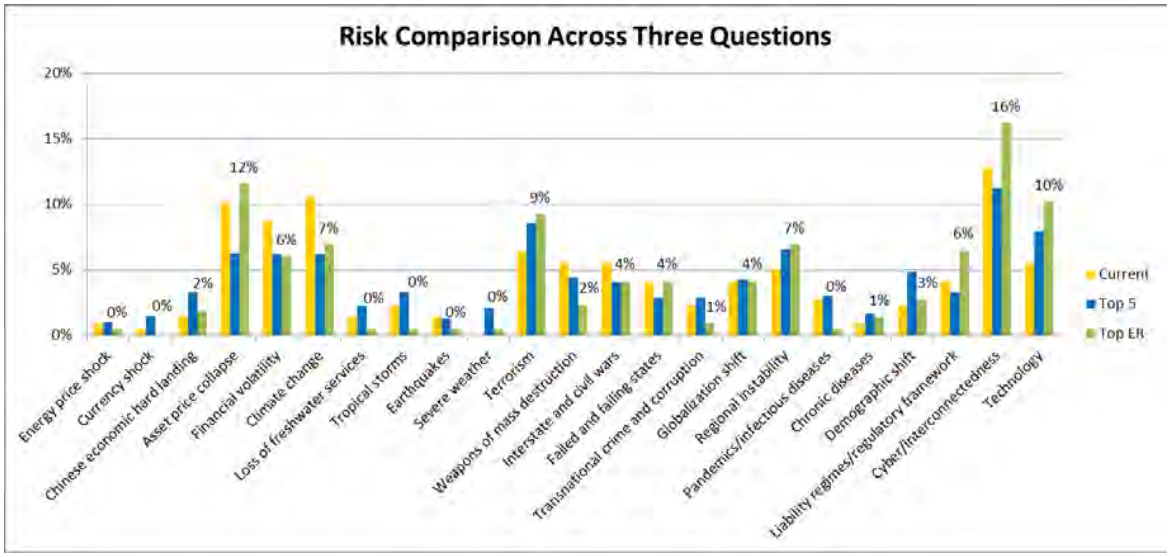












Questions 3, 4 and 5. Questions 3, 4 and 5 should be considered at the same time. Of the 23 emerging risks, are there combinations that you believe will have a large impact over the next few years? These could occur at the same time (concurrent) or follow each other (sequential). Please select a combination of TWO risks for each response. A follow-up question applies to this first combination listed, so make that the one you think will have the largest impact.

Two-risk combinations—608 total responses

Economic (23%/28%/33%/35%/40%/46%/48%/45%/53%/49% in previous surveys)

• (2%/2%/4%/4%/3%/9%)	1	Energy price shock
• (2%/3%/4%/2%/8%/6%)	2	Currency shock
• (3%/4%/5%/5%/6%/7%)	3	Chinese economic hard landing
• (7%/7%/8%/10%/7%/8%)	4 (5)	Asset price collapse
• *(8%/11%/12%/13%/16%/15%)*	*5 (2)*	*Financial volatility*

Environmental (15%/12%/12%/10%/11%/9%/7%/11%/13%/9%)

• (7%/5%/4%/4%/4%/4%)	6	Climate change
• (2%/2%/2%/2%/2%/2%)	7	Loss of freshwater services
• (3%/2%/2%/1%/2%/1%)	8	Natural catastrophe: tropical storms
• (1%/1%/1%/0.4%/0.2%/1%)	9	Natural catastrophe: earthquakes
• (3%/2%/2%/2%/3%/1%)	10	Natural catastrophe: severe weather

Geopolitical (35%/34%/28%/35%/32%/32%/32%/35%/25%/32%)

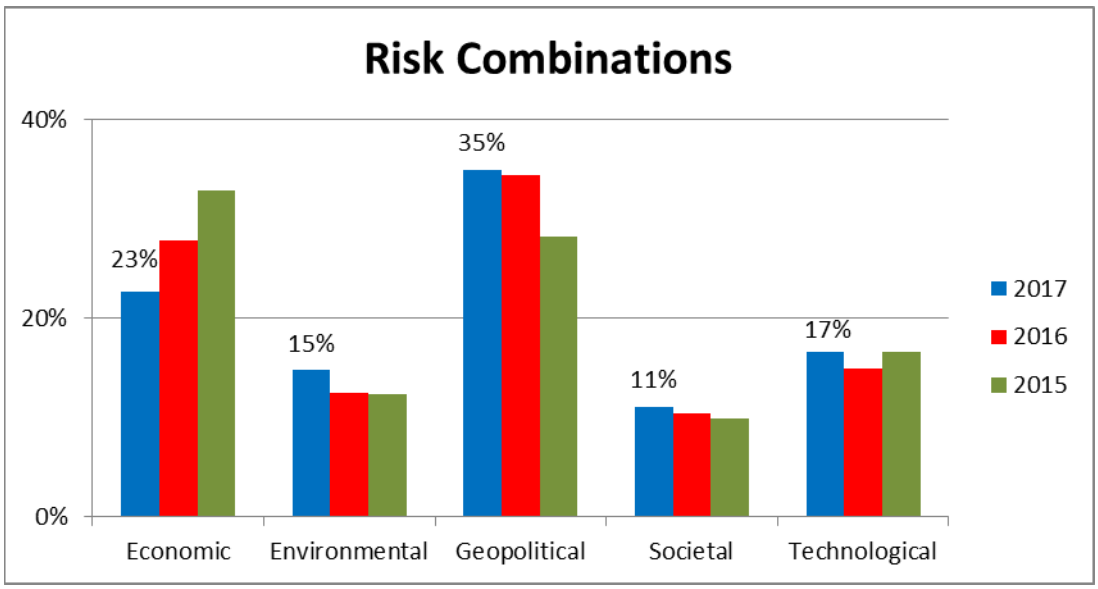
• (8%/9%/8%/9%/6%/6%)	11 (3)	Terrorism
• (4%/2%/2%/2%/4%/4%)	12	Weapons of mass destruction
• (4%/4%/4%/4%/4%/4%)	13	Interstate and civil wars
• (5%/5%/5%/7%/6%/8%)	14	Failed and failing states
• (3%/3%/2%/2%/4%/1%)	15	Transnational crime and corruption
• (5%/6%/1%/3%/3%/3%)	16	Globalization shift
• (7%/6%/5%/7%/6%/7%)	17 (4)	Regional instability

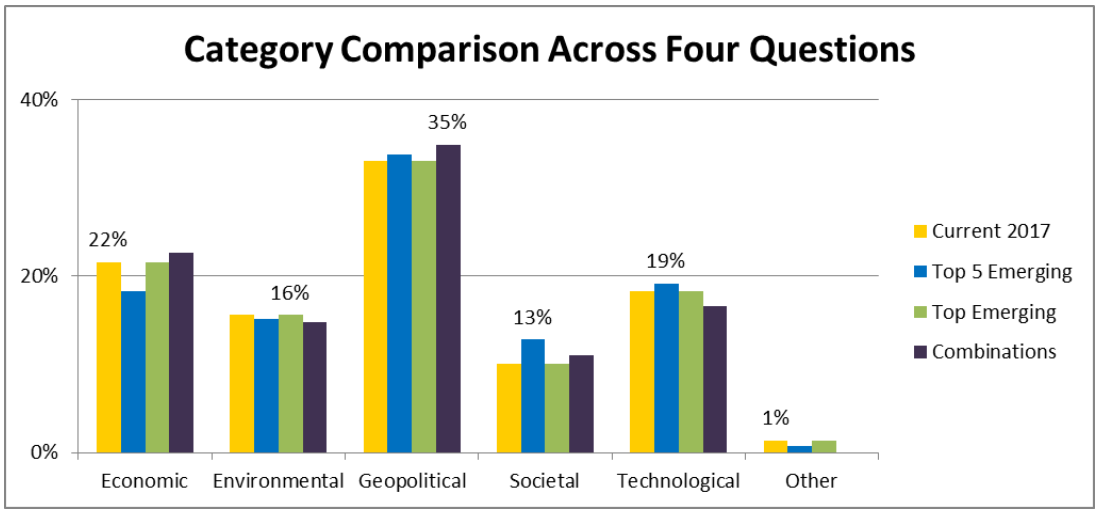
Societal (11%/10%/10%/12%/9%/7%/6%/5%/5%/8%)

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

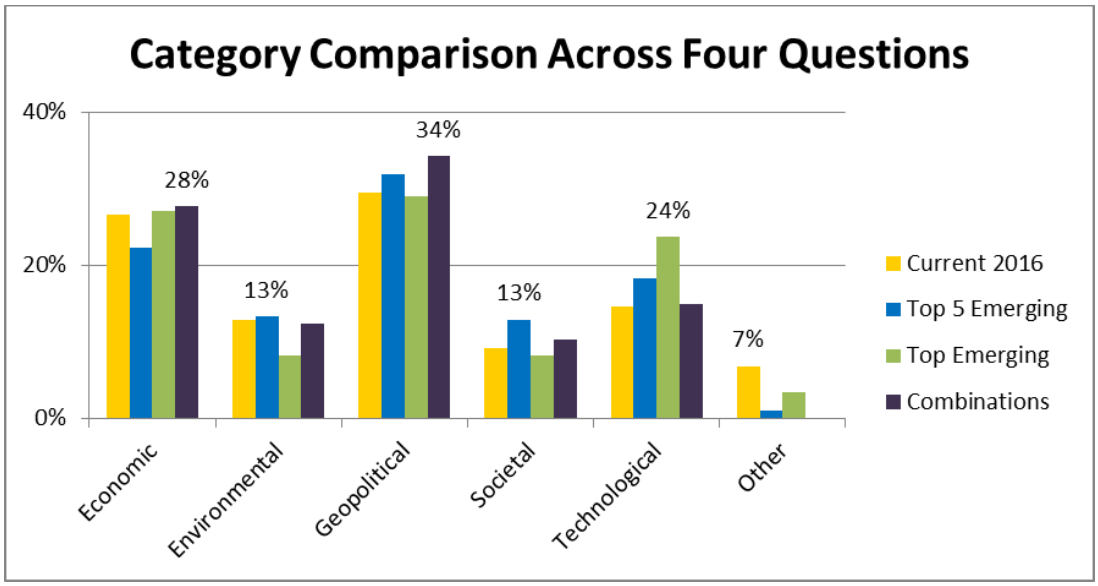
Technological (17%/15%/17%/8%/9%/5%/7%/4%/3%/2%)

- (10%/10%/12%/7%/7%/5%) 22 (1) Cyber/interconnectedness of infrastructure
- (6%/5%/5%/1%/1%/1%) 23 Technology





For comparison, here is the chart from 2016. Note the relative increase for Economic category current risk, Environmental top emerging risk and Technological category top emerging risk.



Combinations

Total	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
1		6	4	4	7	1								1			2			2				1
2			5	4	7									2		6	4				1			2
3				17	7	1					1		1	1		5	2					1	2	3
4					20	1					1		4	3	1	6	2	4		5	3	5	1	4
5						3		1	1	1	6		2	6	3	23	5	1		8	8	11	5	5
6							7	10	1	13	1			3		4	2	11		2		2		6
7								1	1	1			1	1			1	7				2		7
8									6	2	1					1		1						8
9										1				1			2					2		9
10											1									1				10
11												15	8	10	4	1	10			1		33	5	11
12													4	2	2		1	1				2		12
13														7	4	3	4					2	1	13
14															2	6	10	1		1		1	1	14
15																1	5				1	9	1	15
16																	6			1	1		1	16
17																		3			2	4		17
18																			4	2		1	1	18
19																				10				19
20																						3	5	20
21																						6	4	21
22																							29	22
23																								23

Leading combinations were:

41 responses (7%/5%/9%), No. 2 in previous survey

Cyber/interconnectedness of infrastructure

Technology

35 responses (6%/4%/7%), No. 4

Asset price collapse

Financial volatility

28 responses (5%/6%/9%), No. 1

Terrorism

Cyber/interconnectedness of infrastructure

19 responses (3%/2%), NR (not rated in top 10 in previous survey)

Terrorism

Regional instability

18 responses (3%/2%/2%), No. 7

Climate change

Natural catastrophe: severe weather

17 responses (3%/3%/3%), No. 6

Terrorism

Weapons of mass destruction

16 responses (3%/2%), NR

Climate change

Natural catastrophe: tropical storms

13 responses (2%/2%), NR

Transnational crime and corruption

Cyber/interconnectedness of infrastructure

12 responses (2%/3%/5%), No. 5

Chinese economic hard landing

Asset price collapse

12 responses (2%/4%/0.5%), No. 3

Financial volatility

Globalization shift

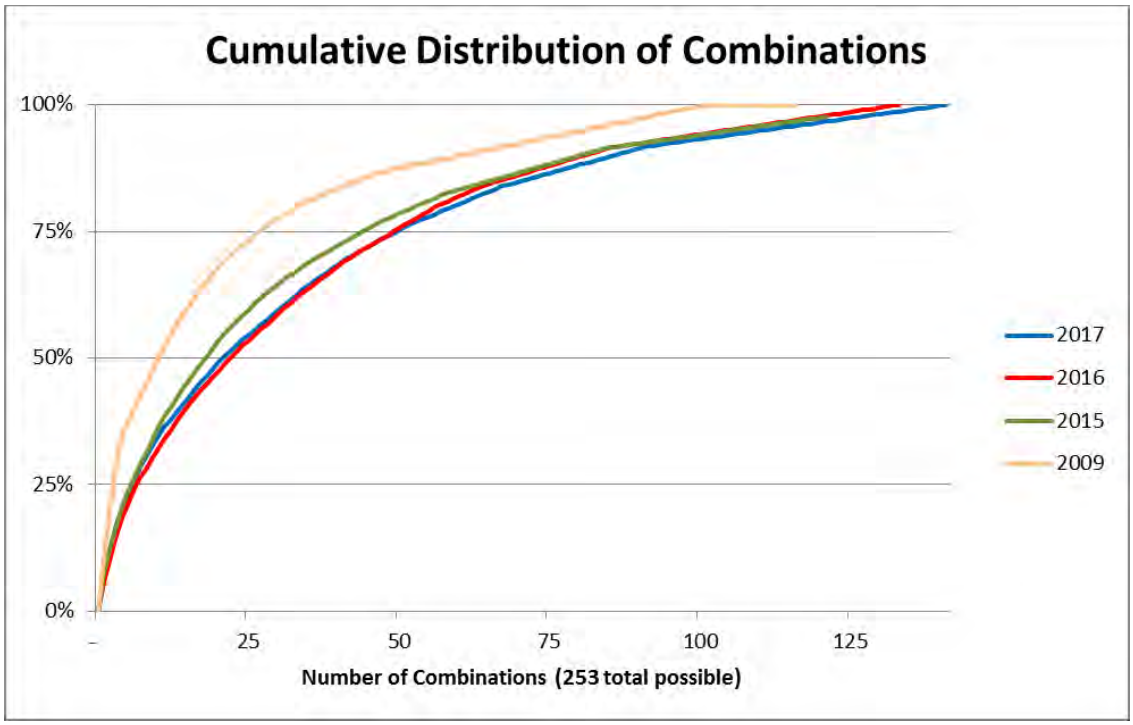
Combinations by Category		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Economic	Economic	34%	42%	29%	29%	29%	24%	19%	21%	14%	13%
Economic	Environmental	2%	3%	5%	3%	3%	2%	2%	2%	2%	2%
Economic	Geopolitical	22%	16%	21%	24%	21%	18%	15%	10%	15%	10%
Economic	Societal	2%	3%	2%	6%	6%	7%	9%	7%	6%	4%
Economic	Technological	1%	1%	3%	4%	3%	4%	4%	5%	4%	4%
Environmental	Environmental	7%	9%	7%	4%	6%	7%	7%	8%	8%	9%
Environmental	Geopolitical	2%	2%	3%	2%	2%	4%	2%	3%	3%	4%
Environmental	Societal	5%	3%	2%	2%	1%	2%	1%	3%	4%	4%
Environmental	Technological	0%	0%	0%	0%	0%	0%	1%	1%	1%	1%
Geopolitical	Geopolitical	16%	14%	20%	14%	18%	15%	19%	15%	19%	20%
Geopolitical	Societal	4%	2%	2%	1%	2%	4%	7%	2%	2%	4%
Geopolitical	Technological	1%	2%	3%	7%	4%	9%	8%	12%	11%	13%
Societal	Societal	2%	1%	2%	1%	2%	2%	2%	3%	3%	4%
Societal	Technological	1%	0%	1%	0%	1%	1%	2%	3%	4%	2%
Technological	Technological	0%	1%	0%	1%	1%	2%	1%	7%	5%	7%

