May 2013
This paper summarizes the 6th survey of Emerging Risks, conducted in fall 2012. A condensed article was published by the Society of Actuaries Joint Risk Management Section in the August 2013 Risk Management newsletter.

Emerging Risks: Another one around the corner

By Max J. Rudolph, FSA CFA CERA MAAA

Emerging risks are a key component of enterprise risk management (ERM). Risk managers should consider risks that develop over a long time horizon in addition to the short term risks involved with tactical planning and putting out fires. Emerging risks focus on outliers -- extreme events that do not occur frequently. Regulatory capital requirements tend to ignore these outliers in their calculations. This does not mean they won't occur, and makes it important for an entity's risk team to fill this gap. Stress tests and qualitative assessments do a better job of interpreting the impact of a negative outlier.

This is the sixth survey of Emerging Risks conducted by the Joint Risk Management Section. Trends are as important as absolute responses, and the research sees value in comparing to past results. The complete survey can be found at http://www.soa.org/research/research-projects/risk-management/research-2012-emerging-risks-survey.aspx .

The financial crisis started more than five years ago and continues to play out. Many risk managers found they had relied too much on models and needed to bring back the qualitative aspects of risk management. Tools measuring liquidity risk had ignored funding rollover of debt. Flooding in Thailand, the earthquake/tsunami in Japan, shipping closures due to Katrina, low water levels in the Mississippi River due to drought, and gasoline shortages following Hurricane Sandy all prompted discussions about how to avoid supply chain disruptions in the future.

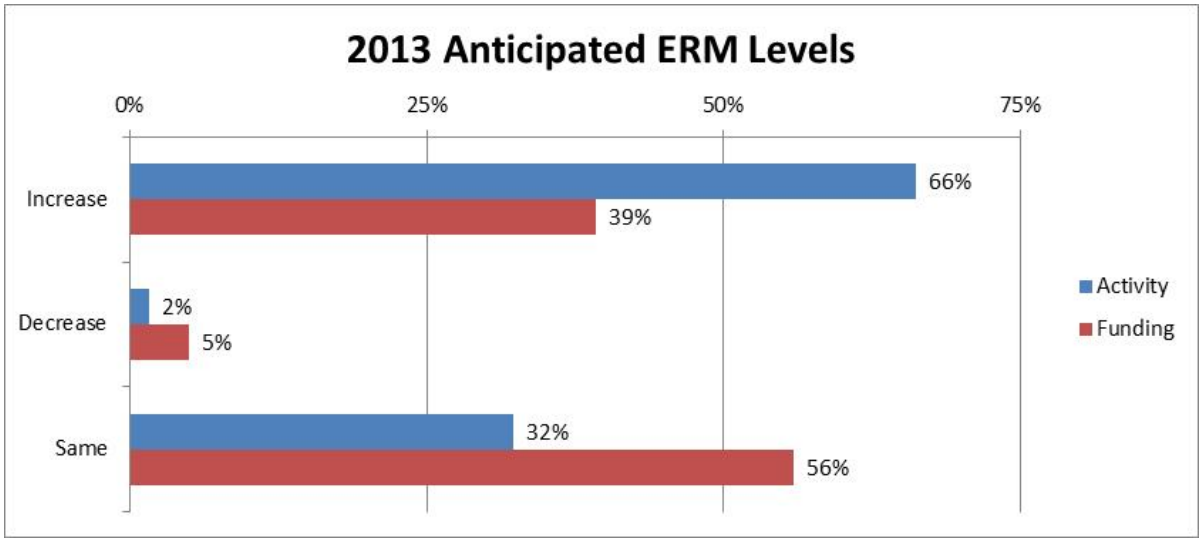
Risks generating historical data that remain stable over time can be represented by a statistical distribution. Other risks are evolving in uncertain ways, have been forgotten in their dormancy, or are new. These latter types are termed emerging risks and typically do not have a well-defined distribution.

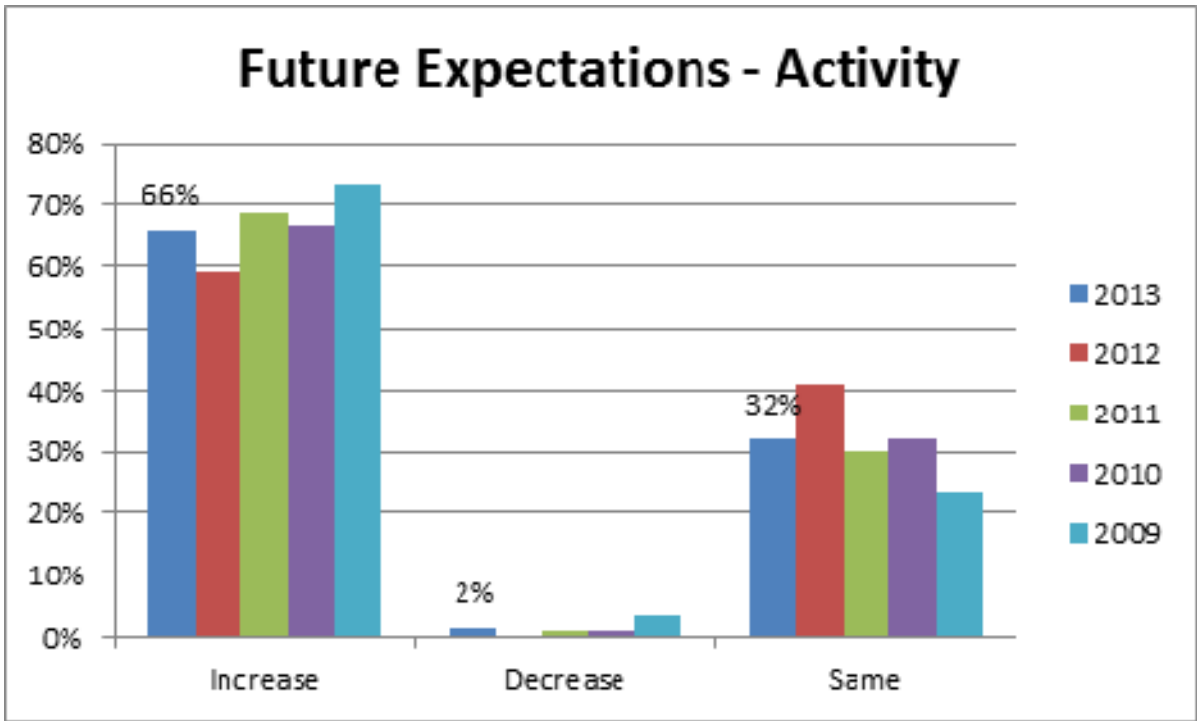
Successful management of emerging risks depends heavily on the existing risk culture. A firm must be open to contrarian views and skeptical thoughts. Getting a broad range of perspectives allows better decisions to be made. Playing the "what-if" game in a relaxed atmosphere can yield improved solutions.

