CAS Actuaries Working Overseas

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CAS Spring Meeting
Palm Beach, FL.
May 16, 2011

Liberty Mutual

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Agenda

- Work Life in Europe
- Liability Coverage in Europe compared to US
- Reinsurance Inflation Clause
- Solvency II

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Work Life in Europe

- When in a country with a different language, colleagues will speak English with you while they use their native language with their colleagues.
- Work customs are often different. In Europe, the local work culture may have different and often restricted hours (e.g., in Zurich, generally everyone leaves at 5pm. In Spain, there is a long mid-day break with evening work hours as late as 7pm)
- Overtime, regardless of project deadlines, may not be customary. You may have to adjust to projects taking longer than normal.
- On the other hand, due to the work hour issue, work and personal life are usually much more balanced
- In Europe, summer vacation time is customarily taken by everyone at the same time

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Work Life in Europe

- As a US actuary you will be used to having data to analyze
- Data systems and data availability may be much more limited (changing with Solvency II)
- Standard actuarial methods may not be possible
- Actuaries are considered mathematicians. In the absence of data, there is usually more emphasis on very theoretical and mathematical modeling in their analyses.

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EU Liability Insurance Coverages

Vary by country but some generalizations:

- Workers Compensation largely government provided
- Auto liability essentially unlimited
  - Example: Selby Train Crash in UK – Auto Liability Loss of £ 30 million – driver falls asleep goes off road onto a train track and causes two trains to derail, killing 10, injuring 82.
- Leads to index clause in excess of loss reinsurance (discuss later)

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EU Motor Liability Limits

	Bodily Injury	Property Damage
UK	Unlimited	£20,000,000
France	€ 300,000,000	€ 100,000,000
Germany	€ 50,000,000	Included w/BI
Italy	€ 50,000,000	Included w/BI
Spain	€ 50,000,000	Included w/BI
Switzerland	CHF 100,000,000	Included w/BI
Belgium	Unlimited	€ 1,250,000
Ireland	Unlimited	€ 115,000
Norway	Unlimited	NOK 3,000,000
Finland	Unlimited	€ 3,360,000

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Large European Auto Losses

Cost €	Location	Country	Year	Description
100,000,000	Mont Blanc Tunnel	France	1999	Volvo Truck caught fire in tunnel causing 39 deaths + multiple injuries, property damage and business interruption. MTPL + Product Liab + Tunnel Operator Liability
46,000,000	Selby Rail Crash	UK	2001	Driver fell asleep crashing his Land Rover through road barrier onto railway line. Passenger train hit Land Rover causing it to de-rail and collide with another oncoming freight train which also derailed. 13 deaths, 70 injured + property damage and BI
30,000,000	Tauren Tunnel	Austria	1999	Motor crash left 12 dead, 49 injured, PD and BI
23,000,000	Brenntag	Germany	1992	Chemical mistakenly unloaded by truck driver into wrong tank, causing explosion. 2 deaths and extensive PD and BI
20,000,000	Los Alfaques	Spain	1978	A tank truck exploded next to a camping site killing 150 and injuring 500
17,500,000	Birrell	UK	1994	23 year old student rendered tetraplegic
10,000,000	St. Gotthard Tunnel	Switzerland	2001	Collision between two trucks in tunnel caused fire and explosion. 11 deaths + PD + BI

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Mont Blanc Tunnel Disaster

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Selby Train Disaster

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EU Liability Insurance Coverages

Vary by country but some generalizations:

- General Liability less significant than US
  - Collective Redress (Class action) gaining traction but carefully controlled
  - Punitive damages rare, but changing
  - High Primary Limits, essentially unlimited compared to US coverage
  - Tail is shorter
- Liability premiums (non Motor) much lower than US
- What would be a huge liability loss in US may be a non-event in Europe
  - Example: SE Fireworks explosion in Enschede, Netherlands, in 2000. 177 tons of fireworks exploded, killing 23, injuring 947. The $302m of insured loss covered property and BI only.