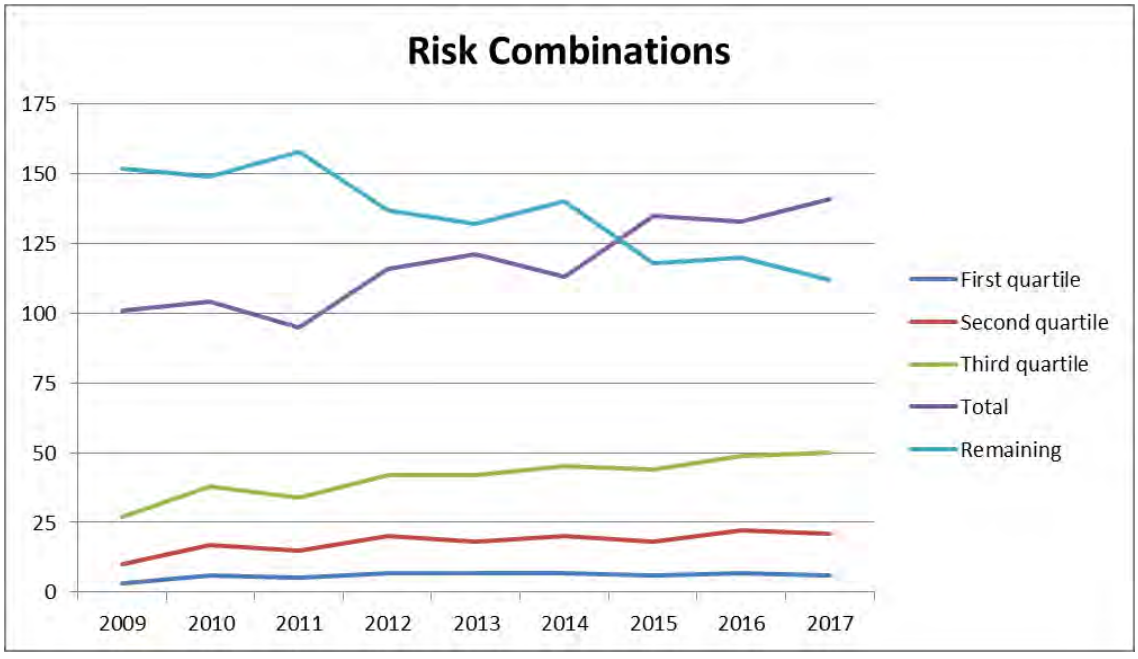
2017 Mix by Primary vs. Secondary Combination

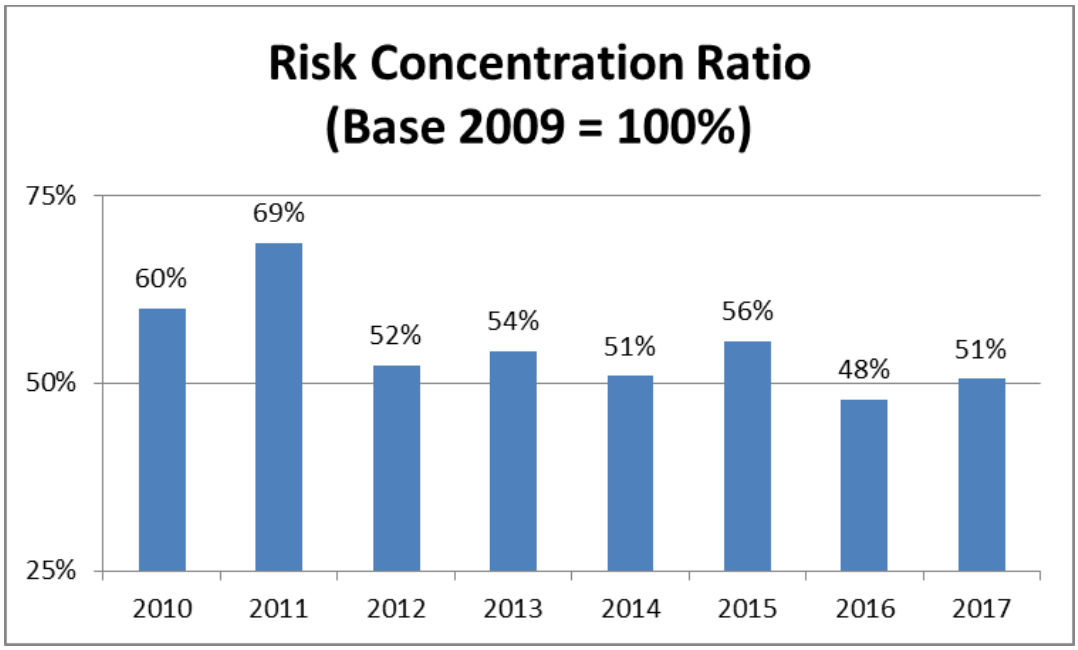
Combination Splits by Category		Combo 1	Combo 2/3	Overall
Economic	Economic	16%	11%	13%
Economic	Environmental	1%	3%	2%
Economic	Geopolitical	9%	11%	10%
Economic	Societal	4%	4%	4%
Economic	Technological	4%	3%	4%
Environmental	Environmental	6%	10%	9%
Environmental	Geopolitical	5%	4%	4%
Environmental	Societal	4%	4%	4%
Environmental	Technological	2%	1%	1%
Geopolitical	Geopolitical	20%	20%	20%
Geopolitical	Societal	3%	4%	4%
Geopolitical	Technological	15%	11%	13%
Societal	Societal	2%	5%	4%
Societal	Technological	2%	2%	2%
Technological	Technological	7%	7%	7%

2016 for comparison

Combination Splits by Category		Combo 1	Combo 2/3	Overall
Economic	Economic	17%	13%	14%
Economic	Environmental	2%	1%	2%
Economic	Geopolitical	19%	13%	15%
Economic	Societal	4%	6%	6%
Economic	Technological	6%	4%	4%
Environmental	Environmental	3%	10%	8%
Environmental	Geopolitical	4%	3%	3%
Environmental	Societal	3%	5%	4%
Environmental	Technological	2%	1%	1%
Geopolitical	Geopolitical	18%	19%	19%
Geopolitical	Societal	2%	2%	2%
Geopolitical	Technological	11%	10%	11%
Societal	Societal	1%	4%	3%
Societal	Technological	5%	3%	4%
Technological	Technological	5%	5%	5%

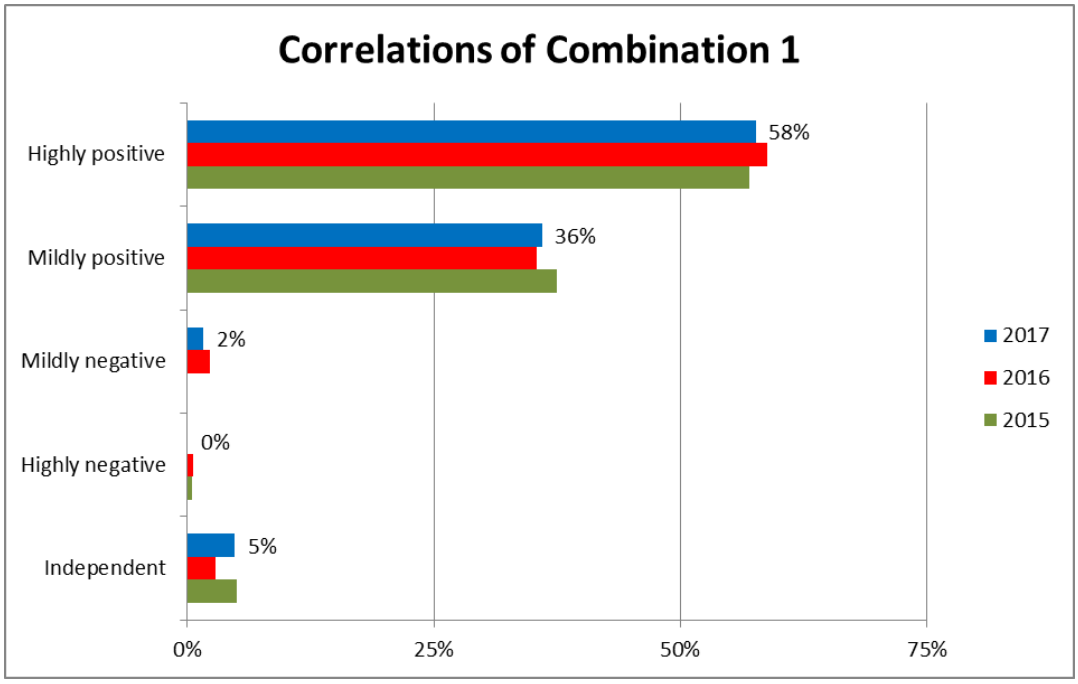






Question 6. For the first combination listed in Question 3, do you feel that the risks chosen will operate independently or be correlated?

- 109 responses 58%/59%/57% Highly positively correlated
- 68 responses 36%/35%/38% Mildly positively correlated
- 3 responses 2%/2%/0% Mildly negatively correlated
- 0 responses 0%/1%/1% Highly negatively correlated
- 9 responses 5%/3%/5% Independent



Each year a specialty question is asked. Traditionally the question has not been repeated in future surveys, but some may cycle through periodically.

Question 7. Time horizon length is likely a driver of emerging risk analysis. If you look out a generation, to 2050, what emerging risks do you think will have played the greatest role between now and then? (Please select no more than three.)

189 respondents chose at least one for a total of 500 responses (2.65 average)

Economic—7%

- 1% *Energy price shock*
- 1% *Currency shock*
- 1% *Chinese economic hard landing*
- 2% *Asset price collapse*
- 3% *Financial volatility*

Environmental—23%

- 16% 1 *Climate change*
- 3% *Loss of freshwater services*
- 1% *Natural catastrophe: tropical storms*
- 1% *Natural catastrophe: earthquakes*
- 1% *Natural catastrophe: severe weather*

Geopolitical—30%

- 5% *Terrorism*
- 3% *Weapons of mass destruction*
- 3% *Interstate and civil wars*
- 4% *Failed and failing states*
- 2% *Transnational crime and corruption*
- 10% 5 *Globalization shift*
- 3% *Regional instability*

Societal—16%

- 2% *Pandemics/infectious diseases*
- 2% *Chronic diseases*
- 10% 4 *Demographic shift*
- 2% *Liability regimes/regulatory framework*

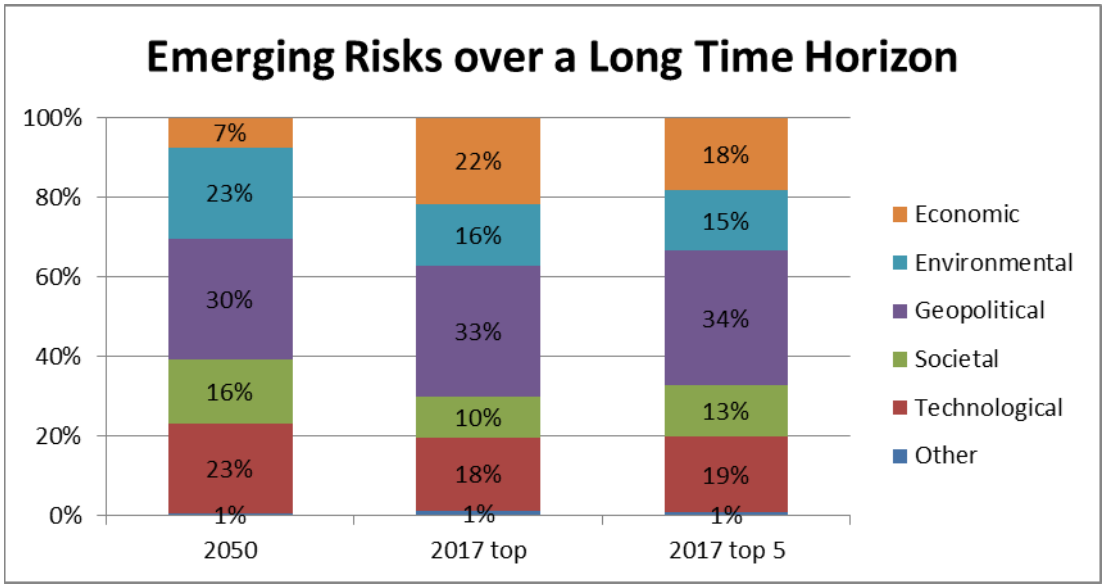
Technological—23%

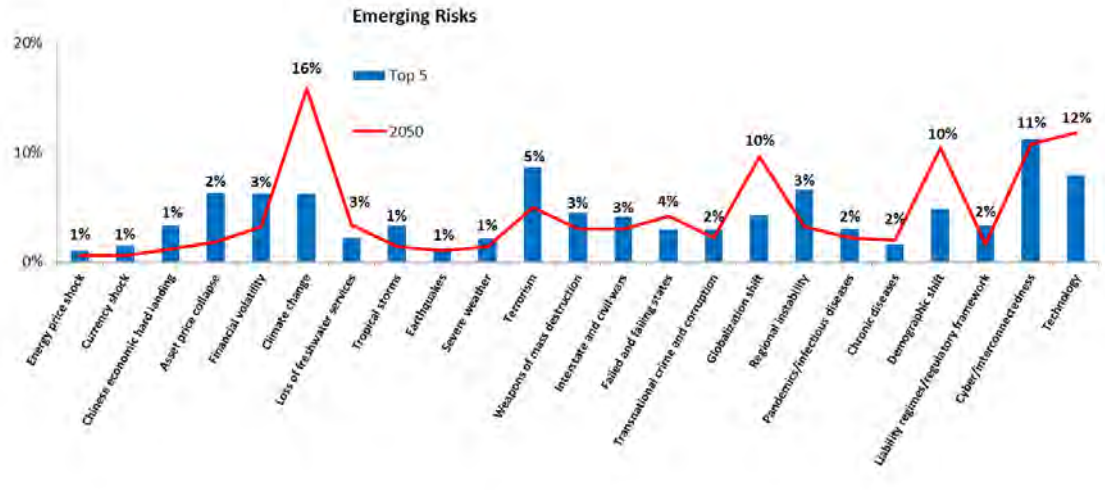
• 11% 3 *Cyber/interconnectedness of infrastructure*

• 12% 2 *Technology*

Other—1%

- *How can 2050 be an appropriate timeline when appropriate immediate action is needed in so many areas?*
- *National Political Landscape*
- *Over-reliance on prescription medications*





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?[15]

- *None*
- *Natural catastrophes*
- *None*
- *Technology, demographic shift*
- *None*
- *Ambiguity in regulation and global leadership will lead to "loopholes" or soft fraud*
- *None*
- *Financial volatility*
- *Longevity*
- *Cyber risk*
- *Demographic shift, technology, chronic diseases*
- ***House prices in low lying areas of North America***
- *All emerging risks are monitored as both a risk and a potential opportunity. A risk can become an opportunity, depending on how the industry or one's Company chooses to respond*
- *Demographic shifts*
- *NA*
- *None*
- *Insurance industry can take on more leadership to mitigate climate change*
- *Collapses in asset prices as a buying opportunity*
- *Technology and an easier way to do business with existing customers*
- *None*
- *Cyber, demographics*
- *Different pricing assumptions—claims cost trend, coding trend*
- *Gaps in regulatory framework*
- *Longevity/mortality/*
- *Technology, globalization, and liability regimes are all two edged swords with opportunity*
- *Financial metrics*
- *Sicker segments of population—counting on the risk adjustment mechanisms vis. current regulations*
- *Energy prices*
- *Financial markets movement*
- *Technology/preference enhancement opportunities*
- *Mortality improvements*
- *None*
- *Technology*
- *Renewable resources appear to be an opportunity and a risk. In countries that heavily rely on non-renewable energy, it is unclear whether energy prices will go back to higher prices which we've seen before. Many of these countries are taking on very high levels of debt to support government spending, etc. Double betting or hedging would provide diversification*
- ***"Tier Zero" old-age solutions (live with family; cooperative communities, part-time work/bartering of skills, tontine arrangements)***
- *Foreign exchange and cryptocurrencies*
- *None*

[15] Some responses throughout the survey are highlighted using bold font to recognize them as particularly thought-provoking to the researcher.

