Analytics for Insurance: Finding the Right Balance

Atlanta, Georgia | July 23-25, 2013







Space travel	
Then	Men on the moon
Now	Private space travel

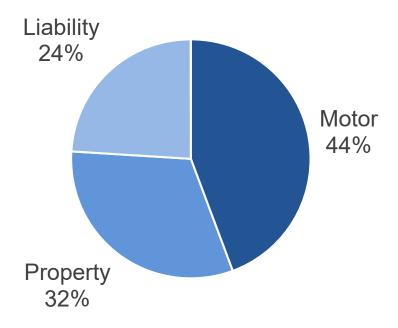
Tempered extra-terrestrial ambitions



Car of the future	
Then	Flying
Now	Self-Driving

- Auto insurance is the largest line in most countries
- 44% of global premium
- Capital provider
- Radical change in allocation of liability and provision of insurance

Distribution of Global P&C Premium



Source: 2012 Aon Benfield Insurance Risk Study

Energy	
Then	Running out
Now	Shale gas

- Inspires faith in technology
- Possible environmental fallout
- Favorable change to balance of energy-power



Source: http://cfp.canadafreepress.com/World_shale_gas_deposits,_source_no_hot_air.jpg



Navigation	
Then	Maps
Now	GPS

- Data, data, data
- Know location of everything, mobile or stationary
- Geocoding core to cat modeling
- Financial time stamps





Information	
Then	Yellow pages
Now	Internet

- Distribution
- Customer service
- Price competition
- On-line reviews
- Cyber risk







Containers	
Then (1966)	1% of countries
Now	90% of countries

Globalization, distributed manufacturing, just-in-time inventory

Power of labor



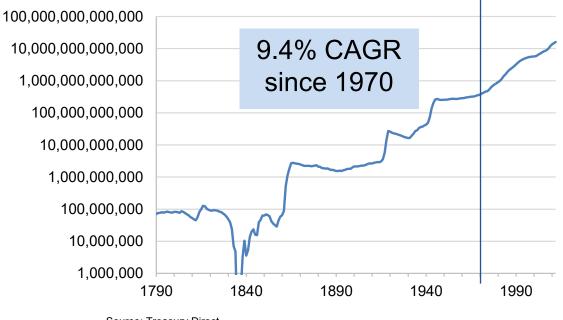




Money	
Then	Gold Standard
Now	Quantitative easing

- Financial industry growth
- Derivatives explosion
- Systemically important financial institution
- Too big to fail





Source: Treasury Direct



Income level	GDP per capita	
Then	Sing \$2K, US \$5K	
Now	Sing \$51K, US \$46K	

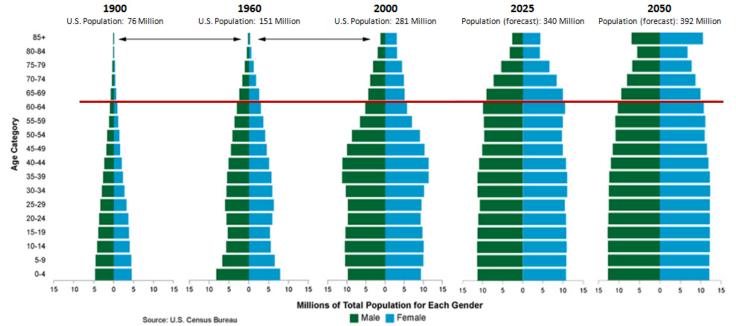
- Growth in income inspired generous future benefit promises
- Technology and productivity dependent, an undiversifiable risk
- Inflation adjustment? Cost of transatlantic call
 - 1970 cost \$3 per minute, \$5K buys 28 hours
 - 2013 cost \$0.06 per minute, \$46K buys 1.5 years



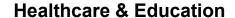
Life expectancy	US, at birth
Then	71
Now	79

