Emerging Risk Management

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YOUR RISK IS OUR FOCUS

September 27, 2010

Agenda

- Introduce a factor model approach to modeling emerging risks
- Setting up and calibrating the model
- Sample model output
- Conclusion

Defining The Model

"All models are wrong. Some are useful."

George Box

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We Start by Defining Emerging Risk

- Risks that do not currently exist (S&P Definition)
  - Slow to appear, difficult to identify, represent idea more than factual circumstances
  - Result from changing political, legal, economic, market or physical environment
  - Most industry identified Emerging Risks are already known but their impact on society, economy, and insurance is not known yet

Mention HBR article re cone of uncertainty

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We Then Classify Types of Emerging Risks

- Need to understand where Emerging Risks can come from
  - Macroeconomic
  - Political/Legal
  - Physical (weather, etc.)
  - Etc.
- Need to understand how each type of Emerging Risk affects insurer
  - Liability side, asset side, both?
  - One or multiple lines of business affected?
  - One or multiple industries affected (understand streams of commerce)?
  - Does it affect competition, buying patterns and/or entire marketplace?
  - Is future business affected?
  - Are suppliers affected?
  - Is there operational exposure?
- Multiple processes require multiple identification and risk management systems

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The Model

- Arbitrage Pricing Theory
  - Multi-factor model
  - Factors are systemic risks that we know are correlated to some or all of our portfolio
  - Do not have to identify specific factor
  - Simply need to know correlations
  - Factors measure risk premiums
- Factor Portfolios
  - Chose general factors which represent different types of emerging risks
  - Create a matrix of correlations between risky areas within firm and factors based on impact of each emerging risk
  - Over-precision in factor development not practical since we aren't identifying exactly what the factor is
- Incorporate in economic capital model and use Monte Carlo simulation to simulate effect on economic capital of factors representing various emerging risks

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Setting Up The Model

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Define Factors

- Three categories of factors:
  - Past events
    - 9/11, financial crisis, etc.
  - Events which are known but whose impact is not known
    - Global warming
    - Product risk from emerging nations
    - Aging population
  - Future events which are not known
    - Possible erosion of tort reform
    - Natural catastrophes
    - Political unrest
    - Deregulation
- Factors are systemic to industry, not just to firm
  - As firm's risk profile changes, only need to update correlations

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Parameterizing Factors

- Frequency
  - Binomial whose mean is a random variable
- Severity
  - Loss ratio approach is generally appropriate as size of market and risk profile of firm change over time
  - May need more detailed model for low frequency businesses
- Correlations
  - Correlation between business and industry, for each factor
    - Miss factor applies to some emerging risks
  - Correlation within and between parts of the business
    - Underwriting lines of business
    - Assets
    - Credit
    - Loss reserves
    - Franchise value

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Parameterization Support

- Historical information about past events
  - Annual statement – remember it is only 10 years of history, a very small sample
    - Schedule P
      - Be careful of effect of rate adequacy
      - Net vs. Gross
      - Regression analysis can help assess correlations between lob's for both non-event years and event years
    - Schedule D to study impact on investments
  - Industry reports
- Known events with unknown impact
  - Lloyd's Disaster Scenarios
  - Industry studies
- Unknown events
  - Cascade failures – stream of commerce, supply chain
  - Near misses
  - Similar /Opposite events

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Parameterization Cautions

- High level of uncertainty in modeling impact of Emerging Risks
- Understand sources of reducible uncertainty – a few lessons from behavioral finance can improve our ability to calibrate
  - The law of large numbers does not apply to small sets of numbers – means and variances
  - Experience biases tend to lead to underestimation of risk
  - Overconfidence
  - Don't discard outlier data because you think it can't happen again
  - Don't have a selective memory
- Assuming an appropriate tail probability is more important that the mean assumption
- "Ceaselessly search for possible correlations among seemingly unrelated risks." Warren Buffet in 2001 Letter to Shareholders
  - Correlations between underwriting years for occurrence business
  - Correlations between creditors (ceded re recoverables)
  - Rhode Island Night Club fire
- Think about your cone of uncertainty - The tail is fatter than we think

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Example

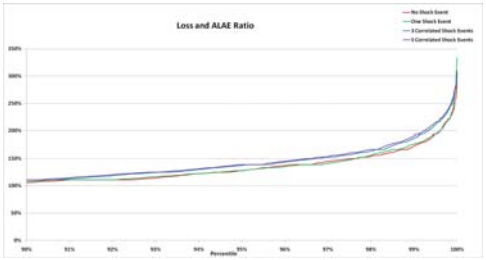
Sample Factor Model

Risk Area	Factor A	Factor B	Factor C
Assets	0	+	+
Credit 1	0	0	+
Credit 2	+	0	+
LOB 1 Current	0	0	+
LOB 1 Reserves	0	0	0
LOB 2 Current	+	0	0
LOB 2 Reserves	0	0	0
LOB 3 Current	0	+	0
LOB 3 Reserves	0	+	0
LOB 4 Current	0	+	0
LOB 4 Reserves	0	+	0
Franchise	+	+	+

Sample Economic and Shock Model

- Underwriting results for current year
- 9 seemingly uncorrelated lines of business
- Low frequency, high severity lines of business
- Initial shock scenarios were adding E(n) to claim count 1 in 10 years

My First Attempt at Adding Shock Loss



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First Questions to Ask Yourself

- Does the result seem reasonable? NO!
- If the output doesn't seem reasonable, is it because the model is flawed or because my gut instinct about the expected results is wrong? In this case the shock scenarios have less impact than I would have thought and I assume my model is flawed.

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Revising the Model

- What did I do wrong?
  - My frequency was binomial but I didn't vary the probability of the shock event.
  - My cone of uncertainty was too small – my shock scenarios were not "shocky" enough
- How to "correct" it?
  - Varied probability of each shock uniformly from 0.10 to 0.25
  - Shock scenario is 3 X E(n)

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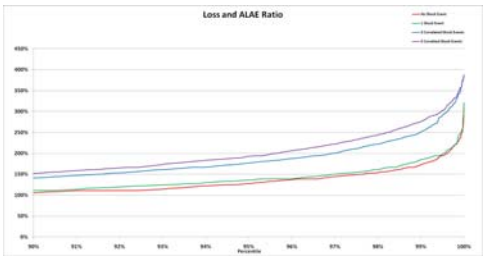
More Reasonable Scenario



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Questions to Ask Yourself

- If the output doesn't seem reasonable, is it because the model is flawed or because your gut instinct about the expected results is wrong?
  - Look at reasonableness overall and on a relative basis
- Does the model accurately assess the impact of known past events?
- What is the sensitivity of the output to my assumptions?
- Is my cone of uncertainty big enough?

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Conclusion

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Conclusion

- You don't have to identify specific emerging risks to establish a stochastic framework for modeling their effect on a (re)insurer
- Requires a thorough job of cataloguing and categorizing types of emerging risks
- Forces an evaluation of correlations and accumulations within the business
- High level of uncertainty should not prevent the building of a model
  - There are ways to minimize some of the uncertainty
  - You can gain an understanding of the uncertainty through scenario testing
- Using the model to make decisions without an understanding of the uncertainty can be worse than using no model at all

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