- *Adaption of technology by competitors to use as a way to attract the right people first, then the right clients after that. And by technology really focused on disruptive practices that make it easier for an employee to do what tasks they want to do that also make it easier for the customer to do business or reduce costs by outsourcing to our company for needed services/advice/transactional help*
- *Financial rates, such as discount rates for settling pension liabilities*
- *College degrees are a mispriced commodity, but I don't know how to "short" that market*
- *Growth in Asian population plus increased wealth*
- *Technological change*
- *Mispricing risk mitigation tools*
- *New technology and its impact on human lives*
- *Cryptocurrencies*
- *Globalization, natural catastrophes(hurricane vs earthquake)*
- *Cyber liability*
- *Regulatory framework*
- *None*
- *Tech*
- *Introduction of IFRS 17*
- *None*
- *Regulatory framework*
- *Cyber, Technology, Demographic shift, financial volatility*
- *Climate change*
- *Technology and Cyber*
- *None*
- *Embracing technology and searching for industry disruptors*
- *None*
- *Genetic testing, artificial intelligence*
- *I should buy put options on Miami real estate*
- *Cryptocurrency*
- *Financial volatility*
- *None*
- *Technology*
- *Undervalued equities, currency*
- *Energy sector and emerging markets*
- *Technology*
- *Technology*
- *Regional Instability / Cyber risk*
- *None*
- *Betting on increased volatility*
- *Reinsurance availability and costs*
- *Financial volatility*
- *None*
- *Property Market*
- *Demographic shifts, technology*
- *Technology*
- *Cyber, Technology, Terrorism, Demographics and Financial Markets*
- *Regulatory regime*
- *Creative use of technology to replace staff, as in automating processes that are thought of as impossible to automate*
- *Digital currencies*
- *Cyber-related insurance, chronic diseases and cost of healthcare and demographic shifts*

Question 9. Are there bubbles that you have identified in today's environment?

- *No*
- *No*
- *Cryptocurrency*
- *No*
- *No*
- *Real estate prices*
- *Real Estate bubble in China—Ghost cities*
- *Yes*
- *State and governmental pensions*
- *No*
- *Equity Market Prices in certain areas*
- *Shift of economies to less workers and more pensioners*
- *No*
- *Asset prices*
- *We are in a bubble of refusing to pay attention to climate change until it burst eventually in a catastrophic manner*
- *Equities*
- *Global equities. Fixed income securities*
- *No*
- *No*
- *No*
- *Pharmaceuticals*
- *Low volatility in equity markets*
- *The upcoming "Trump Dump"—over time inept government policy leads to decline in investment opportunity and a decline in asset value—in other words short sales*
- *Interest rates are artificially low, subsidizing certain aspects of the economy*
- *Climate change funding and hysteria*
- *No*
- *Some specialty drugs and some methods of medical intervention are over-priced. Their adjustment may bankrupt some pharma/medical providers*
- *Real estate*
- *Asset bubbles*
- *Technology/preference enhancement opportunities*
- *Asset prices; currency*
- *Credit*
- *No*
- *No*
- *Low interest rates having driven up real estate prices to levels hard to afford for regular folks*
- *Chinese influenced countries tend to have the most expensive housing market on earth, it is unclear what are the risk factors causing these inflated housing prices that are really out of reach for local buyers*
- *Real estate (moderate), tech firms (moderate), brick & mortar commerce (high), xenophobia (high)*
- *Yes, the cryptocurrencies*
- *Developed equity markets*
- *National competitors and private equity utilizing cheap money to buy to grow versus organically growing by just being better or cheaper. Those who have not invested enough in making their business easier will be disrupted by new players or those who made investments they did not*

- *Not at this time*
- ***College tuition is definitely a bubble.*** *Colleges receive huge sums of government money and charge ridiculous tuition rates. In my opinion, the only thing of value they provide is a diploma (since the education most receive in college is worthless). Eventually colleges will start collapsing, when people stop paying for the incredibly over-valued diplomas. Like most crashes, it won't be pretty...*
- *No*
- *Some equity markets, property markets*
- *Chinese housing bubble*
- *Stock market, housing*
- *Potential crypto bubble based on rapid growth and volatility*
- *No*
- *Real estate in some markets that will be adversely impacted with climate change (e.g. Miami) /crypto-currency*
- *No*
- *Healthcare expenses*
- *Tech boom, with ventures burning through cash (dotcom boom comes to mind—"this time is different")*
- *No*
- *Financially over-extended millennials*
- *Asset price—housing*
- *No*
- *Possibly the stock market, due to the length of time since the last crash*
- *Cryptocurrencies, Chinese Real Estate, North American real estate where Chinese people are attempting to move money out of China*
- *Cyber crime—everyone wants to insure it at a high cost. Tech firms are trying to find solutions. By the time the criminals attack, the holes will largely be filled*
- *Real estate market in coastal areas threatened by climate change. Cryptocurrency*
- *Technology*
- *Asset prices*
- ***Junk bonds, collectibles (e.g., art), anything something trying to get out of yuan could buy (so more likely places with direct flight from Beijing), some real estate, FAANG***
- *No*
- *Yes, within Technology*
- *No*
- *Bitcoin, Chinese equities*
- *Bonds*
- *No*
- *Bubble with some of the niche asset markets*
- *No*
- *US dollar*
- *Overvaluation of consumer technology companies—notably Apple, Facebook and Amazon*
- *Potentially technology stocks*
- *Yes*
- ***"Everything" bubble (all assets); cryptocurrencies***
- *No*
- *Stock market current pricing*
- *No*
- *e.g., Bitcoin*

Question 10. List an unknown known (where you have historical data, but it is not predictive) and how you adjust to manage the risk.

- *None*
- *Earthquakes. Data is too sparse for severely devastating earthquakes*
- *None*
- *Asteroid strike or eruptions of a super Volcano. I have means to manage the risk*
- *Cyber—managed through exclusions. However the so called "silent cyber" is still out there*
- *Longevity*
- *N/A*
- *Data security risk—the risk is ever evolving, so historical trends are not predictive. The risk is managed through continuous monitoring and modifications to our defenses, and increased focus on how to quickly respond to an event*
- *Mortality improvement—mortality hedging*
- *NA*
- *Changes in mortality to the side of higher deaths*
- *Technology changing the way human being behaves*
- *Dynamic lapse behavior in a rising rate environment. We guess*
- *Pandemic risk*
- *Interest rates in the 10–12% range*
- *NA*
- *Rate of improvement in 1st world longevity/mortality—priced conservatively to assume its continuation (though it may slow down, for societal rather than technological reasons)*
- *In a world as dynamic and rapidly changing as ours, the key question is generating appropriate thought models reflecting current market structures rather than historical models reflecting old market structures*
- *Failure of stable governments. Historically we see major players failing. It is difficult to predict, but certain to happen based on the historical record. Lesser versions also happen where the economy of a country melts down without a complete political failure*
- *Regulatory/CFPB: not predictive, you never know. Monitor, affect as one can, react as necessary*
- *Longevity and LTC claim costs. Monitor trends*
- *Health care regulations and the current political infighting. Adjust the rates upward*
- *Stock and commodity price fluctuation relative to the economy and interest rates. Markets are now more reactive to shocks than long term trends*
- *Though asset bubbles are huge, but governments seem to break the traditional rule to protect the interest of rich people liking printing money and robbing the poor. This creates unknown that should have been known from economic theory*
- *Cyber breach—long term view*
- *A was scenario is a unknown known. We have attempted to quantify 5 different scenarios based on historical information. We can manage the risk by reviewing concentrations, policyholder contract exemptions, and having a reaction plan*
- *The effect of medical advances on disabled lives—does it extend the lifetime disabled or will it result in recovery? We have adjusted benefit periods, definitions of disability and management of claims*
- *AI could be a risk.* Blade Runner
- *Asset value degradation as populations become predominantly unproductive (dependency ratios). Raise normal retirement ages, invest in real assets (forestry, infrastructure, emerging markets, STAC/education)*
- *Wars and my strategy is to invest in companies that produce weapons and energy*

- *Going from volume to value based care in healthcare, a niche of our firm. We have adjusted by working with larger healthcare organizations as we believe current regulations are incentivizing consolidation of previously smaller organizations that are our clients now*
- *2008 discount rates raise in fall*
- *The full extent of technological change on society. To manage the risk we must maintain a flexible approach to strategy—don't commit to one path, be prepared to change rapidly*
- *Impact and Changes in regulatory/compliance risk. Constantly monitor Washington for developments on regulation and talk to peers*
- ***Wildfire—research and educate individuals on wildfires, study what is known and understand that we don't know enough, track history and continue to study and educated***
- *Future mortality improvement*
- *Change in technology and the power of social media*
- *?*
- *Healthcare utilization*
- *Prescription drug prices*
- *Cyclical nature of lending rates and requirements. Adjust various curves (interest rate, depreciation, longevity, etc.) for short-term fluctuations before long-term patterns are realized*
- *The impact of opioids and other prescription medications on the quality of life and productivity of individuals, corporations, and society in general*
- *Climate Change and Catastrophe*
- *Future interest rates—build conservatism into the assumption*
- *CLO's raising their heads again, worse than last time*
- *Interest Rate, manage to interest rate neutrality*
- *War risk—related to regional instability, failed states, etc. We know it's coming, but cannot predict either when or how extensive it will be (WMD or conventional?) monitor, hedge, and pray*
- *How predictive analytics & FinTech will impact various industries*
- *Terrorism—avoid concentrated risks*
- *Car insurance should use miles driven*
- *The pace of technology change for specific game changing technology and its application*
- *Operational risk (intentional or unintentional)*
- *Sensitivity testing—quantifying the impact on our company*
- *Inflation. / Build in risk margin*
- *Regulatory framework, follow closely through industry groups*
- *NA*
- *Energy price risk*
- *Pandemics have been very impactful in the past. We use stress testing to manage capital adequacy*
- *Asbestos/Environmental risks*
- *Demographics*
- *Interest rate risk—traditional ALM*
- *Longevity increases*
- *Policyholder behavior, e.g., lapse and utilization of benefits*

Question 11. No list of risks is ever complete. Are there other emerging risks you feel are significant that should be considered for future surveys?

Option 1

- *Societal breakdown*
- *Changing demand for labor*
- *Interplanetary instability*
- *Overthrow of the U.S. government*
- *Stability of White House*
- *Cyber risk*
- *Opioid addiction*
- *Protectionist trade policies*
- *Artificial intelligence*
- *Breakup of USA*
- *Regulatory environment*
- *Rampant social alienation due to social media*
- *Early diagnosis and management—stress models need to rapidly evolve to recognize risk movements earlier and facilitate rapid strategic change*
- *Artificial Intelligence*
- *Mass immigration*
- *Opiate addiction*
- *Pension burdens*
- *Form of Societal Risk—changing attitudes toward entertainment, work, study and family. In short, an increased introversion*
- *Extraterrestrial event—meteor impact, solar flare, etc.*
- *Political Risk*
- *Reliance & prevalence of financial models (& assumptions)*
- *School debt*
- *Political changes that can result in major shifts in economic systems*
- *None*
- *Intergenerational strife*
- *US shift to authoritarianism*
- *Extraterrestrial phenomena*
- *Fracking impact increases chance of earthquakes in regions where it is prominent*
- *Political Polarization*
- *Loss of Unifying Cultural Identity*
- *Donald Trump*
- *The sheer stupidity of governments that lead to major social and economic turmoil*
- *Model Risk*
- *Information risk*
- *Wildfires*
- *Anti-selection risk due to data available to consumer but not company such as genetic testing*
- *Global political unrest due to national leaders*
- *Social unrest in developing countries*
- *New distribution modes*
- *National Political Landscape*
- *Political Climate*
- *Peer-to-Peer companies disrupt the traditional marketplace*
- *Health care technological advances (such as a cure for diabetes)*
- *Human mutations*

- *Social unrest in developing countries*
- *Nuclear disaster*
- *Liability regimes/regulatory frame work—Costs increase faster than GDP, with the spread of litigiousness and speed of regulatory revisions*
- *Political risks—prior to failed states*
- *Environmental hazards*
- *The rising amount of individual and national debt*
- *Solar Flares*
- *Lack of truth and transparency e.g. in politics and financial reporting*
- *Aging distribution*
- *Key Personnel Risk*
- *New health care technology*
- *Lack of faith in public institutions*
- *Reduction in People's ability to think for themselves*
- *Chinese influence on free markets*
- *Political instability and chaos*
- *Artificial intelligence*
- *End of life care expense*
- *Artificial intelligence*

Option 2

- *Income and wealth disparity*
- *Identity definition*
- *Fast pace expansion of Russia's influence in the world*
- *Longevity risk*
- *Fundamental change in the nature of work due to technology*
- *Overpopulation—strained resources generally*
- *Political divisions*
- *US isolationism*
- *Interaction of economic and individual firm risks—e.g., when do bailouts make sense?*
- *Shift in Global Leadership*
- *U.S. Debt driving collapse of $*
- *Credit debt*
- *None*
- *Security vs. multiculturalism*
- *Substitution of human beings by robots*
- *Rising sea levels due to global warming*
- *Economic Inequality*
- *Donald Trump*
- *Longevity & retirement*
- *Digital disruption of insurance business model*
- *Remove China hard landing*
- *Nontraditional Competitors*
- *Social media and interconnectedness lead to mob mentalities and values change causing certain sectors/businesses to fall out of favor*
- *Non-human mutations*
- *Technology disruption*
- *Social undermining of the Rule of Law*
- *Lack of bench strength*

- *Emerging cryptocurrencies*
- *Concentration of private ownership on media*
- *Inability to compromise on issues in government*
- *Impact of digital devices on health*
- *Social media*

Section B: 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.