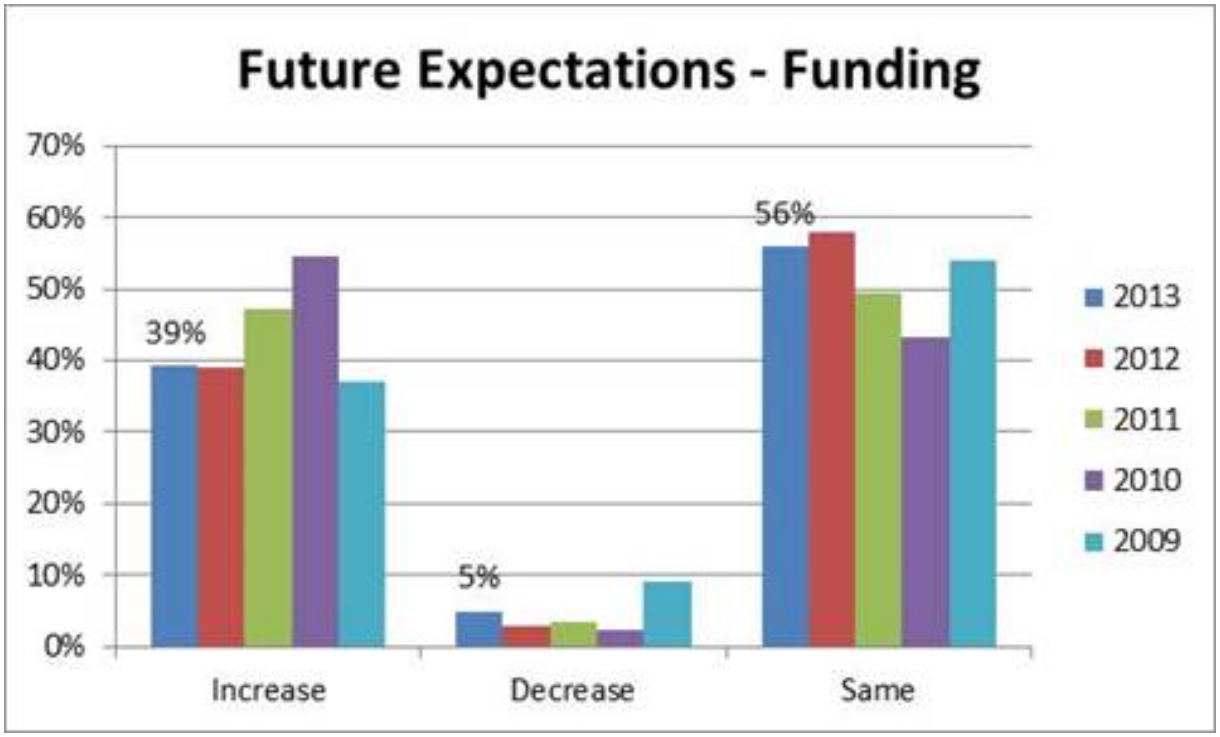
Risk managers reported in the survey that risk tools are being used more frequently to improve decision making. These incorporate quantitative, qualitative and combination methods. Stress testing is being used to supplement economic capital calculations and

consider alternative investment strategies and product designs. Scenario drivers include economic factors, improved building codes and rapidly improving cyber risk analysis. They report a balance needed between sophisticated models and simplified techniques based on experience that can be used to identify emerging risks and other outlier events. Quantification helps management get their arms around the magnitude of the risk in ways that qualitative assessments can't.

Many activities related to ERM continued to grow in 2012, especially those involving financial modeling. While reduced from last year's 50%, 41% reported internal staff growth in 2012. ERM activity grew at a slightly faster pace than the prior year (65%). In 2013 most expect an increase in activity (66%), but fewer than half (38%) anticipate an increase in funding. A small number (5%) anticipate decreased funding for ERM activities. This separation of high expectations from the willingness to fund them should be a concern to those in these positions. The cumulative effect of many years where activity growth is faster than funding growth leaves other initiatives potentially underfunded.




Future Expectations - Activity
80%
70%
60%
50%
40%
30%
20%
10%
0%
66%
2%
32%
Increase
Decrease
Same
2013
2012
2011
2010
2009


Future Expectations - Funding
70%
60%
50%
40%
30%
20%
10%
0%
39%
5%
56%
Increase
Decrease
Same
2013
2012
2011
2010
2009

Emerging Opportunities

Risk can be viewed in a number of ways. Risk managers tend to focus on volatility, downside risk, or solvency events. Initial risk management efforts focus on mitigation efforts, and some respondents viewed emerging risk efforts primarily as risk avoidance, but best practice is evolving toward those who incorporate strategic risks in their analysis and look at upside opportunities. When asked for examples, responses focused on instances where inconsistencies or niche products could be explored. One response shared an example of a warming climate's impact on Canada, with longer growing seasons and improved shipping methods (opening of an ice-free northwest passage) providing opportunities for those ready to exploit them. Another respondent monitors the demographic shifts within markets for potential changes in financial instruments.

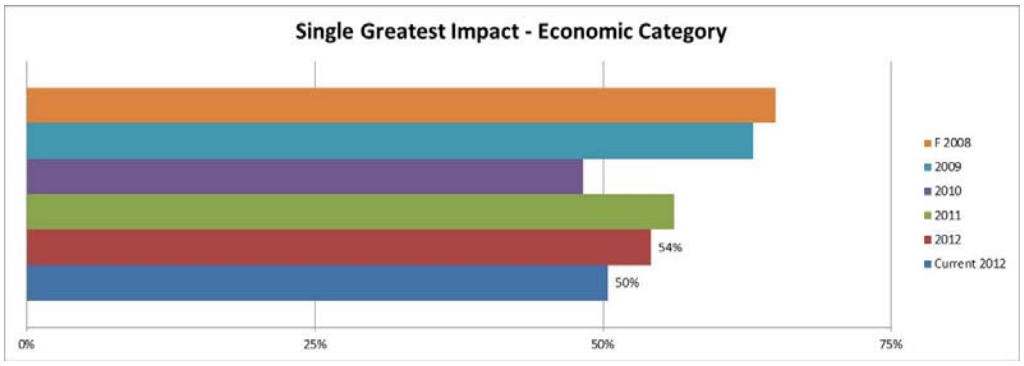
Cognitive Bias

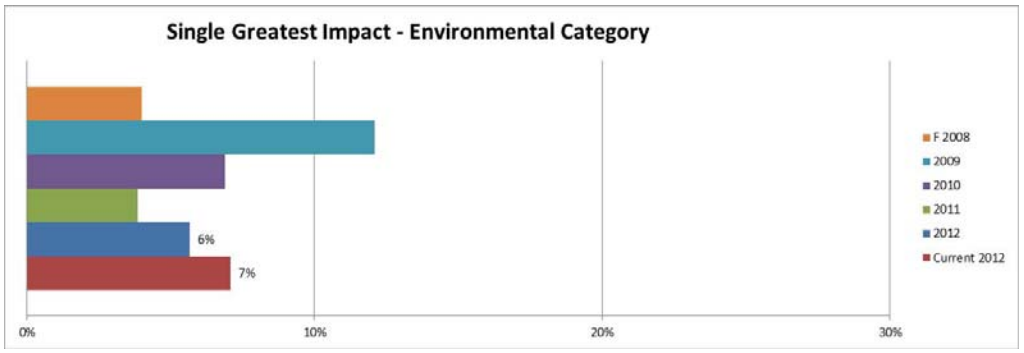
In the past this emerging risks survey has considered anchoring bias as described in Prospect Theory by Daniel Kahneman and Amos Tversky (summarized in Kahneman's Thinking, Fast and Slow).