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SE Fireworks Explosion in Netherlands

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EU Commercial Liability Premiums[1]

(USD Billions)

	Commercial Liability[2]	Total Non-Life	% Liability
US	77.2	492.9	15.7%
Europe (Top 5)	34.8	424.7	8.2%
Rest of World	30.0	667.4	4.5%

1. 2008 Data
2. Excludes Motor and WC but includes GL, E&O, D&O and Environmental

Source: Swiss Re, "Commercial Liability: a challenge for businesses and their insurers"

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EU Liability Class Action Process

Collective Redress (Class Action)

Distinction between European and US class actions

European Type of Class Action	US Class Action
– Class actions limited to small area of the law, in general	
– Opt-in procedure	– No restrictions in bringing class actions
	– Opt-out procedure
– Lead plantiff chosen by court	– "Beauty contest" of plaintiff counsels
– Pressure element on defendant not significant	– Widely used to exert pressure on defendant ("settlement class actions")
– Costs to be shared between plaintiffs	– Defense costs borne by defendant
– Recovery of costs only in case of winning trial	– No reimbursement of costs in case of winning trial

Source: Swiss Re

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EU Inflation Clauses (Reinsurance)

Unlimited (or effectively unlimited) Liability Insurance means inflation disproportionately affects reinsurer's excess layers

- Example: take a $10 million xs $10 million reinsurance layer and a $10 million claim in today's dollars. Assume the claim inflates to $15 million over the course of payment. Originally, $0 are ceded. With inflation, $5 million is ceded.
- Inflation clause attempts to return the proportion ceded to that expected at inception
- Usually index is tied to CPI. To the extent that the CPI does not track with claims inflation, there is basis risk for the cedent or reinsurer
- This clause typically not used in the US

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Reinsurance Index Clause

Attachment 10,000,000
Limit 10,000,000
Index Rate 4.0%

				No Index	European Index Clause (Full)					London Mkt Clause	
		Gross Loss Payments			PV Loss Payments						
Year	Index	Incremental	Cumulative	Ceded	Incremental	Cumulative	PV Ceded	% Ceded	Nominal Ceded	Trended Attach	Ceded
1	1.020	2,000,000	2,000,000	-	1,961,161	1,961,161	-	0.0%	-	10,198,039	-
2	1.061	2,000,000	4,000,000	-	1,885,732	3,846,893	-	0.0%	-	10,605,961	-
3	1.103	2,000,000	6,000,000	-	1,813,204	5,660,097	-	0.0%	-	11,030,199	-
4	1.147	2,000,000	8,000,000	-	1,743,465	7,403,563	-	0.0%	-	11,471,407	-
5	1.193	2,000,000	10,000,000	-	1,676,409	9,079,972	-	0.0%	-	11,930,263	-
6	1.241	2,000,000	12,000,000	**2,000,000**	1,611,932	10,691,903	691,903	6.5%	**776,554**	12,407,474	-
7	1.290	2,000,000	14,000,000	**4,000,000**	1,549,934	12,241,838	2,241,838	18.3%	**2,563,808**	12,903,773	**1,096,227**
8	1.342	2,000,000	16,000,000	**6,000,000**	1,490,321	13,732,159	3,732,159	27.2%	**4,348,518**	13,419,924	**2,580,076**
9	1.396	2,000,000	18,000,000	**8,000,000**	1,433,001	15,165,160	5,165,160	34.1%	**6,130,689**	13,956,721	**4,043,279**
10	1.451	2,000,000	20,000,000	**10,000,000**	1,377,886	16,543,046	6,543,046	39.6%	**7,910,328**	14,514,989	**5,485,011**

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What is Solvency II

- EU regulations on (re)insurance companies to be effective 1/1/2013, designed to facilitate a single insurance market in Europe, similar to the Basel II requirements for banks.
- Solvency Capital Requirement (SCR) imposes stiff solvency formula
- SCR is an "economic" solvency calculation that uses market pricing to value assets and liabilities
- SCR is based on the 99.5th percentile value at risk over 12 month horizon
- SCR can be based on a EU promulgated "standard formula" or a company derived "internal model" approved by regulators
- Requires standard deviations and fitted distributions for internal models. Promulgated factors are used for standard formula.

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What is Solvency II

- Huge value to developing internal models as shown in the required capital from the Fifth Quantitative Impact Study.
  - Companies ran both the standard formula and their internal models. Internal models gave a SCR €75 billion less than the standard formula increasing "own funds" from €114 billion to €197 billion
- Internal models require detailed data collection and data history
  - Many companies are scrambling to improve their IT/data warehouses
- Actuaries with ERM experience are in high demand

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Results of QIS 5

€ Billions	Own Funds Solv. I	Own Funds QIS 5	Increase in Surplus
Results Using Internal Models			
Large	109.4	129.5	18%
Medium	26.7	18.3	-31%
Small	64.3	49.5	-23%
All	200.4	197.4	-1%
Results Using Standard Formula			
Large	109.4	54.6	-50%
Medium	26.7	15.5	-42%
Small	64.3	43.6	-32%
All	200.4	113.7	-43%
Internal - Standard			
Large	0	74.9	137.2%
Medium	0	2.8	18.1%
Small	0	5.9	13.5%