- 40%/48%/62% Yes
- 60%/52%/38% No

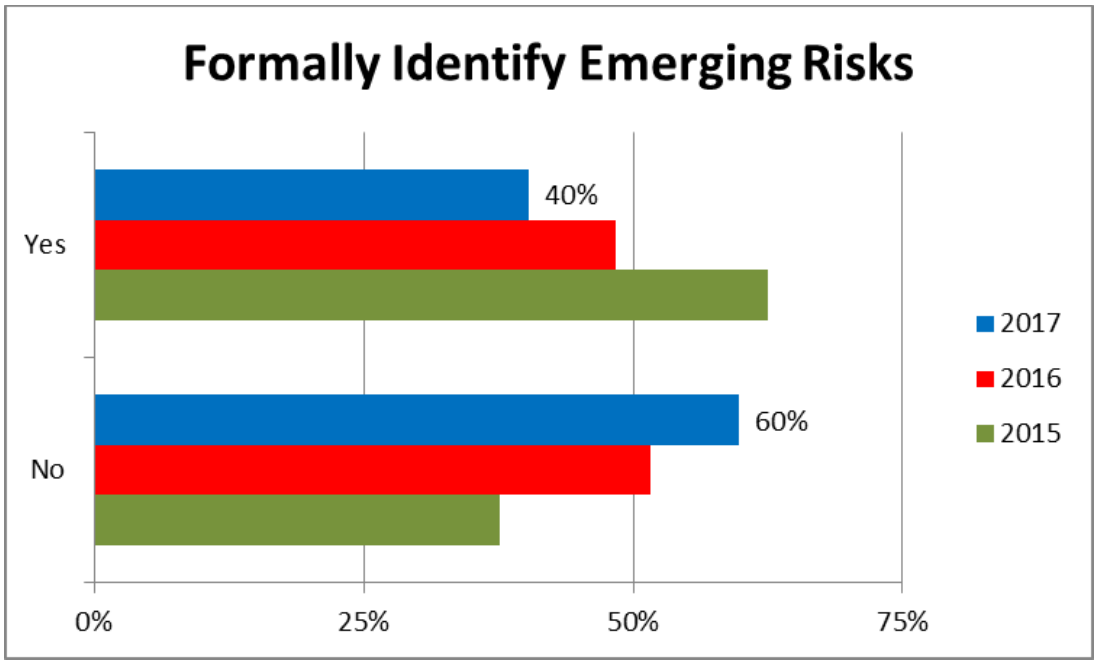
These results were influenced by result discrepancy between health and pension practitioners, who were more prevalent in the current survey. This implies that results were similar to the prior survey. The results split out are as follows:

Health/Pension practitioners (57)

- 23% Yes
- 77% No

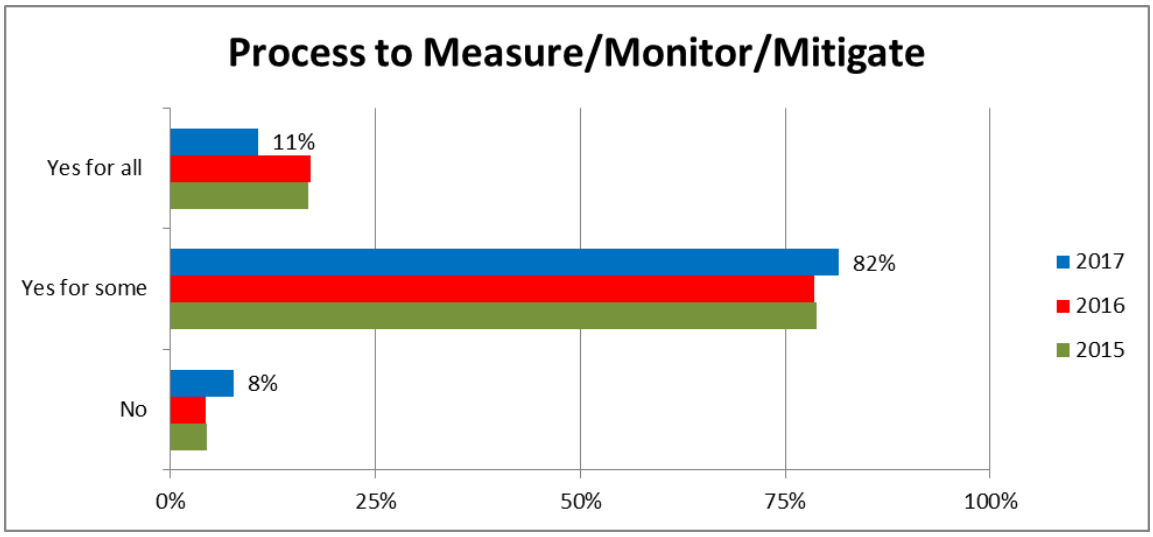
All others (130)

- 49% Yes
- 51% No



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

- 11%/17%/17% Yes for all
- 82%/79%/79% Yes for some
- 8%/4%/4% No



Question 3. If yes, please provide examples.

From those who responded *Yes for all*:

- *Rapid changes in inflation levels. Rapid changes in interest rate levels*
- *They are included on a monthly risk dashboard for discussion*
- *Scenario testing done for each emerging risk based on expert judgment*
- *Establish the impact and frequency of risk and then determine the most appropriate mitigation strategy, even if it is to monitor*
- *Adverse policyholder behaviour*

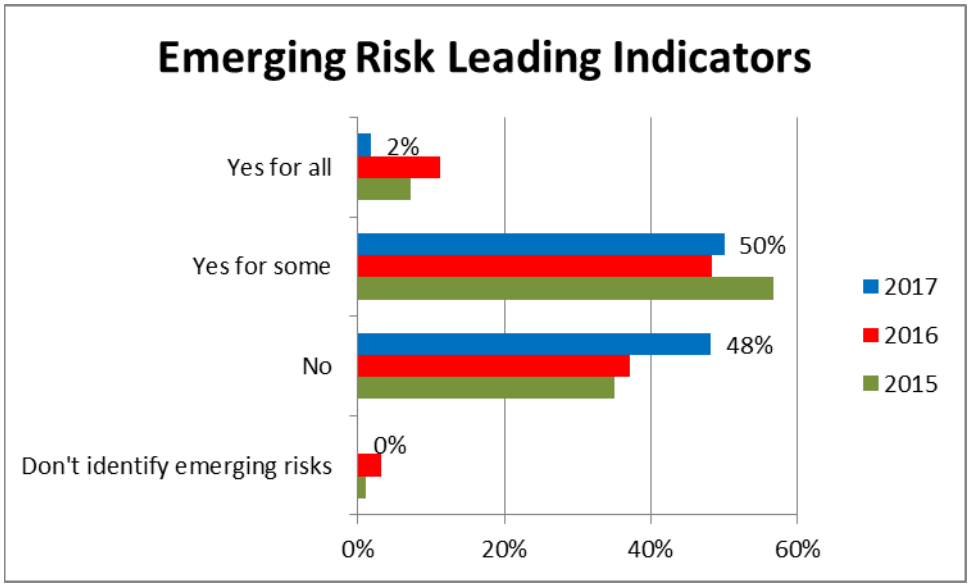
From those who responded *Yes for some*:

- *Monitor industry trends in risk appetite across firms. For example, the capital, earnings, and/or liquidity levels and trends of banks*
- *Due to our critical position to the housing industry we test new scenarios and risks required by the regulator and others for our own internal sake*
- *Emerging risks are monitored to assess their impact on the Company's ability to thrive. If the Company's financial health could be threatened, mitigating strategies are incorporated into the business plan*
- *ERM team reviews and discusses trends*
- *Cyber*
- *Quarterly, management reviews/updates emerging risks list and status of items on the list*
- *Chronic conditions, monitoring pharma R&D pipeline*
- *Vet known facts with local experts*
- *We estimate velocity, likelihood, and financial impact to our company quarterly*
- *Medical advances and their impact on recovery from disabilities*
- *Pension reform, regulation & enforcement. / Capital markets development and protection*
- *Quantifying the size of cyber risks for customers, quantifying the size of new and future liability risks for clients, etc. Specific example, identifying the risks of liability for going from volume to value-based care*
- *Confidential*
- *Independent research, using expert consultants, and monitoring industry trends*
- *Artificial Intelligence, Autonomous Vehicles*
- *Cybersecurity, Physical Security. Electrical Grid Vulnerability*
- *Quarterly reports produced as part of the ERM process*
- *Regulation monitoring*
- *De-risking activity related to like products offered globally, and application of appropriate hedging*
- *Impact of various economic scenarios on our company*
- *Look for ways to measure impact of potential regulatory change to production and income*
- *Changes in Opioid Usage. Technological Advancements in Medicine. Changes in Psychological Condition Revampments*
- *Monitoring use of digital currencies in the marketplace*
- *Non claim-related data to predict future health expenditures*

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.

- 2%/11%/7% Yes for all
- 50%/48%/57% Yes for some
- 48%/37%/35% No
- 0%/3%/1% 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.

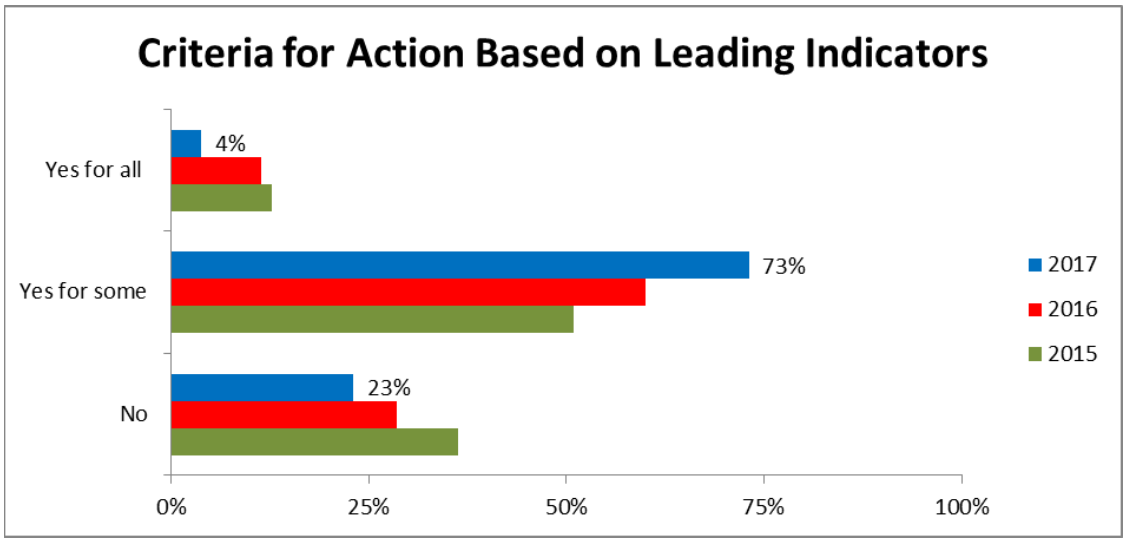
For those who answered *Yes for some*:

- *In our case, given the housing finance focus and risk exposure, trends in unemployment by region, cities' real estate markets*
- *Valuation metrics on housing. Bond issuance volume. Market volatility*
- *Various economic capital statistics*
- *We do this in our annual risk tolerance testing*
- ***Dependency ratios, income replacement rates, compliance, evasion, fraud, corruption, incompetence, generational selfishness***
- *Research from the industries we work in, client identification, benchmarks we track and a host of other methods, looking for examples that help us quantify risk there is not data to quantify yet, discussion of risks with stakeholders, etc.*

- *Confidential*
- *Regulatory and accounting changes: we use a qualitative risk assessment scale developed internally to determine the potential frequency and severity*
- *Not previous response*
- ***Cybersecurity—Monitor patch management and press-reported incidents. Signed up for monitoring service for internal cybersecurity***
- *Confidential*
- *Volatility indices*
- ***Number of articles discussing the issues.*** *Changes in Rules/Laws related to the subject*

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?

- 4%/11%/13% Yes for all
- 73%/60%/51% Yes for some
- 23%/29%/36% No



Question 7. If yes, please provide examples.

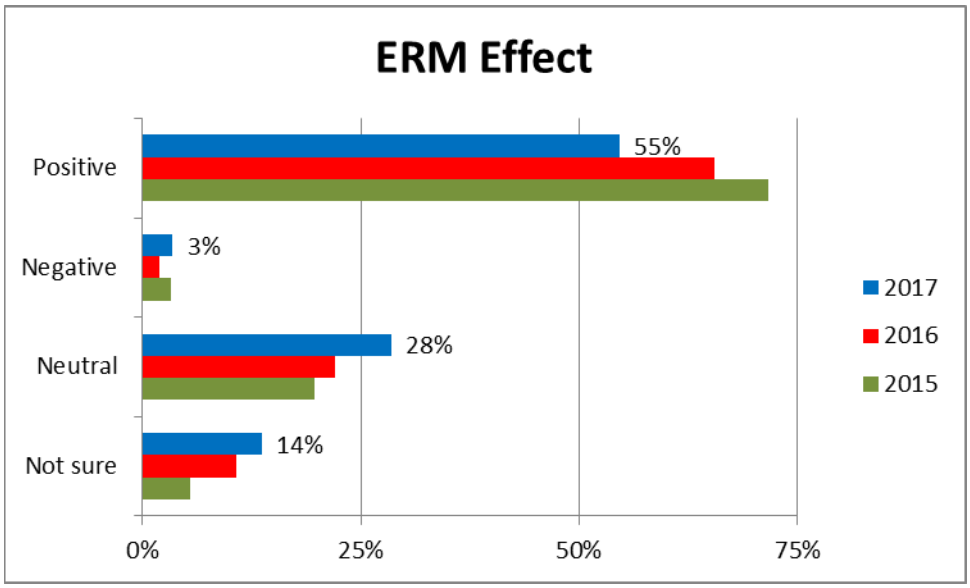
For those who said *Yes for some*:

- *Low valuation levels relative to historical norms is a buy indicator*
- *Search out & participate in ILA (World Bank, USAID, IDB etc.) development & training projects. / Remain vocal with agents for change*
- *We try to focus on addressing the risks that we can do something about, that possibly affect insurance costs/losses and those that are strategic in nature. Key is to be aware of identified risks, but only spend time on those that affect costs since we have finite resources*
- *Confidential*
- *See previous answer*
- *In most cases have to take the risk, but can mitigate to some extent by monitoring and actively reducing the prevalence of that event happening*
- *Trigger hedging at defined combinations of interest rate/equity levels/rates/trends*

Section C: Methodology

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

- 55%/65%/72% Positive
- 3%/2%/3% Negative
- 28%/22%/20% Neutral
- 14%/11%/5% Not sure



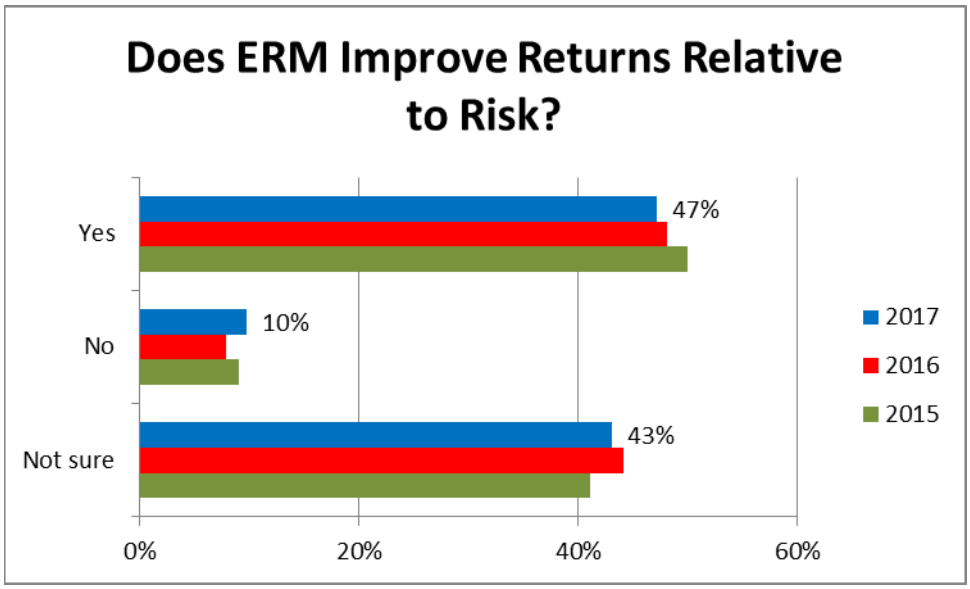
Question 2. Please share an example from the past year, if applicable, where another company (in any industry) used ERM in a positive way.