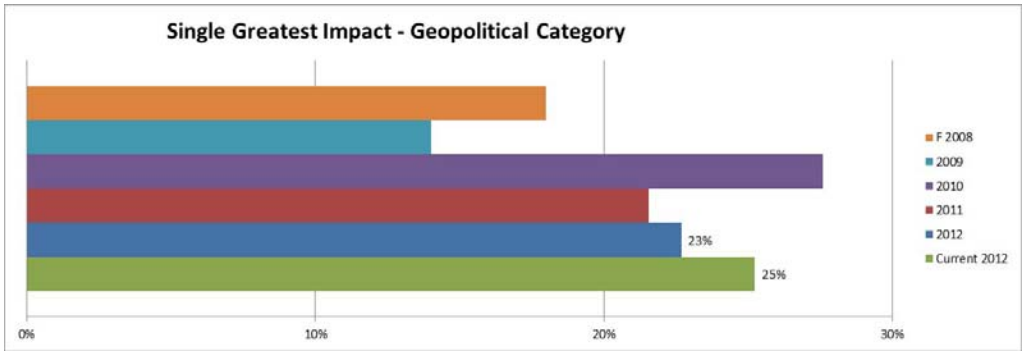
Since the previous iteration of this survey, a number of events have influenced the thinking of risk managers. Reverberations still echo from the 2008 financial crisis, but less so from the 2011 Japanese earthquake/tsunami and Arab Spring. The continuing European sovereign debt crisis combined with weather related events like storms and drought, but no event led to contagion.

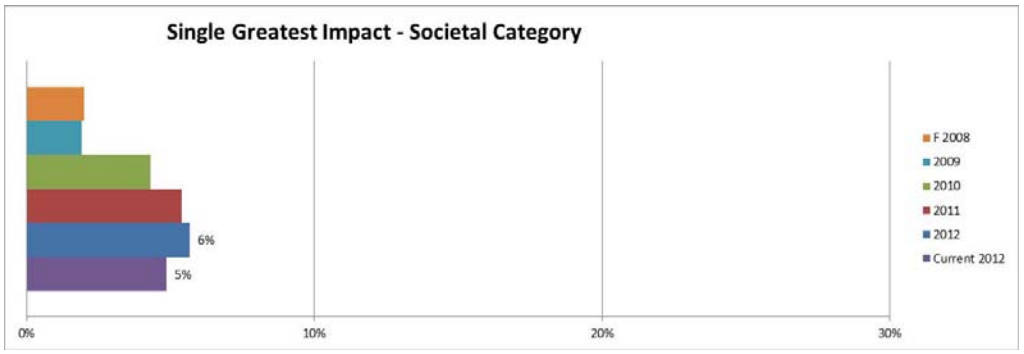
The evolving field of behavioral finance describes anchoring as the tendency to let recent events influence our thinking about potential events. Previous survey reports discussed the impact on results when the Mumbai terrorist attacks occurred while the survey instrument was open (Fall 2008) and *International terrorism* became a popular choice. In 2012 the survey closed shortly before Hurricane Sandy came ashore in the US Northeast, avoiding what would have been another interesting data point. We continue to see evidence of anchoring. Three risk categories show strong results that move percentages from last year's survey results toward the top current risk. The other two, Societal and Technological, have the smallest results.

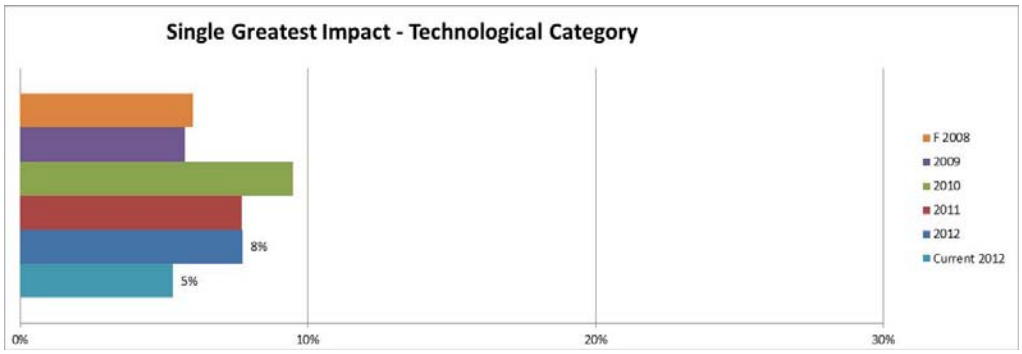
Note that, for ease of viewing, labels are included on graphs for only the most recent data points. (This next set of graphs has two data labels since it also includes the top current risk).


Single Greatest Impact - Economic Category
F 2008
2009
2010
2011
2012
Current 2012
54%
50%
0%
25%
50%
75%

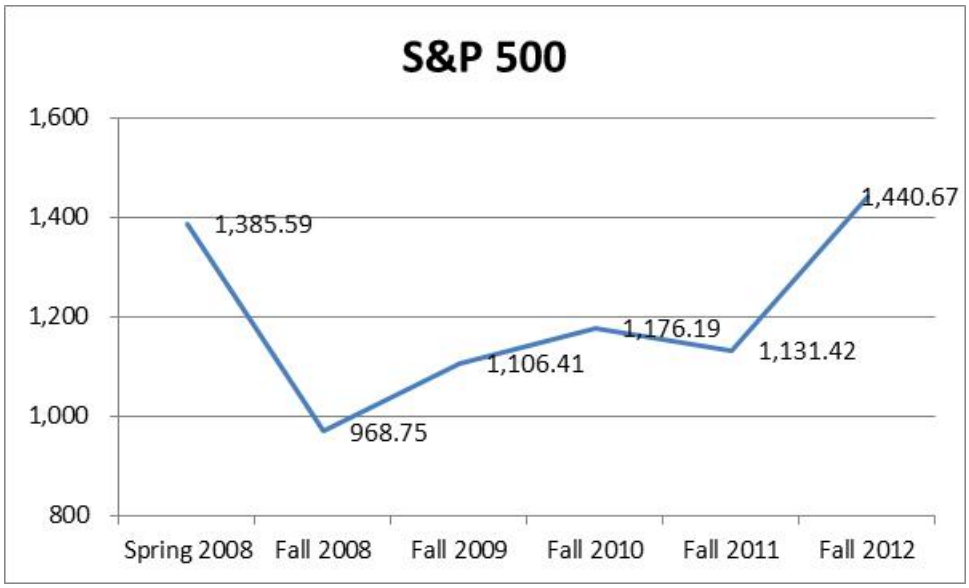

Single Greatest Impact - Environmental Category
F 2008
2009
2010
2011
2012
Current 2012
6%
7%
0%
10%
20%
30%