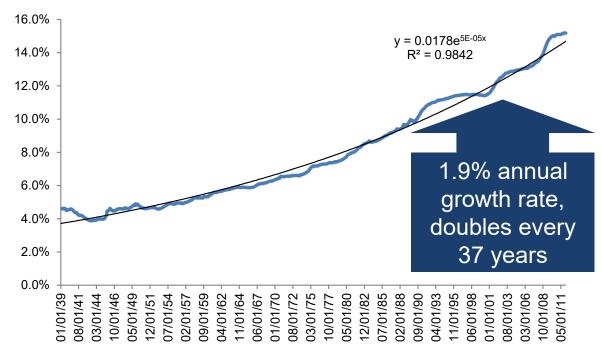
- Increase of 8 years in 43, or one year of longevity every five years
- Exacerbates problems of rich benefits

By 2050, People Age 65 and Older Will Equal 20% of the Population U.S. Population (and Forecast) by Age Category and Gender



Pensions & Healthcare	
Then	Company provided
Now	Personal responsibility





- Education
- Annuities
- Supplemental pensions
- Supplemental healthcare
- 30% of employment in health and education by 2050



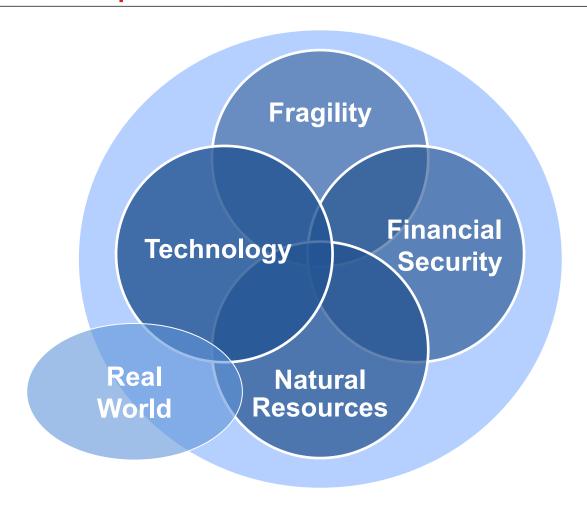
Trend in mega-liability events?	
Then	D&O, E&O new; asbestos a fine insulator
Now	BP, TEPCO \$50B+ events

Tort	Estimated Total Industry Incurred	Estimated Number of Claims	Estimated Average Per Claimant
Agent Orange	273,600,000	48,000	5,700
Asbestos	70,000,000,000	730,000	95,890
Fen Phen	21,100,000,000	63,000	334,921
IUD	1,000,000,000	161,000	6,211
Mold	360,000,000	16,000	22,500
Pollution - Chevron	1,000,000,000	30,000	33,333
Silicon Implants	2,869,000,000	19,000	151,000
Thalidomide	5,250,000,000	3,500	1,500,000
Tobacco	205,988,000,000	92,000,000	2,239
Welding Rod Fumes	35,000,000,000	70,000	500,000
Vioxx	10,000,000,000	50,000	200,000
Totals	352,840,600,000	93,190,500	3,786

- History of multi-occurrence, single cause mega-liability events in the \$10B-100B+ range
- Total \$350B comparable to Pilke estimate for tornado losses
- BP and TEPCO losses uniquely caused by single events, isolated in time



Insurance implications of future evolution





Natural resources

Concerns

Food

Water

Metals and minerals

Oil and gas

Insurance Implications

Crop

Products liability, GM seeds

Social unrest: riot, civil commotion, war



Technology improvements

Concerns

Paying for pension promises

Paying for health care promises

Achieving further global poverty reduction

Political stability

Ensuring energy and food resources – what is "fracking for food"