- *None*
- *Insurance carrier revised reinsurance limits and terms*
- *Use of immigration flow data to determine future product offerings*
- *CVS Aetna potential merger*
- *Developed better protocols for insurance risk selection in particular to concentration risk management*
- ***Let's not delude ourselves. Enterprise risk management has been around for centuries, what is new is introducing the term to overcome some restructuring in some companies and giving a much more strong mathematical flavor so that communication across disciplines is less direct***
- ***More aware of risk, but more afraid of it as well***
- *A healthcare carrier in Florida actively targeted the sicker population, and set adequate pricing. Some others who targeted healthier segments found their prices too low*
- *Evaluate several specific strategic decisions*
- ***It is driving the minimization of internal risk by driving model governance***
- *Companies that prepared early for the Fiduciary Rule mitigated potential liability risk. Some even chose to exit the business (Met Life)*

- *Reviewing potential changes in VA reserve and capital requirements. Formulating contingency plans depending on which changes might become reality, beginning to implement where the changes make sense regardless of the outcome*
- *None*
- ***It's hard to label a success since nobody seems to track all the costs/impacts that were avoided, but tend to focus on the losses that were actually made***
- *ERM appears to be a regulatory requirement. I deal with many smaller insurance companies, and it is clear that [for] smaller insurance companies and/or insurance reciprocals (captives), it is hard to see the benefit of risk optimization within their risk appetite statement. They do not have the resources, technology, to optimize risk that helps them see the benefits. In essence, it appears more of a regulatory requirement and a cost, i.e., small captives or reciprocal exchanges or small insurers, would rather have the funds for being capitalized, than spending it on implementing an ERM program. But many regulations treat these captives as insurers and some make them apply the same standards as larger insurers*
- *Accounting & other professional service firms' strict promotion, adoption and monitoring/enforcement of ethical and controls-based risk practices*
- ***I am a consultant and I know that some Mexican banks improve their operational risk management to decrease the requirement of capital***
- *Used ERM to identify the effectiveness of their cyber security program*
- *Our ability to focus on ahead of our peers' cyber risk has put us years ahead of our peers and customers on the most important aspect of that, company awareness and education*
- *Hedging annuity guarantee risks*
- ***FEMA purchased flood insurance for the first time***
- *Non applicable*
- *Review of retention level for CAT reinsurance coverage*
- *Organization aligned assets across all companies to identify correlations and diversification opportunities*
- *SOA in its enhanced environmental scanning approach*
- *RGA reinsurance searching their block to improve Return on Equity through Inforce Management*
- ***The local power company beefed up its IT security because the risk of regulation and the possibility of fines became greater than their perception of (1) it won't happen to us, and (2) it's too costly***
- *HOOPP asset liability matching*
- *The US military uses enterprise risk to prioritize budget requirements*
- *Due to low yields, companies are taking more investment risk to increase value by staying within their risk appetite*
- ***Allianz applied conservative investment strategy to avoid peril during the 2008–10 financial crisis***
- *Companies have used ERM to identify leading and lagging indicators for major projects*
- *Not about it*
- *Our company considered strategic and operational risks formally in development of new strategy*
- *Determination to leave a business*
- *Monitoring inforce business and decisions/changes made by insureds and policyholders with regard to their contracts (health or life/retirement)*
- *Exiting markets when risk profile increased due to legislation*
- *Formal risk assessment procedures for pension plan*

Question 3. Does implementing ERM improve company returns relative to the amount of risk? (Please select one.)

- 47%/48%/50% Yes
- 10%/8%/9%/16% No
- 43%/44%/41% Not sure



Question 4. Why or why not?

For those who answered *Yes*:

- *It helps to evaluate all the risks together and study interactions*
- *Provides a framework for classification of risk and identification of acceptable risk levels*
- *Having a proper understanding of one's economic capital leads to better decision making*
- ***Eliminates some riskier activities that would have reduced returns***
- *Provides a broader view of risks, by allowing all firm participants understand how their risk management processes (and risk appetite limits) impact other risks within the organization*
- *Succeeds in seeking to further refine the match between return and risk profile (note: I am not part of the ERM team but on the Actuarial team)*
- *Improves decisions on future growth and allocations of current resources*
- *Better response to significant changing situations*
- ***It puts more attention on how risk rolls up at the 'top of the house.' Other than the time and expense necessary to do these calculations, there is no downside to the extra transparency and can only help to improve risk-adjusted returns***
- ***Because it makes for better strategic decision making and long term better use of resources***
- *Helps management reduce the financial impact of various risks by identifying potential future risks and ways to minimize those risks*
- *The level of risk is a factor in product pricing, ideally producing better returns*

- *Quantifies gains and/or losses likely*
- ***It brings risks to people's top of mind and hence we prepare for them***
- *Effective ERM can help a company avoid risks. Think about the impact to Wells Fargo from ignoring its risky sales culture*
- *ERM includes understanding underlying risks and quantification of what these might be. Risk adjusted rates of return steer capital to where the returns are higher based on the real risk assumed, not the formulaic capital allocations that can be a poor measure of the actual riskiness of the business*
- ***Perhaps not from one day/week/month to the next, but all it takes is one (two?) major intentional, lazy or incompetent blowups to destroy an organization, with collateral damage to many linked industries***
- *Implementing ERM helps to identify, measure, and manage risk, including deliberately seeking opportunities and identifying risks with insufficient returns. A formal ERM function dedicates resources and formalizes the process. Without dedicated resources it is too easy to push aside risk management or do it haphazardly*
- *Yes, because these banks released capital*
- ***You can make more calculated risks, you focus resources on the right activities and you reduce the likelihood of known losses that drive costs and from shocks you didn't know about. Plus, once people think this way, it changes how they think about risks, and makes them do their jobs better by understanding where to focus on not making mistakes that have consequences. Externally, being aware of what has happened to others and then learning from their mistakes***
- *It gives a better overall tradeoff between expected return and the risk taken to achieve that return*
- *ERM, through financial risk management, provides many dividends of identifying risk and pricing for it. Pricing Insurance per the risk associated will always in the long run return value. ERM through operational risk management can provide a lot of expense which is hard to quantify the dollars saved. Ultimately a well-managed operational risk program(s) will save the company more money in the long run if effectively managed*
- *ERM helps companies proactively identify the amount of risk they are willing to take in pursuit of their strategy*
- *Better understanding of overall risk level and diversification of the company*
- *Knowing risks and their impacts allow companies to consider the best approach to manage and mitigate risks and contribute positively to the bottom line*
- *ERM helps organizations make informed decision on risk acceptance vs. anticipated outcomes/returns. Can be used to help organization prioritize opportunities*
- ***Usually the upside is much smaller than the downside, so searching for those large downside risks keep the company better prepared to act***
- ***We have used it to recommend efforts that yield the same return while reducing risk. Some "bad business ideas" have been thwarted at least partly by ERM effort***
- *ERM allows companies to know where to focus efforts. They may find opportunities in certain risks, and double down, while protecting against others*
- *It should because management now has the tools/information to more accurately assess risk adjusted returns and to use that in their decision making*
- *More thoughtful risk assessment improves understanding of risk*
- ***It is a form of dynamic strategic planning***
- *ERM makes us think about big risks and smaller ones and avoid things we would not have thought about before*
- *Helped in decision making*
- *Being aware of risks and making them transparent to decision makers allows them to better allocate capital*
- *Help company to manage the risks based on risk appetite*
- *Yes, in a risk adjusted manner. Actions employed to keep risk metrics within required bounds*

- *It establishes a clear process to identify the key sources of risk and return*
- *ERM helps companies to identify, assess, and manage risks*
- *Transparency around decision making*
- *Provides a framework and measurement system to value risk to reward*
- *Deep dive analytics helps identify potential areas of risk, allowing for mitigation, leading to lower risk and better risk-adjusted returns*
- *Yes, ERM allows the company to actually measure the amount of risk being taken and provides a process to manage it*

For those who answered *No*:

- *Poor implementation; short-term focus over considers time horizon for risk vs. realistic timeframe*
- *ERM restricts innovation. If ERM had been in use Apple, Inc. would never have developed any of the i-products because the risk would have outweighed the potential rewards. Nor would Columbus ever have sailed for the Far East. ERM is a retardant for business, not an aid to increased returns*
- *If you believe that markets reward successfully taking risk, then stabilizing risk through ERM should reduce the amount of award. On the other hand, the amount of variation in results should also reduce*
- *More of a guardian against getting out of balance. Optimizing is not easy to achieve. In theory, it might be possible, but regulatory/outside influences are greater than internal risk management in many cases*
- *The cost outweighs the benefits*
- *In practice, I've usually seen companies sacrifice returns to limit risk. They tend to accept anything that passes the hurdle rate, but prior practices further exceeded hurdle rates. For example, suppose the hurdle rate is 12%. A company has an opportunity that will provide a return between 10%–18% or one that has a return of 14%. ERM is too conservative. They might tend to estimate the first option at only 12%, but historically it returns 16%. While the risk is higher, the return is also higher. I think ERM practices tend to overestimate the amount of additional risk, making the risk:reward look too high*
- *ERM hasn't created any new technology or methods. The same risks as measured now in insurance have always existed. Those who ignored or rationalized them before will continue to do so*
- *Cost greater than benefits*
- *Implementation is not effective*
- *Our ERM framework is based too much on subjective judgement*

For those who answered *Not sure*:

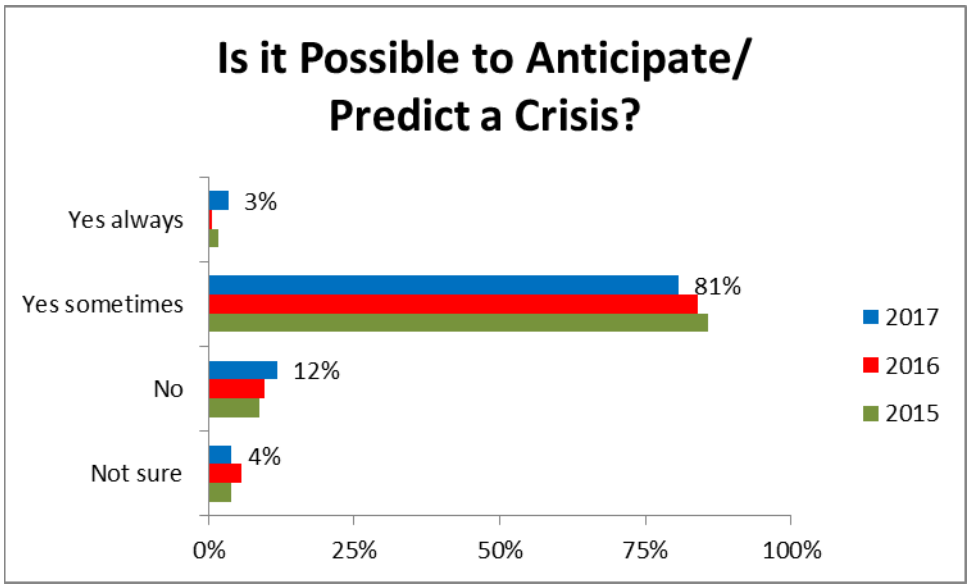
- *Relation between risk and company financial performance is not direct*
- *It depends on how ERM is implemented. If ERM is integrated within business decision making, it will have a positive impact. However, if too much focus is placed on building overly complex models, ERM will have limited value, and will be viewed solely as a compliance exercise. For ERM to have value, the business needs to understand the information produced and how that information can enable more informed business and strategic decisions. Much of the ERM literature is too focused on highly complex model building, with limited focus on how to embed it in business decisions*
- *Without ERM, how do you know the amount of risk from a company-wide perspective? It's not obvious to me that ERM improves actual returns (outcomes aren't always correlated with improved decision making skills)*
- *In theory it should, but in practice its results can vary widely. Not all enterprises are equally benefited by the investment*
- *Probably does and should, but to the extent it is viewed as a compliance exercise with a check-box, it will be more cost and less benefit*

- *ERM is an attempt to formalize what most companies practice "implicitly", or "intuitively". This formalization has helped some, and had no clear effect for others. / / So my answer is "Partially Yes", "Partially Not sure", with 0% weight assigned to "No"*
- *Not sure*
- *ERM and risk culture is important but does it really resolve the issue of improving a company's returns relative to the amount of risk, as the amount of risk involves judgement by individuals. ERM likely eliminates the mostly fundamental and rudimentary risks but does not necessarily improve risk allocation*
- *For large insurance companies yes, but for reciprocals and small insurance companies likely no. It's hard to justify the regulatory and/or cost to implement to see the benefits for some companies vs the return it can create*
- *Very little testing or data available on risks being identified. Few resources dedicated to risk management in this particular industry*
- *It is a lot of work, but I don't know if anyone ever makes decisions based on it*
- *Not applicable*
- *It depends upon the industry. Industry that is dependent upon someone else's enterprise risk management assessment, such as the government's, will have a different model than if the company were managing its own independent enterprise risk assessment*
- *Difficult to identify impact on returns related to risk management in many cases*
- *Depends on how the company implements its program. Is ERM viewed as a check the box exercise or a strategic tool*
- *Hard to quantify*
- *Not familiar with the uses to which company management puts ERM*
- *It depends on the company culture and alignment of stakeholder and management expectations. In the long run ERM should improve risk-weighted returns*
- *Not sure we measure/monitor the right things?*
- *If ERM is a check the box exercise then there really cannot be any benefit*
- *It can depend on how the ERM program is used, and the type of people involved. Implementing an ERM program should involve someone who is willing to accept more risk, not just risk averse folks*

Section D: Predictions

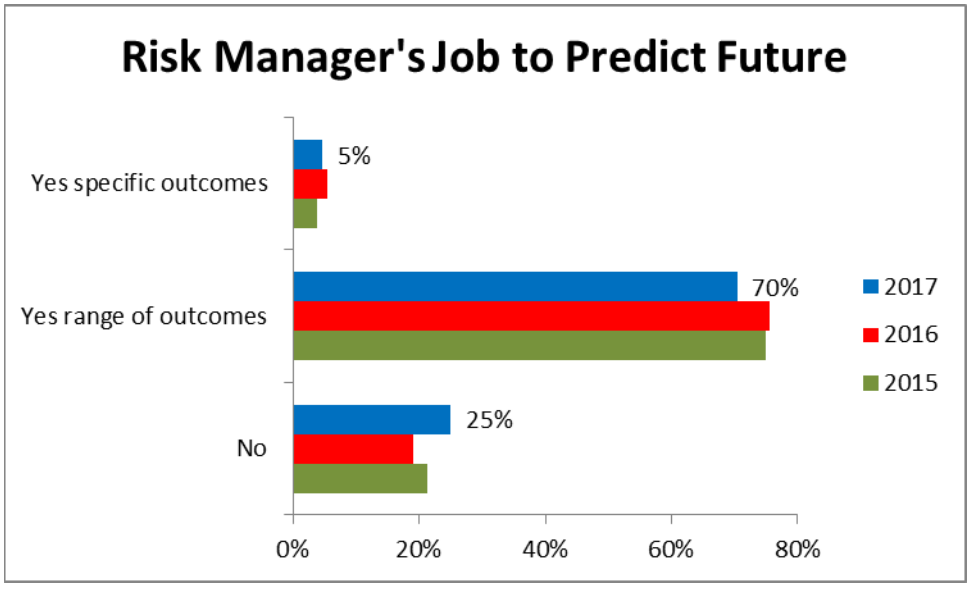
Question 1. Is it possible to anticipate/predict a crisis? (Please select one.)