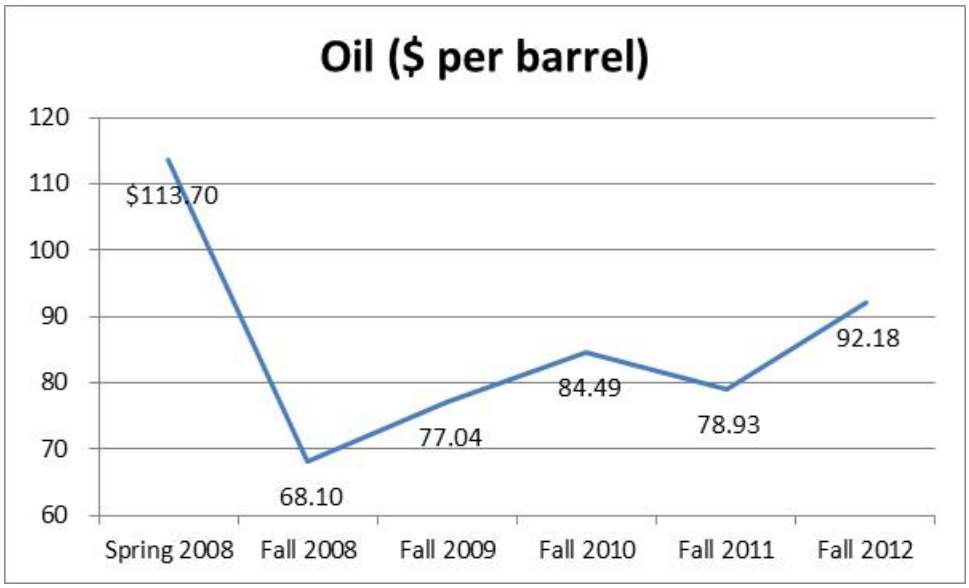

Single Greatest Impact - Geopolitical Category
F 2008
2009
2010
2011
2012
Current 2012
23%
25%
0%
10%
20%
30%

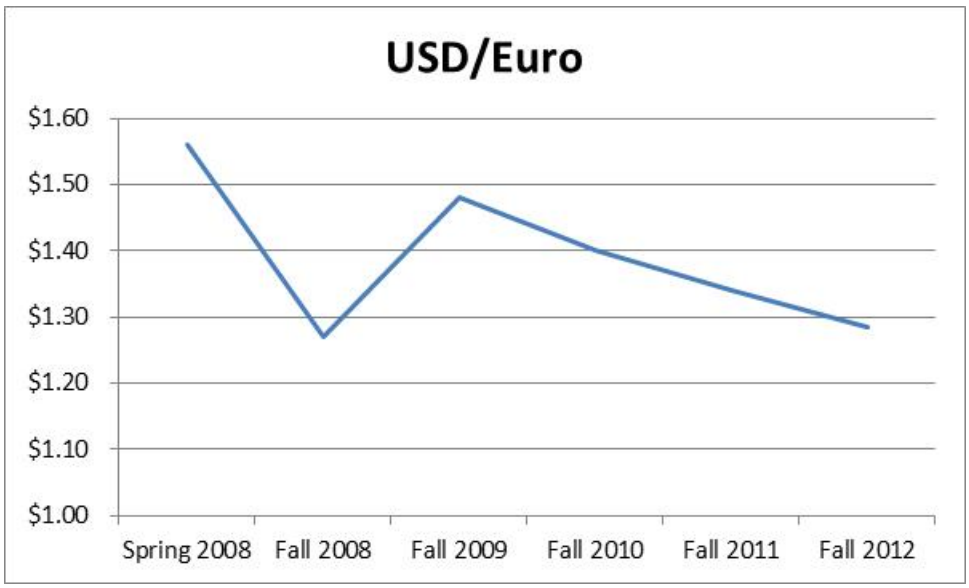

Single Greatest Impact - Societal Category
F 2008
2009
2010
2011
2012
Current 2012
6%
5%
0%
10%
20%
30%



As in past reports, the survey results show that current values of the S&P 500, a barrel of oil, and the U.S. dollar relative to the Euro seem to anchor perceptions of risk. Results have evolved over time, generally led by recent events.







The initial survey was completed in April 2008, soon after Bear Stearns lost its independence. When that survey was completed, oil was priced relatively high, the stock markets were at record levels, and the dollar had recently trended down. At that time the top four emerging risks chosen were

Survey 1 (April 2008)

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

With oil at historic highs, it was the predominant emerging risk chosen. The second survey was completed in early November 2008. By then 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%. Systemic risk was perceived to be very high at this time. The top four emerging risks from this second iteration of the survey were

Survey 2 (November 2008)

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

The next survey was in December 2009. The S&P 500 had increased 14%, the price of a barrel of oil had increased 13%, and the U.S. dollar had weakened 17%. The economy had begun its slow recovery. The top four emerging risks from the third iteration of the survey were

Survey 3 (December 2009)

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

In 2010, data was compiled in October and the indicators had not changed materially. The stock market was up 6%, 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.

Survey 4 (October 2010)

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

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

For the 2011 survey the list of 23 risks were updated with changes to four of them. Most of the top six results continue to come from the Economic category. The new risk, *Financial volatility*, resonated with risk managers as they made it their top selection.

Survey 5 (October 2011)