Insurance Implications

Achieving returns to support accumulation products

Capital strains from asset return shortfalls

Adverse regulatory activity from political scape-goating

Fewer government subsidies

...go well beyond insurance



Financial security

Concerns

Employment and income security

Retirement income

Healthcare

Debtors vs. creditors

Generational conflict

Insurance Implications

Full or supplemental private pensions

Full or supplemental health insurance

Elder care

Supplemental unemployment insurances

Low cost capital replacing equity capital via ILS



Fragility

Concerns

Tendency for rare, but catastrophic failure with improved "small risk" safety

Geomagnetic storm

Pandemic

Black Swan

Insurance Implications

Decreasing demand for standard insurance lines

Increased (unmet) need for capacity products

Product design and product relevance hard to maintain, quality of promise

Increased operational risk, e.g. Thailand flood

More surprises drive higher capital requirement and lower ROE; banks



Projected employment growth

Growth Rates by Insurance Related Occupation

Occupation	Median Pay (\$)	Number of Jobs	Growth 2010-20	Total Cost (\$B)	Pct P&C Premium
Meteorologists	87,780	9,500	11%	0.8	0.2%
Statisticians	72,830	25,100	14%	1.8	0.4%
Actuary	87,650	21,700	27%	1.9	0.4%
Underwriters	59,290	101,800	6%	6.0	1.2%
Claims Adjustor	58,460	290,700	3%	17.0	3.4%
Financial Analyst	74,350	236,000	23%	17.5	3.5%
Lawyer	112,670	728,200	10%	82.0	16.4%
Physicians and Surgeons	166,400	691,000	24%	115.0	23.0%

Source: Bureau of Labor Statistics

- Actuarial employment +27%
- Underwriter employment +6%
- Claims Adjustor employment +3%



The dark side of well-modeled risk

- Declining US loss to GDP since 1986: less "small risk"
- Capacity skewed almost exclusively to property = well-modeled
- Well-modeled = lower risk = lower return, not historic insurance norm
- Convergence with capital markets further reducing risk premium
- Take the hair off non-modeled risk to look more like modeled risk



The future dominated by pressing insurance needs...with concomitant modeling needs

Crop	Pensions income	Negative spreads		
Riot, civil commotion	Health insurance	Capital strains		
Capacity products	Elder care	Adverse regulatory activity		
Operational risk	Unemployment insurance	Government subsidies		
Low cost capital, ILS	 Success of natural catastrophe modeling can 			

- Surprises û capital ∜ROE
- Success of natural catastrophe modeling can be replicated in many of these domains
- Hazard/vulnerability/financial paradigm
- Data availability: 90% of stored data was created in last two years



Analytics: preparing and managing for the future

Accumulation

- Financial risk
- Non-diversifiable technology "beta"
- Policyholder behavior

Small Risk

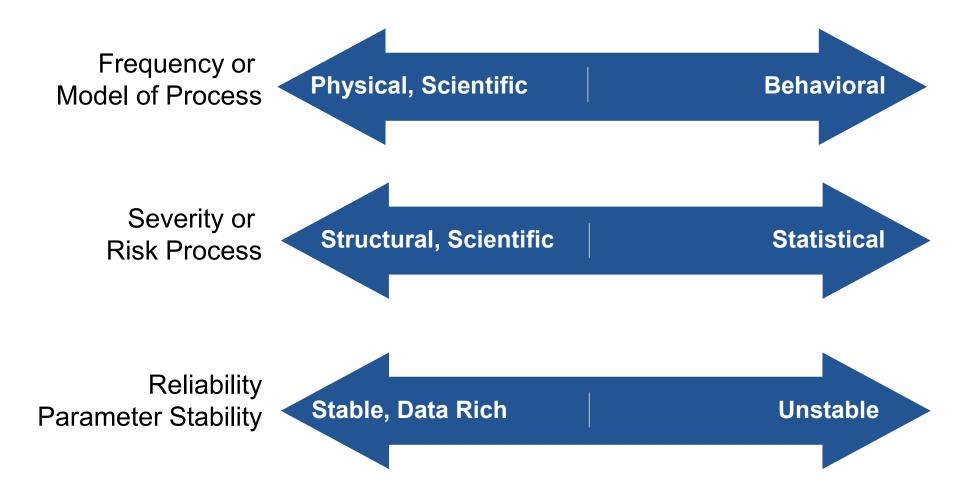
- Predictive modeling, big data, law of large numbers
- Automated underwriting
- Secular decline in volume; servicing vs. risk transfer
- Capital provider

Capacity

- Catastrophe risk, thick tails, low frequency
- Product design "Quality of promise" problem
- Secular growth in volume
- Capital consumer