- 3%/1%/2% Yes always
- 81%/84%/86% Yes sometimes
- 12%/10%/9% No
- 4%/6%/4% Not sure



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

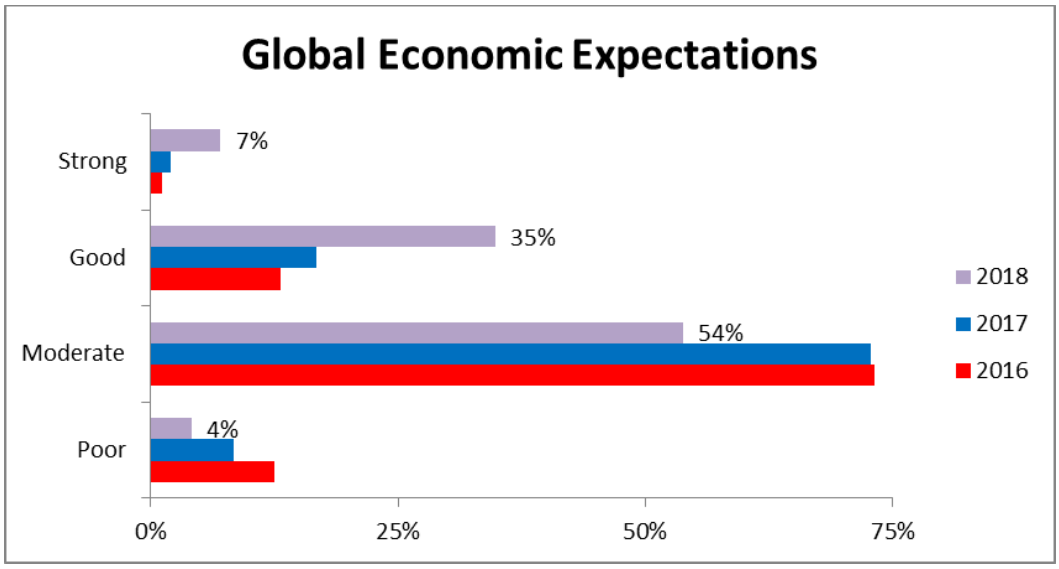
- 5%/5%/4% Yes—specific outcomes
- 70%/75%/75% Yes—range of outcomes
- 25%/19%/21% No



Section E: Current Topics

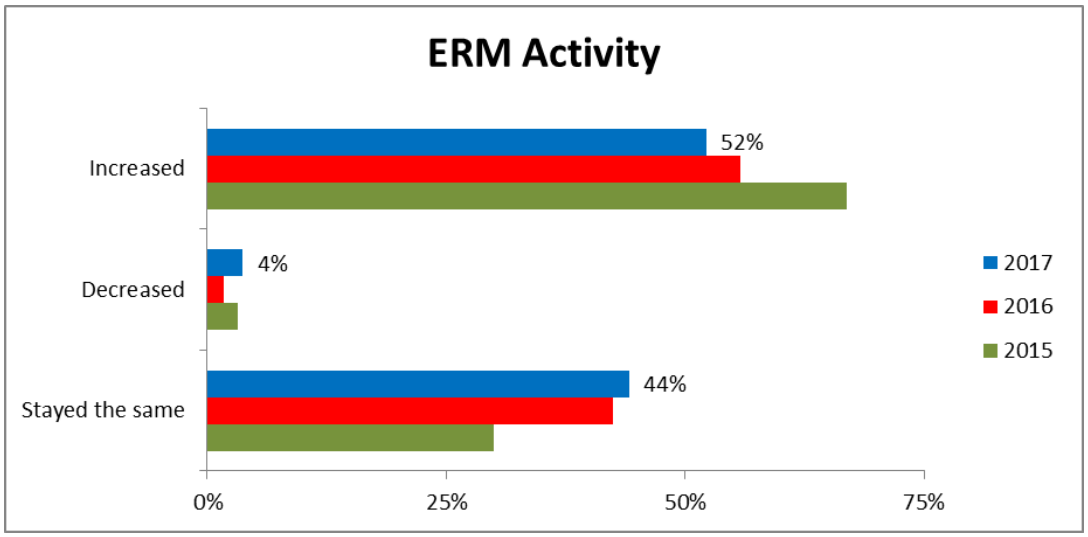
Question 1. Your expectations for the 2018 global economy are:

- 4%/8%/13% Poor
- 54%/73%/73% Moderate
- 35%/17%/13% Good
- 7%/2%/1% Strong



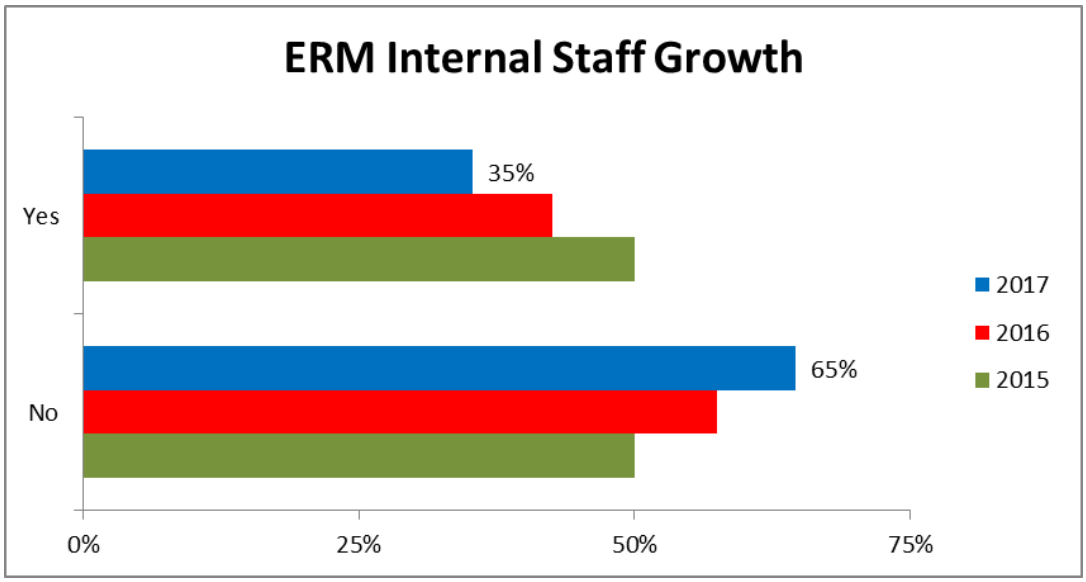
Question 2. Did you experience a change in the level of ERM-focused activities for your organization or clients in 2017?

- 52%/56%/67% Increased
- 4%/2%/3% Decreased
- 44%/42%/30% Stayed the same



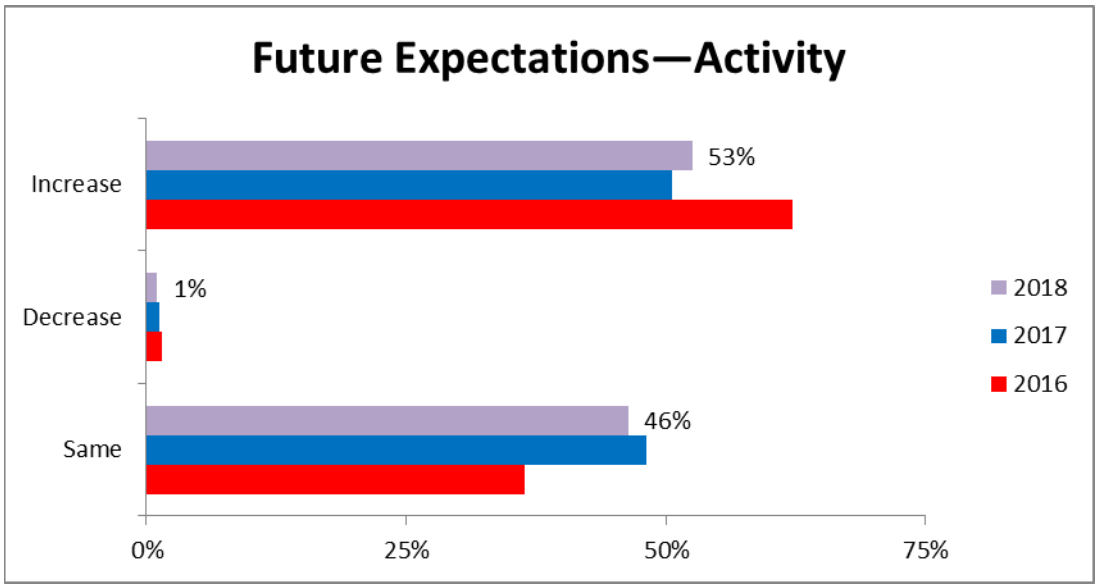
Question 3. Did your internal ERM staff increase in 2017?

- 35%/43%/50% Yes
- 65%/57%/50% No



Question 4. Do you anticipate a change in the level of ERM-focused activities for your organization or clients in 2018 relative to 2017?

- 53%/51%/62% Increase
- 1%/1%/2% Decrease
- 46%/48%/36% Stay the same



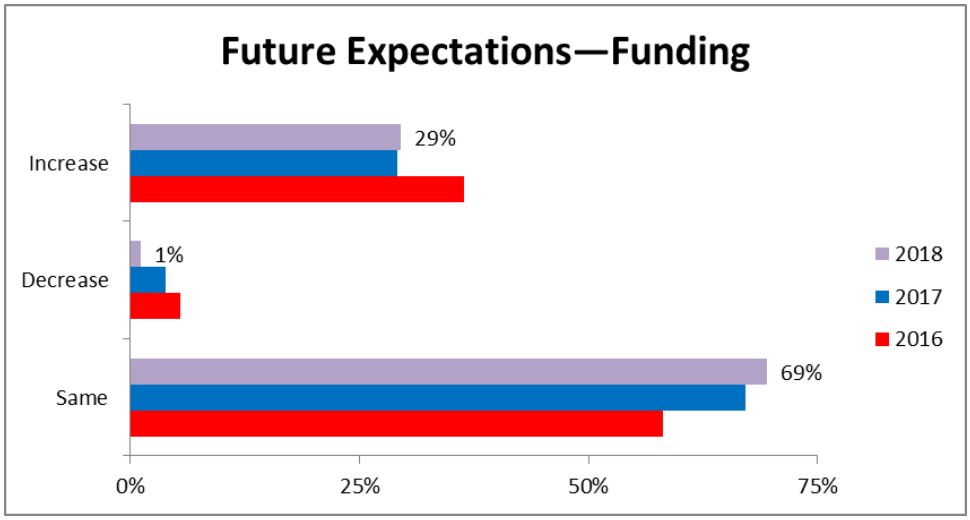
Question 5. What activities are being added, if any?

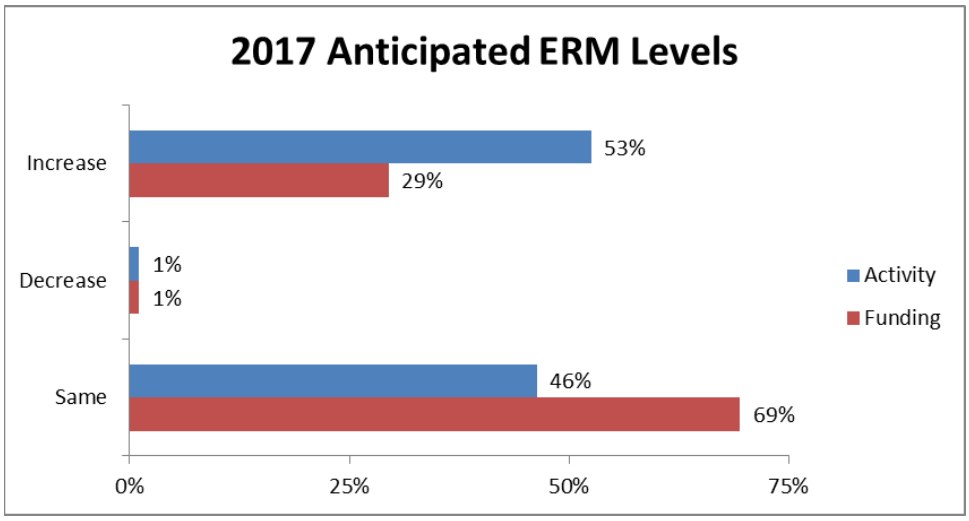
- *Capital modeling at the divisional level*
- *More financial monitoring and governance/oversight*
- *Better reporting*
- ***Increased monitoring of emerging risks***
- *Operational ERM analysis, development of more predictive dashboards and monitoring*
- *Formal ERM Program introduction*
- *International companies / Group capital / Economic capital enhancements*
- *More internal and external monitoring-focused staff*
- *More extensive (cross-area) discussions of medical trend and the risk implications / 2) a more formalized approach to IBNR / 3) Risk adjustment computations are performed at the state or federal level. We try to decrease the risk of these models getting incorrect data from our company*
- *Specific communication and metric improvements*
- *Continuing expansion of model validation*
- *A risk appetite based regimen*
- *More focus in the government of models. Risk management will be taken into account in decision making*
- ***Focus on employee accountability, retention, recruitment. We added a recruiting manager to help us get better at finding the right people***
- *More activities focused on regulatory & rating agency pressure*
- *Technology solutions are being implemented to create efficiencies, allowing us to expand our ERM functionality*
- *Formalized risk management framework, and imbedding that framework into the day-to-day culture. Attempt to have ERM formally considered within strategic alternatives*
- *Model validation*
- *Completing ORSA*
- *Lifetime valuations of all customers, employees, partners, etc.*
- *Continued improvements in monitoring and reporting. Generally working to increase maturity of risk management framework, especially operational risk*

- *Concentration on ORSA-related activities although we do not qualify for ORSA yet*
- *More monitoring of more risks*
- *Focus on $$$ measurements, rather than just a "feel" for what the impact would be*
- *Regulatory/compliance work with the cyber security rules*
- *Staff, monitoring, awareness*
- *Further Development of Economic Capital model. / Further Development of Company-Wide Aggregation of Risk Metrics Reporting / Further Development of ERM Policy / Using ERM quantitative models to support strategic decision making*
- *Refinement in risk monitoring and reporting*
- *None*
- *Key risk control monitoring and independent testing of the effectiveness of the risk controls*
- *Defining and quantifying company risk appetite*
- *Continue to enhance training, improvement to risk dashboards*
- *Emerging risk monitoring*
- *Additional ways to measure various emerging risks*
- *Improved risk appetite to aid in measuring risk exposures; linking strategic and product decisions to ORSA*
- *More deep dive reviews, more model validations*

Question 6. Do you anticipate a change in the level of funding dedicated to ERM-focused activities for your organization or clients in 2018 relative to 2017?