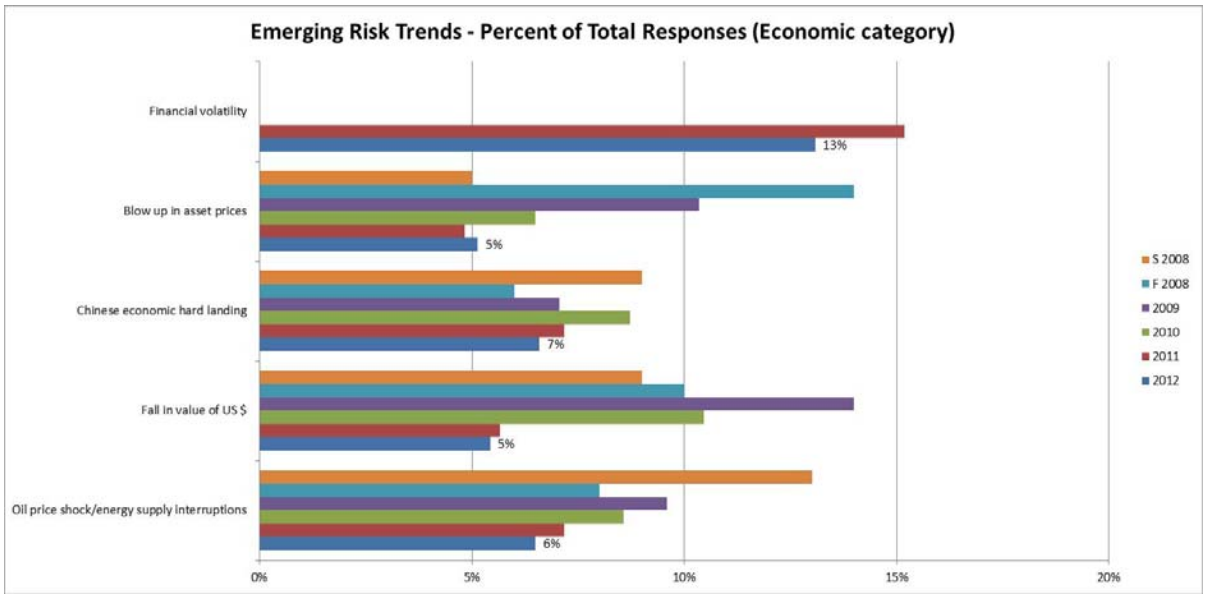
1. *Financial volatility (68%)*
2. *Failed and failing states (42%)*
3. *Cyber security/interconnectedness of infrastructure (38%)*
4. *Chinese economic hard landing (32%)*
4. *Oil price shock (32%)*
4. *Regional instability (32%)*

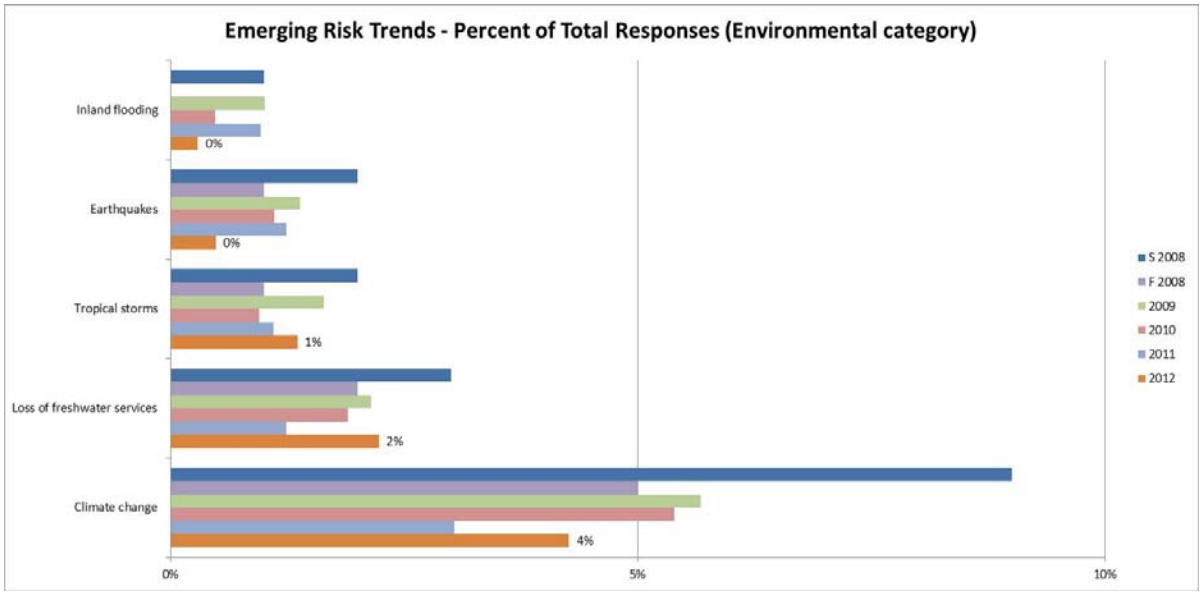
At the current version of the survey, completed in October 2012, equity markets had surpassed the levels of spring 2008 for the first time while oil prices rebounded and the dollar strengthened. There were some interesting shifts in the 2012 results. The Economic category of risks continues to be the top emerging risk choice (respondents could pick up to five) ahead of the Geopolitical, Societal, Technological and Environmental categories. As time passes from the financial crisis, the Economic category's importance has faded. Finishing a strong number two (32% versus 37% for the Economic category), Geopolitical risks increased. Risks with new highs across the survey history were *Loss of freshwater services* (11%), *Interstate and civil wars* (14%), *and Liability regimes* (8%). New lows were recorded by risks *Oil price shock* (31%), *Chinese economic hard landing* (31%), *Pandemic/infectious diseases* (12%), *Natural catastrophes: Inland flooding* (1%), *and Natural catastrophes: Earthquakes* (2%). Despite recording new lows, some of these risks remain in the top ten overall.

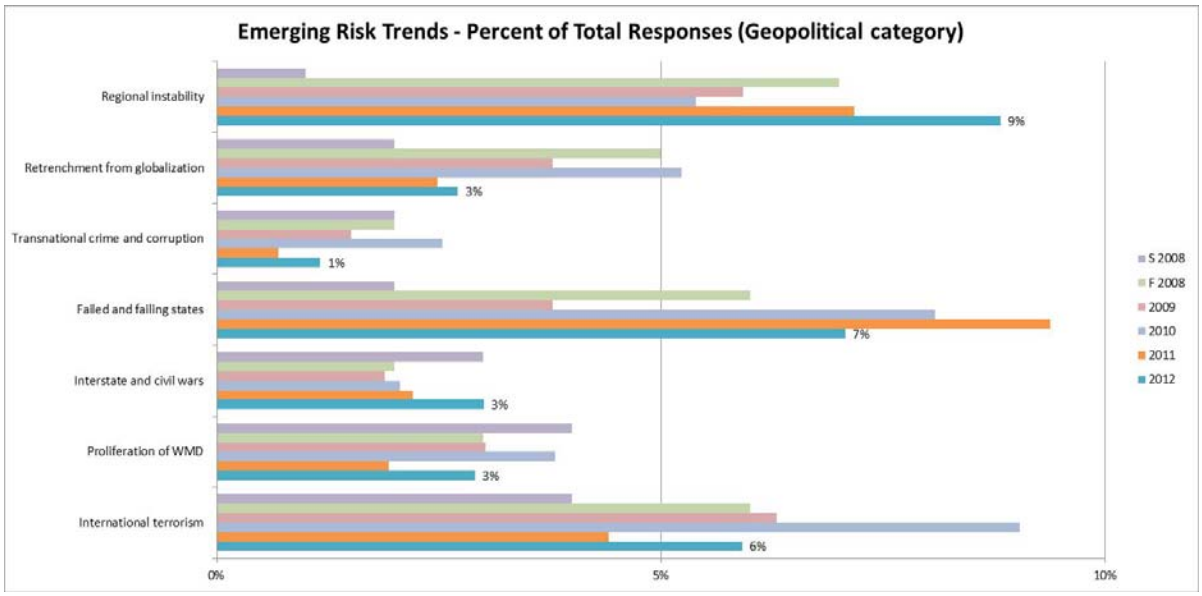
Survey 6 (October 2012)