Different modeling paradigms



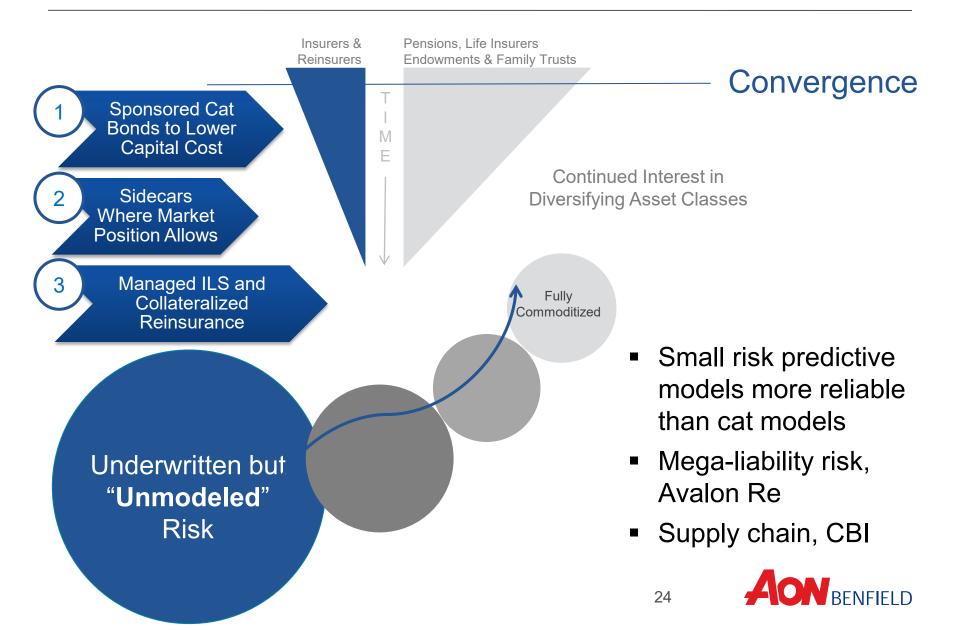


Risk and return vs. modeling paradigm

Peril	Data	Frequency	Severity	Reliability
Small Risk	"Big"	Statistical	Irrelevant	Very High
Natural Cat	Excellent	Conditional	Scientific	High
Accumulation	Excellent	Systemic	Contractual	Worrying
Mega-liability	Proprietary	Social science	Social science	Challenging
Supply chain	Obtainable	Varies	Varies	Promising
Terrorism	Obtainable	Social science	Scientific	Low

- Scientific: unchangeable, understood system
- Social science: changeable, reactive system
- Reliability: high = trumps management intuition, a currency

Convergence the Hairless Bear = broader view of "model"?



Terrorism modeling and capacity

Overall, marketplace terrorism risk insurance capacity has increased, and significantly in some forms. Nevertheless, capacity is constrained in some markets (e.g., high-risk geographic locations and properties), and some commercial insurance policyholders in highrisk urban areas have difficulty obtaining coverage with sufficient limits.

- The US State Department reported over 10,000 global terrorist attacks in 2011 in 70 Countries resulting in more that 12,500 deaths
- Seventy-five percent of the worlds terrorist attacks and deaths occurred in South Asia and the Near East
- Attempted attacks within the US have continued at an annual rate of between two and seven since 2001

Market participants
(policyholders, insurers, and reinsurers) remain uncertain about the ability of models to predict the frequency and severity of terrorist attacks.
Such views influence policyholder perception of risk and purchase decisions, as well as insurer and reinsurer capacity allocations.

Report of the **President's Working Group on Financial Markets**

Market Conditions for Terrorism Risk Insurance 2010



The analytic opportunity

- 90% of stored data created in last two years
- Social media, smart phones, micro-embedded GPS devices
- Big data modeling techniques and high powered computing
- Could understand network, contagion and system effects
- "Capital commoditization" of small risks and well-modeled risks
- The Right Analytic Balance takes the hair off the bear: art & science
- The Right Underwriting Balance for growth and equity capital returns



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