- 29%/29%/36% Increase
- 1%/4%/5% Decrease
- 69%/67%/58% Stay the same



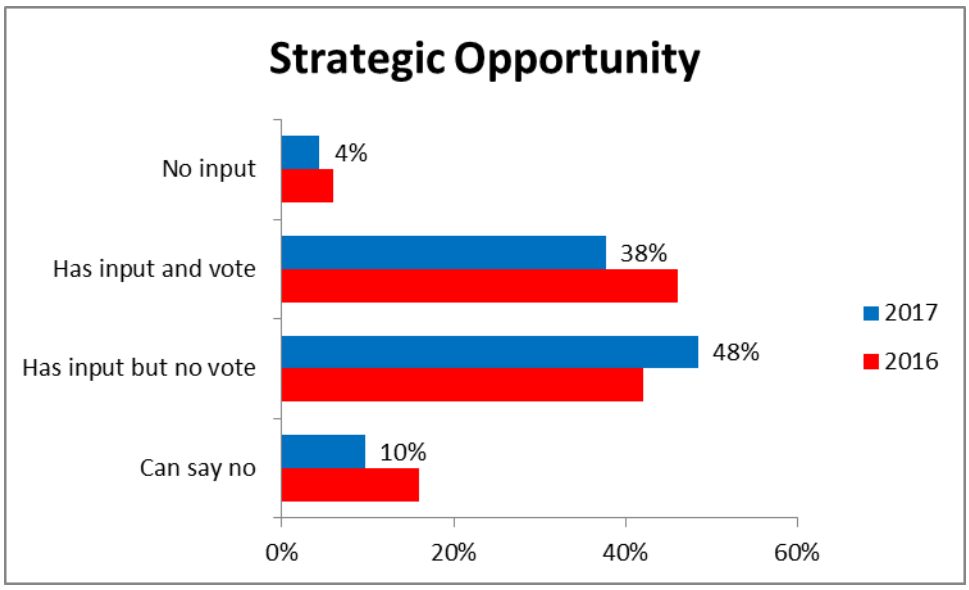


Question 7. The true measure of an ERM program is how it is received by the board and senior management. Which of these is true in your situation? (Please select all that apply.)

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

- 10%/16%/25% Our ERM function can say no to a strategic opportunity
- 48%/42%/53% Our ERM function has input but not a vote when a strategic opportunity is being considered
- 38%/46% Our ERM function has input and a vote when a strategic opportunity is being considered (new response in 2016)
- 4%/6%/9% Our ERM function has no input when a strategic opportunity is being considered

  - *Varies depending on the strategic opportunity*
  - *Sometimes the ERM function has a vote and sometimes not due to the sometimes lack of clarity of the role and responsibility of ERM on all strategic decisions*
  - *ERM is part of senior leadership decision making*



Question 8. Please share an example where the ERM department was recognized, either positively (e.g., proactive mitigation) or negatively, following a risk event.

- *Oil risk identified, and hedges put on before oil severely declined*
- *Nothing recent comes to mind*
- *Negatively for not identifying earlier*
- *In the discussion regarding a new product offering, the decision was made not to pursue that product line due to ERM input*
- *There is no ERM department per se, several areas of the company perform ERM functions. Example: Risk Adjustment team began to monitor the data submissions to the state/federal entities performing Risk Adjustment transfer computations, to ensure accuracy*
- ***ERM coordinated the company impact data following the hurricanes***
- *Review of potential regulatory changes in capital requirements lead to a proactive capital plan to deal with potential outcomes*
- *Our education on cyber risks has been acknowledged regularly in making our firm better at managing that risk, first by quantifying how big the exposure was followed by other research and market examples well before our industry has become a target*
- *Recent Hurricanes showed good ERM Practices by having smaller loss amounts than peers when scaled*
- *Our ERM department helps assess exposure potential to severe weather events as they are forming and occurring*
- *No example*
- ***Partnered with a new MGA to provide a new product. ERM input was relationship was too risky and too expensive, could result in huge losses. Senior management saw it as an opportunity to further diversify and went ahead with agreement knowing ERM didn't approve. Relationship was ultimately very expensive, but has been profitable since inception and helped mitigate losses through diversification***
- *Isn't a good one to share*
- *Increase the equity quota when risk appetite increase*
- *Never recognized following any event*

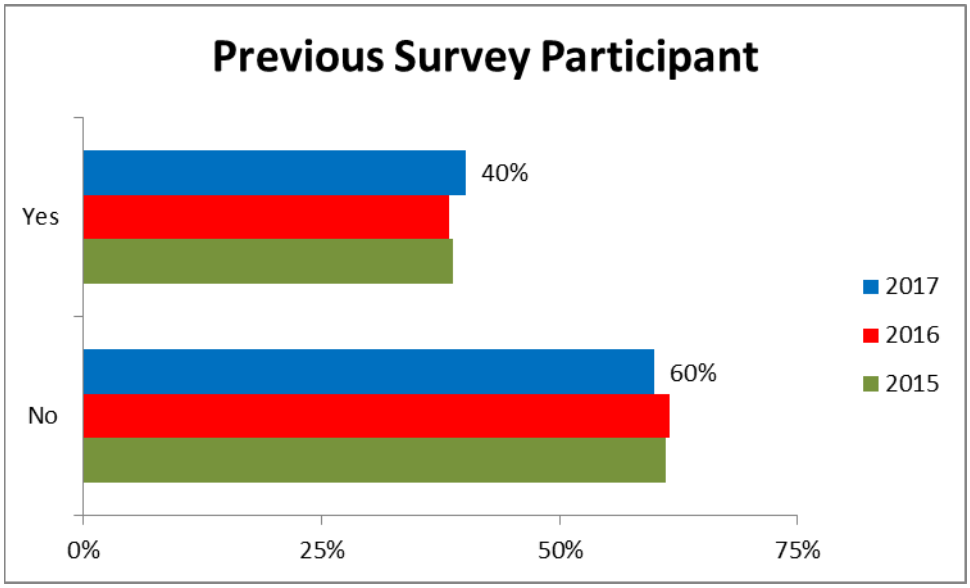
- *Anticipation of negative interest rates and the possible actions employed to mitigate were positively received*
- ***Recent creation of a risk taxonomy (library) that spans audit, risk and compliance. Created a common language for all of us to use***
- *ERM took the lead on developing a new reinsurance strategy in response to some adverse claims experience. Board appreciated increased clarity and alignment with risk appetite*

Section F: Demographics

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

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

- 40%/38%/39% Yes
- 60%/62%/61% No

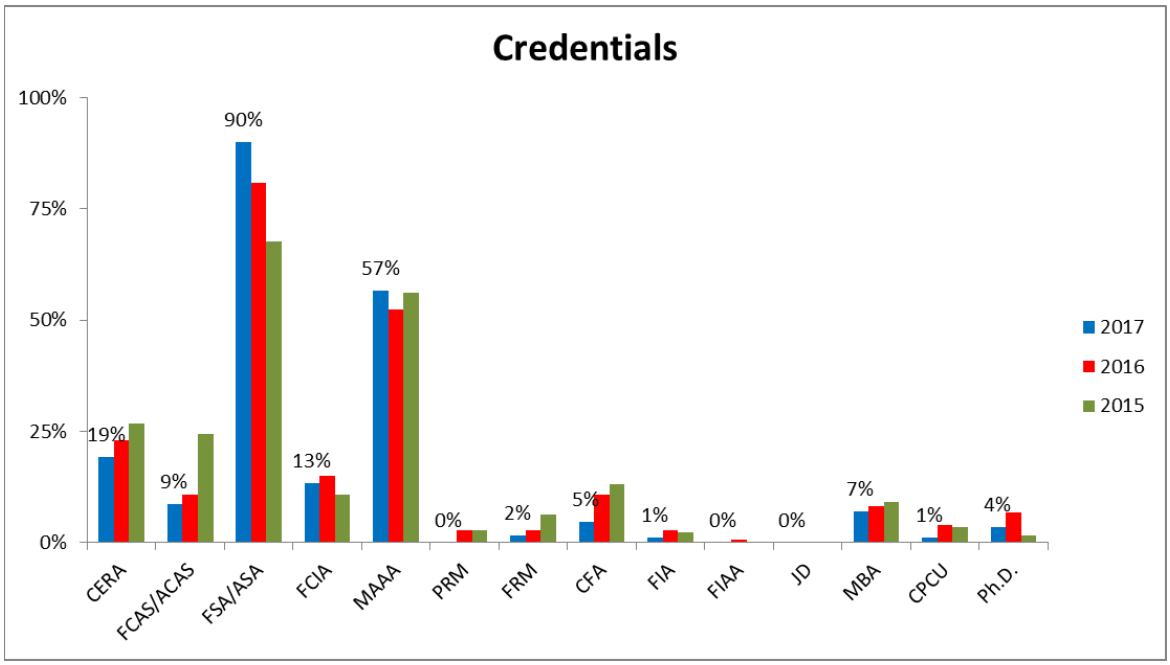


Question 2. What credentials do you currently hold? (Please select all that apply.)

384 responses from 171 surveys (2.3 average)

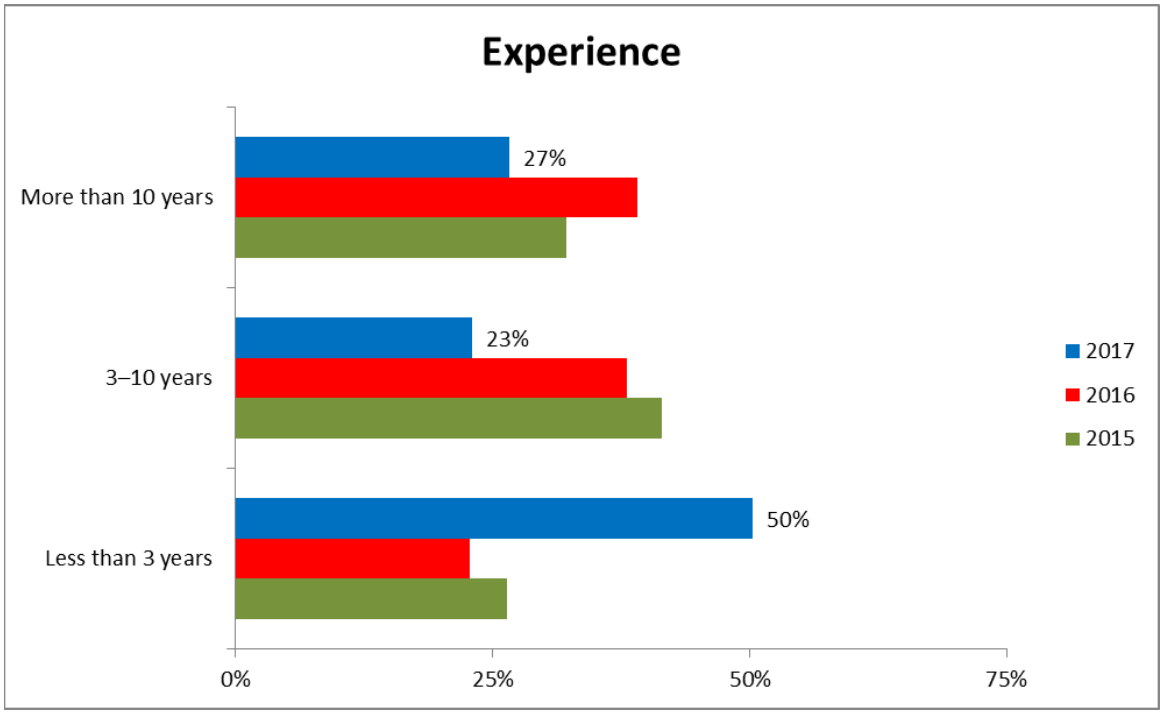
Percentages are based on 171 surveys

- 19%/23%/27% CERA
- 9%/11%/24% FCAS/ACAS (Fellow/Associate, Casualty Actuarial Society)
- 90%/81%/68% FSA/ASA (Fellow/Associate, Society of Actuaries)
- 13%/15%/11% FCIA/ACIA (Fellow/Associate, Canadian Institute of Actuaries)
- 57%/52%/56% MAAA (Member, American Academy of Actuaries)
- 0%/3%/3% PRM (Professional Risk Manager, PRMIA)
- 2%/3%/6% FRM (Financial Risk Manager, GARP)
- 5%/11%/13% CFA (Chartered Financial Analyst, CFA Institute)
- 1%/3%/2% FIA (Fellow, Institute of Actuaries)
- 0%/1%/0% FIAA (Fellow, Institute of Actuaries of Australia)
- 7%/8%/9% MBA (Master of Business Administration)
- 1%/4%/3% CPCU (Chartered Property Casualty Underwriter, The Institutes)
- 4%/7%/2% Ph.D. (Doctor of Philosophy)
- 9%/3%/5% Other actuarial credential (please specify)
    - EA (6)
    - ASAI
    - CSPA
    - FCA (5)
    - ERP
    - AU
    - France
    - FCIA
    - FFA
- 14%/19%/19% Other non-actuarial credential (please specify)
    - MMath
    - ChFC
    - LLIF
    - CLU (2)
    - FLMI (4)
    - CPA
    - CRM, ERMCP, CIC, AAI
    - FCIP and CRM
    - MBA
    - Masters Applied Math



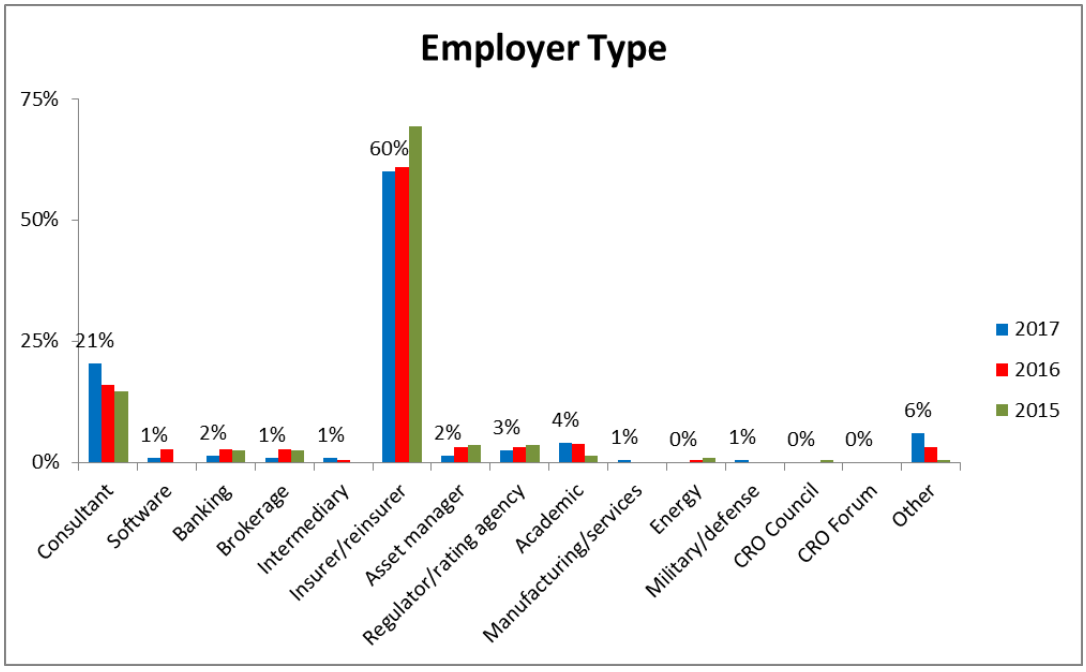
Question 3. How long have you been a risk manager?