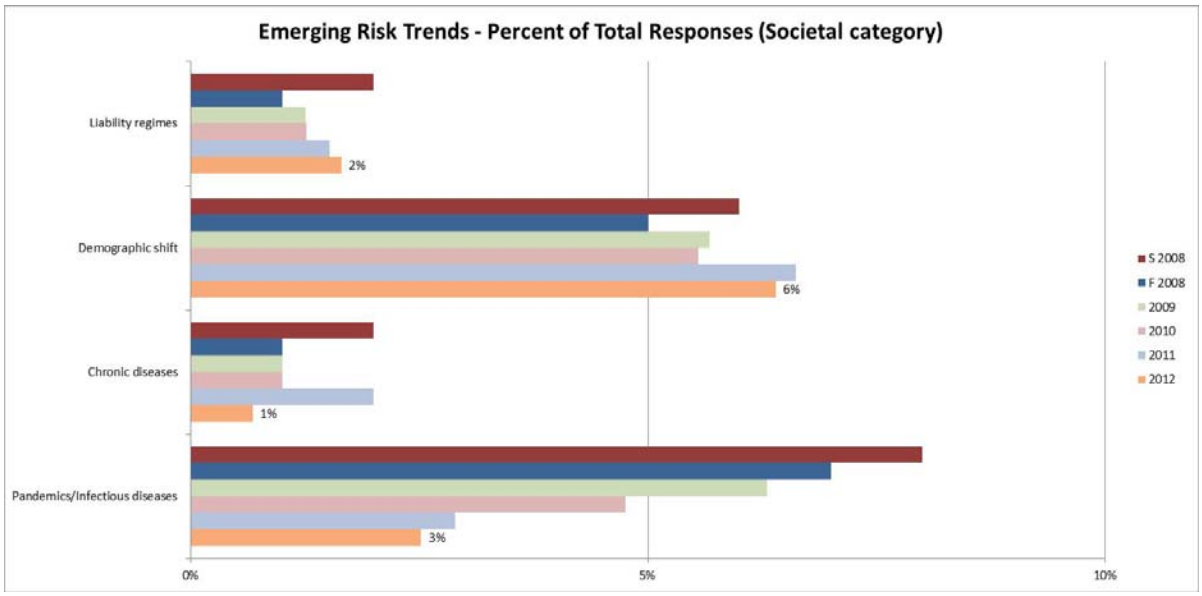
1. *Financial volatility (62%)*
2. *Regional instability (42%)*
3. *Cyber security/interconnectedness of infrastructure (40%)*
4. *Failed and failing states (33%)*
5. *Chinese economic hard landing (31%)*

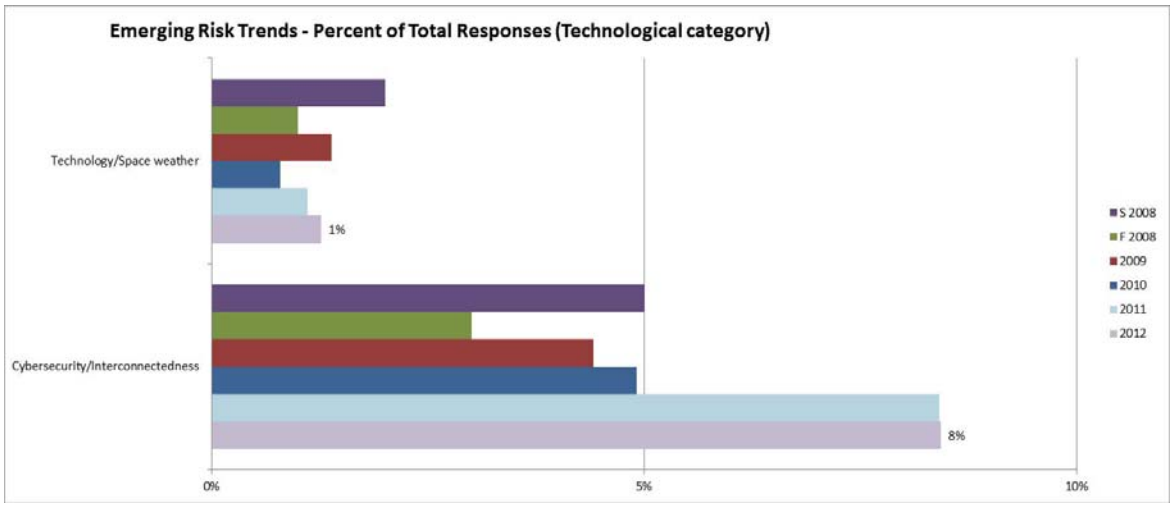
The following set of charts show historically the results by category and risk.


Emerging Risk Trends - Percent of Total Responses (Economic category)
Financial volatility
13%
Blow up in asset prices
5%
Chinese economic hard landing
7%
Fall in value of US $
5%
Oil price shock/energy supply interruptions
6%
0%
5%
10%
15%
20%
S 2008
F 2008
2009
2010
2011
2012


Emerging Risk Trends - Percent of Total Responses (Environmental category)
Inland flooding
0%
Earthquakes
0%
Tropical storms
1%
Loss of freshwater services
2%
Climate change
4%
0%
5%
10%
S 2008
F 2008
2009
2010
2011
2012


Emerging Risk Trends - Percent of Total Responses (Geopolitical category)
Regional instability
Retrenchment from globalization
Transnational crime and corruption
Failed and failing states
Interstate and civil wars
Proliferation of WMD
International terrorism
9%
3%
1%
7%
3%
3%
6%
0%
5%
10%
S 2008
F 2008
2009
2010
2011
2012


Emerging Risk Trends - Percent of Total Responses (Societal category)
Liability regimes
Demographic shift
Chronic diseases
Pandemics/Infectious diseases
2%
6%
1%
3%
0%
5%
10%
S 2008
F 2008
2009
2010
2011
2012