Huge Incentive to use Internal Models

Enterprise Size: Large: Assets > € 90 billion, Small: Assets < € 30 Billion

Source: EIOPA Report on the fifth Quantitative Impact Study for Solvency II

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Cost of Solvency II

- Implementation Costs:
  - Lloyd's £ 250 million
  - Multi-National UK companies £100 million
  - Total of all companies > € 3 billion
- High Annual Maintenance Costs:
  - Lloyd's £ 60 – 70 million per year
  - Regulator Fees, in the UK alone, £ 500 million per year to be assessed on UK companies

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Solvency II
Development of Technical Provisions

Technical Provision = Best Estimate Liability + Market Value Margin

$TP = [\sum BEL(i)] + MVM$

BEL(i) = E(Paid Loss in Year i)

- SCR = Value at Risk at the 99.5th percentile of the BEL
- $MVM = \sum_t 6\% * SCR_t/(1+r_t)^{-t}$
  - Cost of Capital assumed to be 600bp over risk free rate
  - SCR_t = run-off SCR at year-end t years in future
  - r_t = risk free rate for t duration (off yield curve)
- "Market Value" = price that a reinsurer would require to assume the cedent's liabilities = BEL + MVM

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Solvency II
Market Value When Portfolio Distressed

- No Correlation Scenario: expected future payments in years 2,…,n are unaffected by a payment in year 1 that falls into the 99.5th percentile
  - SCR, as originally calculated, is sufficient to provide BEL and MVM – portfolio can be transferred to a reinsurer at end of year
- Correlation Scenario: expected payments in years 2,…,n increase when the payment in year 1 is higher than expected
  - Parameter risk – misestimation of expected value. New estimate is revised upward
  - Higher than expected BEL(2), BEL(3),…,BEL(n) → Higher SCR(2),…,SCR(n) → Higher MVM(2),…,MVM(n)
  - SCR (1) needs to be augmented by ΔT(2),…,ΔT(n) in order to have sufficient funds to transfer portfolio to reinsurer at end of year

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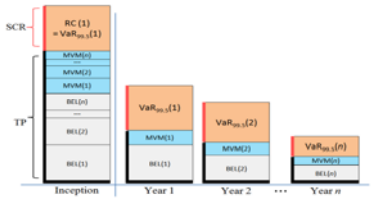
Solvency II
Illustration of SCR – No Correlation



BEL(n) = E[L(n)], L(n)=Paid loss in Year n

Source: Insurware, "The One-Year Risk Horizon"

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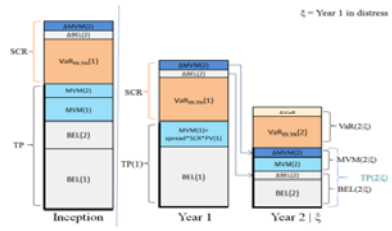
Solvency II
SCR – Correlation of Future Payments



$SCR = VaR_{99.5\%}(1) + \Delta TP(2) + \Delta TP(3) + ... + \Delta TP(n)$

Source: Insurware, "The One-Year Risk Horizon"

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Solvency II

Reserve Risk

- SCR_t is the 99.5th percentile of the BEL remaining at year t (run-off basis)
- Takes on a new value at each year-end as portfolio runs off
- Difficult to model. Actuaries have the skill set
- Can use factors determined by CEIOPS by LOB and member state if using the standard formula

Premium Risk

- Inforce Policies + Policies written over the next 12 months
- Discounted combined ratio approach
  - Recognizes profit immediately
  - Recognizes loss on a discounted basis

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Solvency II - Reinsurance

Benefit of Excess of Loss Reinsurance is not fully reflected using the standard formula

- Standard formula fits lognormal to historical gross and net results to derive the 99.5th VaR
  - Lognormal may not fully reflect the tail of the distribution
- Many contract features disqualify incorporation of reinsurance
  - Limited or no reinstatements
  - Loss limiting features: Annual Aggregate Deductible, Aggregate limits, sliding scale ceding commissions, sublimits
- Historical reinsurance programs may differ significantly from going forward programs
- Full reflection allowed in Internal Model

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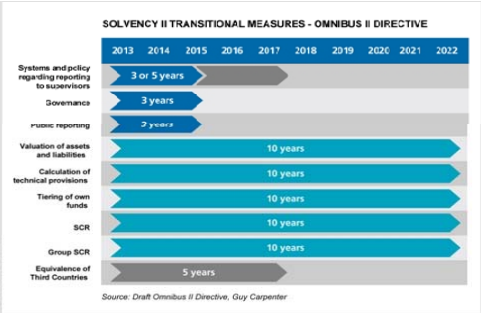
Solvency II – Implementation Timeline



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