- 50%/23%/26% Less than 3 years
- 23%/38%/41% 3–10 years
- 27%/39%/32% More than 10 years



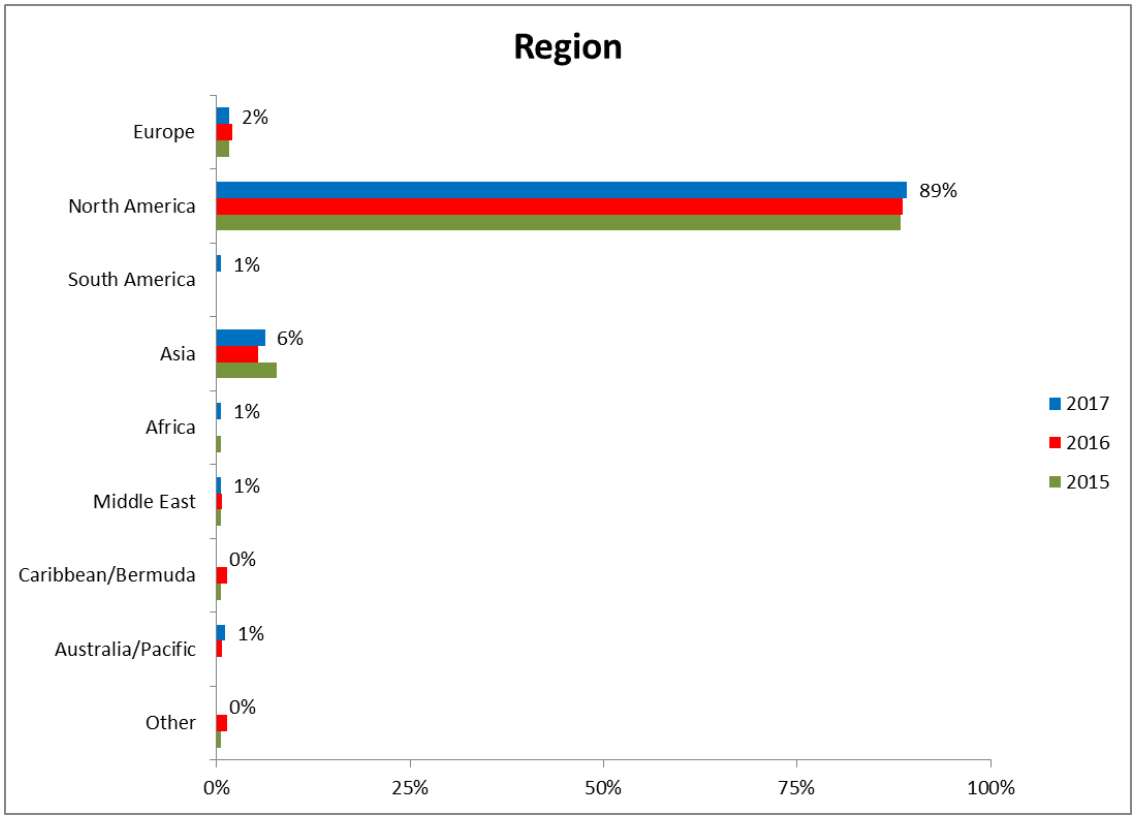
Question 4. Employer type (Please select all that apply.)

- 21%/16%/15% Consultant
- 1%/3%/0% Software
- 2%/3%/3% Banking
- 1%/3%/3% Brokerage
- 1%/1%/0% Intermediary
- 60%/61%/69% Insurance/reinsurance company
- 2%/3%/4% Asset management
- 3%/3%/4% Regulator/rating agency
- 4%/4%/2% Academic
- 1%/0%/0% Manufacturing/services
- 0%/1%/1% Energy
- 1%/0%/0% Military
- 6%/3%/1% Other
  - Trade Association for Insurance Industry
  - Retired
  - Regulator
  - Pension plan actuary
  - Pension fund
  - Financial nonprofit
  - Audit/Accounting
  - Pension Administrator
  - Travel
  - Acting CRO
  - Health care provider
  - Trade Association



Question 5. Primary region (Please select one.)

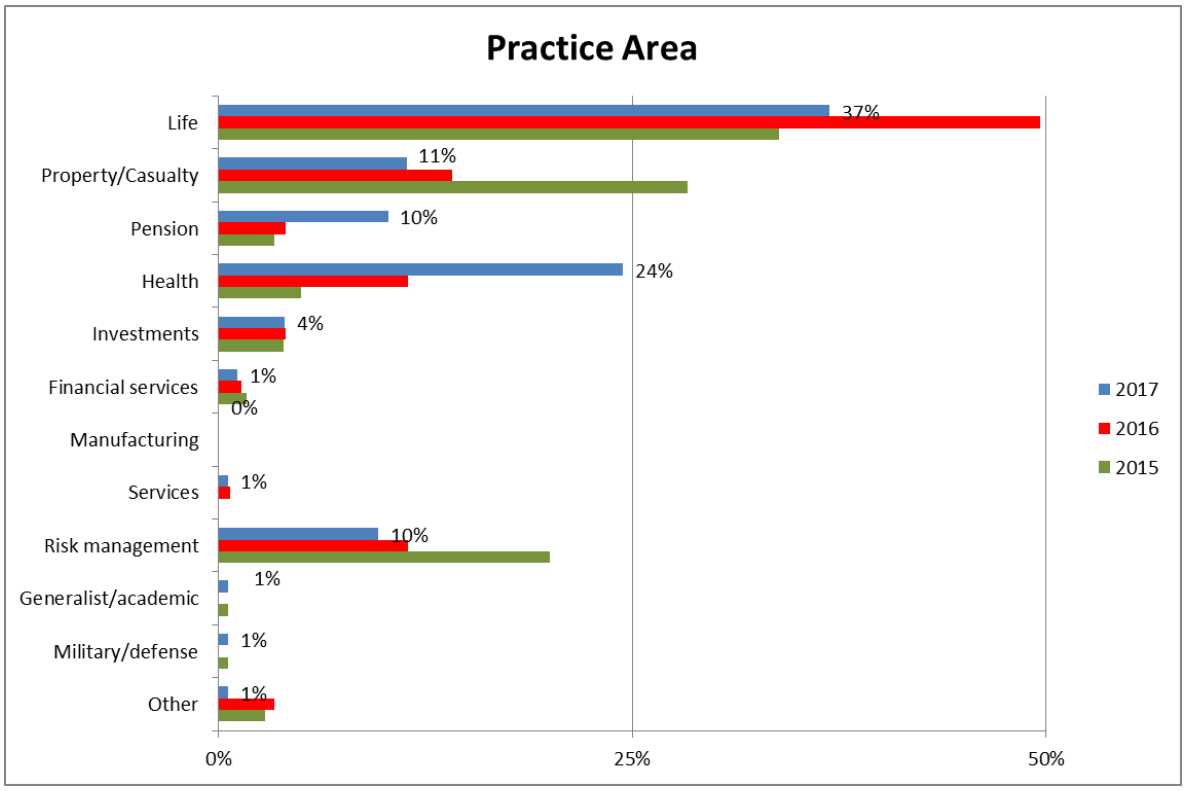
- 2%/2%/2% Europe
- 89%/89%/88% North America
- 1%/0%/0% South America
- 6%/5%/8% Asia
- 1%/0%/1% Africa
- 1%/1%/1% Middle East
- 0%/1%/1% Caribbean/Bermuda
- 1%/1%/0% Australia/Pacific
- 0%/1%/1% Other



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

- 37%/50%/34% Life
- 11%/14%/28% Property/casualty (general insurance, nonlife)
- 10%/4%/3% Pension
- 24%/11%/5% Health
- 4%/4%/4% Investments
- 1%/1%/2% Financial services (noninsurance)
- 0%/1%/1% Manufacturing/Services

- 10%/11%/20% Risk management
- 1%/0%/1% Generalist/academic
- 1%/0%/1% Military/defense
- 1%/3%/3% Other
    - Retired



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

- *News*
- ***This survey****/Discussions with others/Reading scientific papers and reports*
- *Industry news, internal reports*
- *Newspapers, news websites, insurance industry publications*
- *Internet, Newspapers, Internal Daily News*
- *Regulatory communications, news outlets, industry journals*
- *Research, financial publications*
- *General news,* Contingencies *(I'm not brown-nosing)*
- Wall Street Journal*/Associated Press news (on the web)*
- ***Berkshire Hathaway Annual Report****/S&P/ACLI*
- *Most articles that I read*
- Wall Street Journal/Economist/Atlantic Monthly
- *Published research, in professional journals or periodicals/Objective, data-driven reporting, in news media/Insights direct from industry experts, including colleagues and other contemporaries*

- *Most valuable is discussion with various client executives in various professional areas in order to identify hoped for changes in operations and extent of preparation for possible risks. Rarely does an individual firm closely follow broad economic trends with any precision*
- *Wide variety of listening—CNBC, top books read by CEOs, risk related articles through services that identify articles by category*
- *This survey*
- *Internet searches, watching how the world evolves*
- *Industry publications/Internet searches/NOT headline news*
- *Tech journals, headlines*
- *Reviewing the news, especially non-US sources for a FEED ON WHAT IS HAPPENING*
- *Review of annual risk studies (Protiviti/SONAR Swiss Re/NC State) /*
- *N/A*
- *I read the* Wall Street Journal*,* The Economist *and* The Atlantic
- *That natural disasters are separated into tropical storms, earthquakes and non-tstorm/earthquakes*
- *SOA Emerging Risk Surveys/Insurance Companies Annual Report—emerging risk identifications/Other insurance magazines that talk about emerging risks*
- *Foreign newspapers/sources/Actuarial publications/ILO's—World Bank & related*
- The Economist*, actuarial publications*
- *News*
- *Google and other online sources/Consultant newsletters/TV News and Newspapers*
- *Advisen, healthcare industry trades,* Business Insurance
- *Newspapers, magazines, internet*
- ***Science fiction****/eclectic reading*
- *CEB,* ***peer group has quarterly emerging risk calls****, Actuarial or other risk management publications*
- *Valuation indicators, trends*
- *Reinsurance emerging risk reports /*
- *PWC Banana Skins/SOA/EY*
- *Actuarial Society publications/webinars (CAS and SOA)/Industry publications (*Insurance Journal*,* PropertyCasualty360*,* SNL*)/Colleagues practicing in similar or related fields*
- *PwC – 20th CEO Survey/Key findings in the Insurance industry/February 2017/Centre for the Study of Financial Innovation – Insurance Banana Skins/Efma/Capgemini – World insurance report 2017*
- *Industry news sources/Conferences/Guided interviews with operations leaders*
- WALL STREET JOURNAL
- *SOA meetings, webcasts, section newsletters*
- *JRMS*
- *News/Research*
- *Claims data*
- Vanity Fair*,* New York Magazine*,* Economist
- *Reinsurance regular study report, risk insights,* The Actuaries*,* Economics
- *Intelligence/Science and Technology/Operations*
- *Internal company risk inventory/Risk magazines/News*
- *Investment bank research, CNBC and other news sources*
- *SOA material, CEB Risk Council*
- ***PBS***
- ***Advisen Publications****/*Wall Street Journal*/Conning*
- *WEF; Consultancy reports*
- *World economic forum*
- *News, Institute for Health Metrics and Evaluation, Kaiser*

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

- *Less bias. Feels like SOA is looking for data to sell ERM's value to public, but questions seem framed to elicit more positive responses*
- *I would like for the results to be more widely publicized*
- *No*
- *An excellent survey. No suggestions for change*
- *Rather than asking respondents to indicate their frame of reference when thinking of emerging risks (e.g. self, company, society in general), define the frame of reference you want respondents to use. 2. Have a demographic question regarding company size—e.g. domestic, multi-national conglomerate. 3. Just before question 3 was a paragraph indicating that the first combination chosen would be used in a later question, but I never saw a later question that referenced back to that combination. 4. Make the buttons for the 23 risks smaller so that they all fit on the screen at once*
- *It would be good to see brief commentary from people that "support" a given risk. I may not be fully aware of the various ways certain risks can matter, or were intended to be understood (even with the glossary)*
- *No*
- *Please provide a list of people within an organization that receive the survey*
- *More of an industry-specific focus would allow me to answer more competently*
- *Gee, I have never thought of this survey as a repeat of past surveys but rather an effort to assess changing risk in a changing world from a broad variety (albeit predominantly actuarial) of viewpoints at the close of calendar year. So my first suggestion is replace the word "iteration" with the word "version". // More generally, differentiate among global risks, country/regional risks, industry risks, etc. in contrast to a single word throughout the survey*
- *Questions 3, 4, 5 in retrospect weren't very clearly explained*
- *No*
- *N/A*
- *Wider range of suggested solutions in short form, i.e., disseminate a greater number of proposals, early draft (or rejected) research submittals. Even inferior or dumb ideas can stimulate others to improve upon or come up with different approaches*
- *Nope. Good work. I always look forward to seeing the results*
- *Insight on the profile of the response per risk definition in Q1*
- *NO*
- *Provide links to glossary more frequently throughout survey. It makes it easier to reference, especially when I accidentally close out of it but still need to look at it*
- *More examples*
- *None*
- *No*
- *Not at this time*
- *When choosing the risks that will have large impact in combination with one another, copy those two selections to the next question so we can see what we chose*

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)
- Make clear in survey intro that long time horizon should be used for Section 1 but that other questions will have varying time horizons.
- Create a question that talks about avoiding a bad outcome rather than "timing the market"—seems like this is where winners reside.
- Add pension fund as employer
- Include glossary link in the email
- Section 6 add categories EA FCA
- Send to all CERA
- Section 2 ask how many leading indicators they have identified
- Section 5 Question 3 add shrink to options

Appendix III—Survey Results 2016 and Earlier

Detailed results for prior surveys can be found at https://www.soa.org/resources/research-reports/2015/research-emerging-risks-survey-reports/