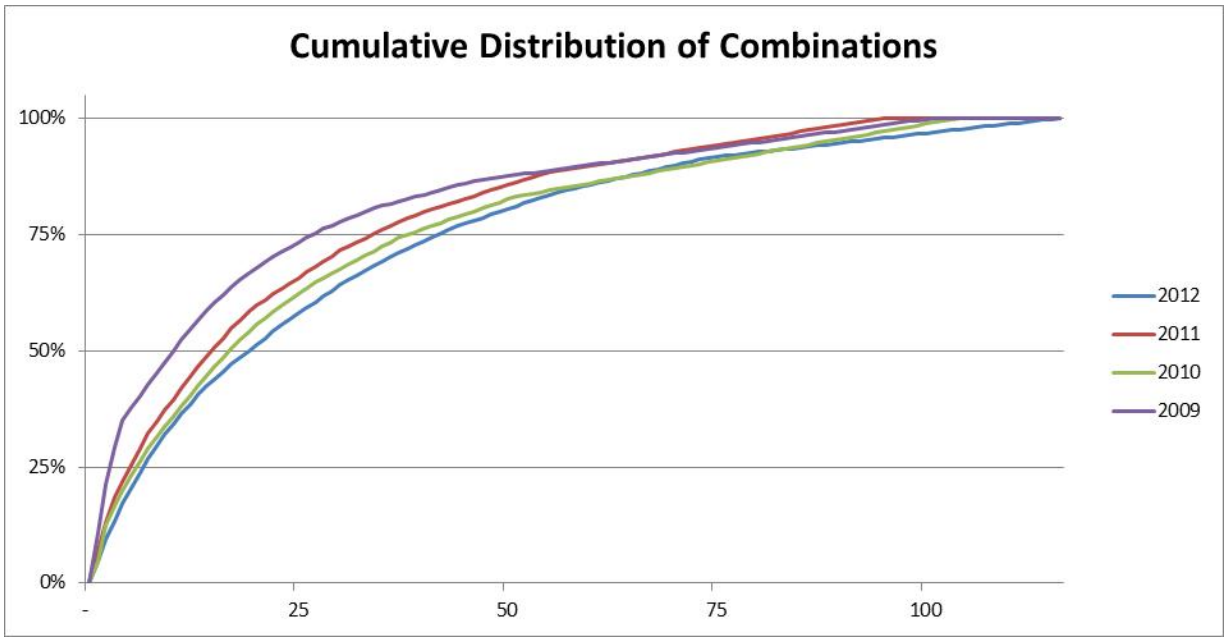


Risk Combinations

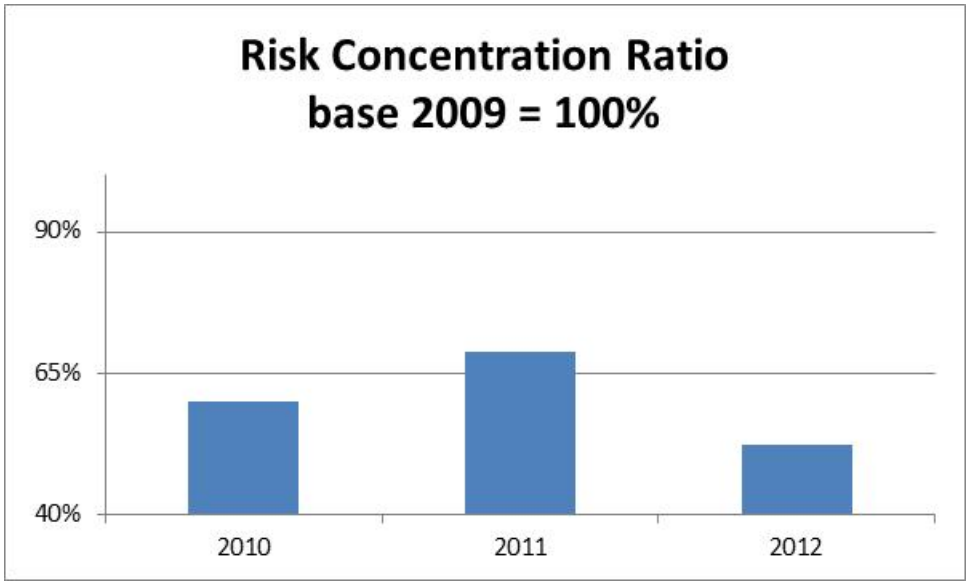
One of the more interesting debates within ERM is how to consider interactions between risks. To enhance knowledge in this area the survey asks about concerns due to combinations of two risks. Five of the top six combinations included *Financial volatility,* chosen with *Oil price shock* (5%), *Blow up in asset prices* (5%), *Chinese economic hard landing* (4%), *Failing and failing states* (3%), *and Fall in value of US $* (3%). The top combinations not including *Financial volatility* were *International terrorism and Proliferation of weapons of mass destruction (WMD)* with 4%, third overall. *Oil price shock* was the second highest risk mentioned.

While *Financial volatility* dominates the combination category as it does when considering individual risks, several other risks had small increases but for the most part there was a wider dispersion of results. It is interesting to see that *Oil price shock,* which continues to receive less attention as an isolated risk, moved up to second place when considering its importance in combination with other risks.

There are 253 possible two-risk combinations. The spread of results was the least concentrated so far, as can be seen in the accompanying chart.

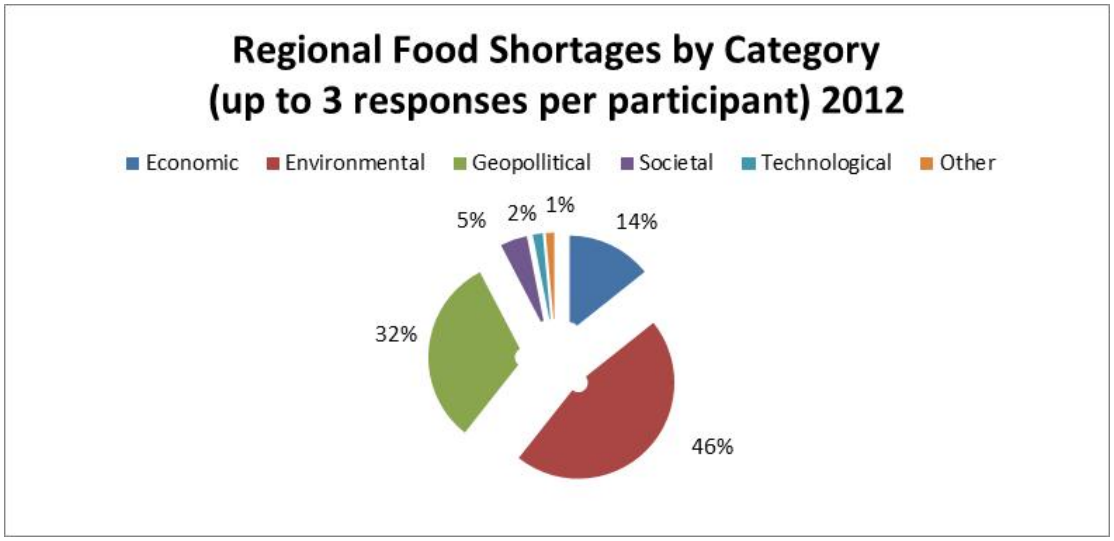


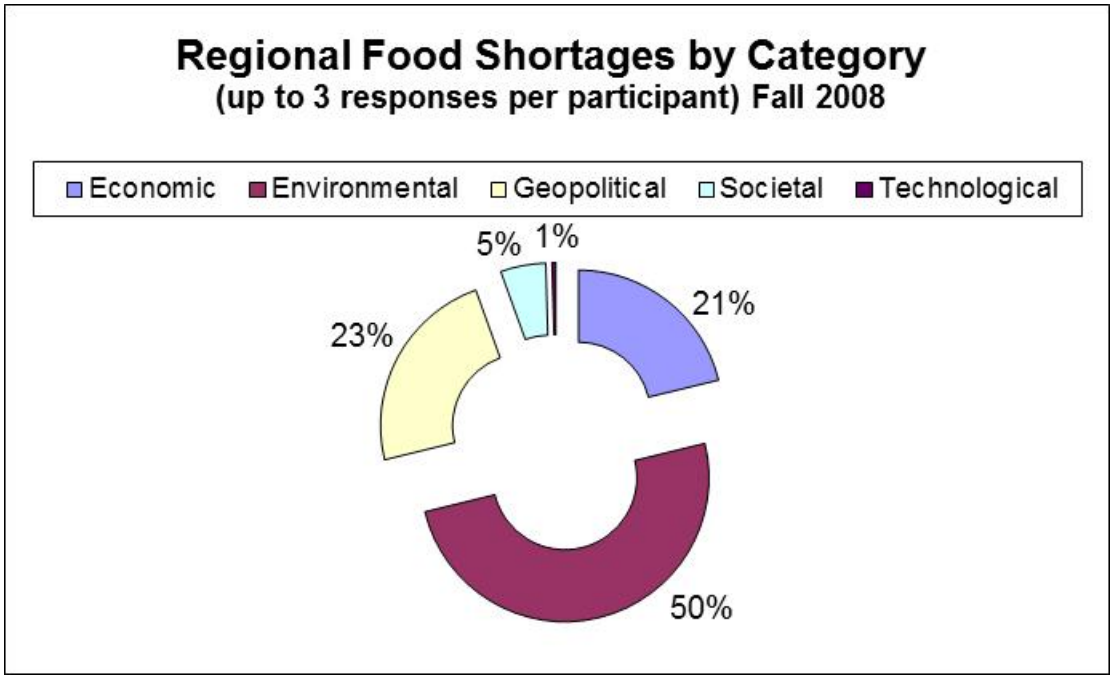
The period immediately following the financial crisis might be the most extreme we will see, so 2009 is used as the base year with a 100% Risk concentration ratio. Comparisons are made at the 25th percentile, median (50th percentile) and the 75th percentile, and then combined. A higher number reflects greater concerns. As a relative measure, the Risk Concentration Ratio represents the current feeling among the risk management community. They seem to be less focused on a potential crisis this year.



This year's topical issue question returned to one asked previously (in fall 2008) about regional food shortages. Respondents were able to include up to three risks. Results were

primarily spread across Environmental (46%), Geopolitical (32%), and Economic risks (14%). These results shifted toward Geopolitical and away from Economic since the question was originally asked. This likely reflects a reduced anchoring effect as time passes from the worst of the financial crisis.





The top two specific risks chosen were *Climate change* (18%) and *Loss of freshwater services* (13%). Rounding out the top 5 were *Regional instability* (11%), *Natural catastrophe: Inland flooding* (9%) *and Oil price shock* (9%).

Leading Indicators

Best practice approaches to incorporate leading indicators in action plans improved this year. Key risk indicators (KRI) provide information earlier in the decision making process. A lagging indicator uses information such as quarterly revenue. A leading indicator provides information earlier in the process. Examples would include instances of long lines on the first day of a holiday shopping season reflecting retailer success or a spike in the credit default spread for a supplier reflecting credit risk. Over half, 57%, reported having at least some leading indicators around emerging risks. Examples reflected a move to incorporate triggers and thresholds, such as to help manage a liquidity crisis by putting in place mitigating actions well in advance of the event.

A blend of quantitative sophistication and qualitative analysis is needed. One respondent reflected the general tone of comments by stating: *We have come to the conclusion that for emerging risks it is far more informative and worthwhile to do stress tests based on scenarios developed specifically for the risk. Trying to use stochastic processes on a risk that is not well understood can lead to a false sense of security and can be misleading.*

Conclusions

Emerging risks can be difficult to effectively manage. Unintended consequences and interactions with other risks are only understood in hindsight, so risk "experts" who profess complete knowledge and a cookie cutter approach should be treated with suspicion. Behavioral finance is a key for interpreting emerging risks, especially anchoring. Recent concerns greatly influence future concerns, as we have seen for several years. As the time since the worst of the financial crisis passes, respondents broaden their focus.

ERM is at a crossroads. Many are being asked to do more without additional funding. Some complete the bare minimum to deflect external stakeholders. Others find their efforts receiving more exposure but not in ways that add value. Happily, some best practice firms have incorporated risk into their strategic planning process. By extending their time horizon and seeking out alternative perspectives as they analyze their risk profile, this creates a competitive advantage. Current challenges like low interest rates may create an opportunity to identify bubbles and other mispriced assets and liabilities by being skeptical and studying history. As they say, history may not repeat but it often rhymes.

Glossary of Risks

Initially 23 core risks were defined in Global Risks 2007: A Global Risk Network Report. They can be found at www.weforum.org/pdf/CSI/Long_Global_Risk_Report_2007.pdf. What follows is an updated version for the 2012 survey with a description of the risks.

23 risks

Economic Risks

- Oil price shock – Oil prices rise steeply due to major supply disruption.
- Fall in value of US dollar - US current account deficit triggers a major fall in the dollar.
- Chinese economic hard landing – China's economic growth slows, potentially as a result of protectionism, internal political or economic difficulties.
- Blow up in asset prices – The value of personal assets such as housing and equities collapse, fueling a recession.
- Financial volatility – price instability of core products such as commodities, energy or currency

Environmental Risks

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

Geopolitical Risks

- International Terrorism – Attacks disrupt economic activity, causing major human and economic losses.
- Proliferation of Weapons of Mass Destruction (WMD) –nuclear Non-Proliferation Treaty no longer effective, leading to spread of nuclear technologies.
- Interstate and civil wars – Major interstate or civil wars erupt.
- Failed and failing states – Trend of widening gap between order and disorder.
- Trans-national crime and corruption – Corruption continues to be endemic and organized crime successfully penetrates the global economy.

- Retrenchment from globalization – Rising concerns about cheap imports and immigration sharpen protectionism in developed countries. Emerging economies become more nationalist and state-oriented.
- Regional instability – Certain unstable areas may cause widespread political and other crises. These include, but are not limited to, the Middle East and the Korean peninsula.

Societal Risks

- Pandemics/Infectious disease – A pandemic emerges with high mortality/Incidence of diseases such as HIV/AIDS spreads geographically.
- Chronic diseases – Obesity, diabetes and cardiovascular diseases become widespread.
- Demographic shift – Aging populations in developed economies drive economic stagnation by forcing governments to raise taxes or borrow.
- Liability Regimes – Liability costs rise by multiples of GDP growth, with spread of litigiousness.

Technological Risks

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

Warning: The information provided in this newsletter is the opinion of Max Rudolph and is provided for general information only. It should not be considered investment advice. Information from a variety of sources should be reviewed and considered before decisions are made by the individual investor. My opinions may have already changed, so you don't want to rely on them. Good luck!