



Historical P&C Dependencies in Context

Reserve and Underwriting Risk - An Industry Viewpoint

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To Be Discussed

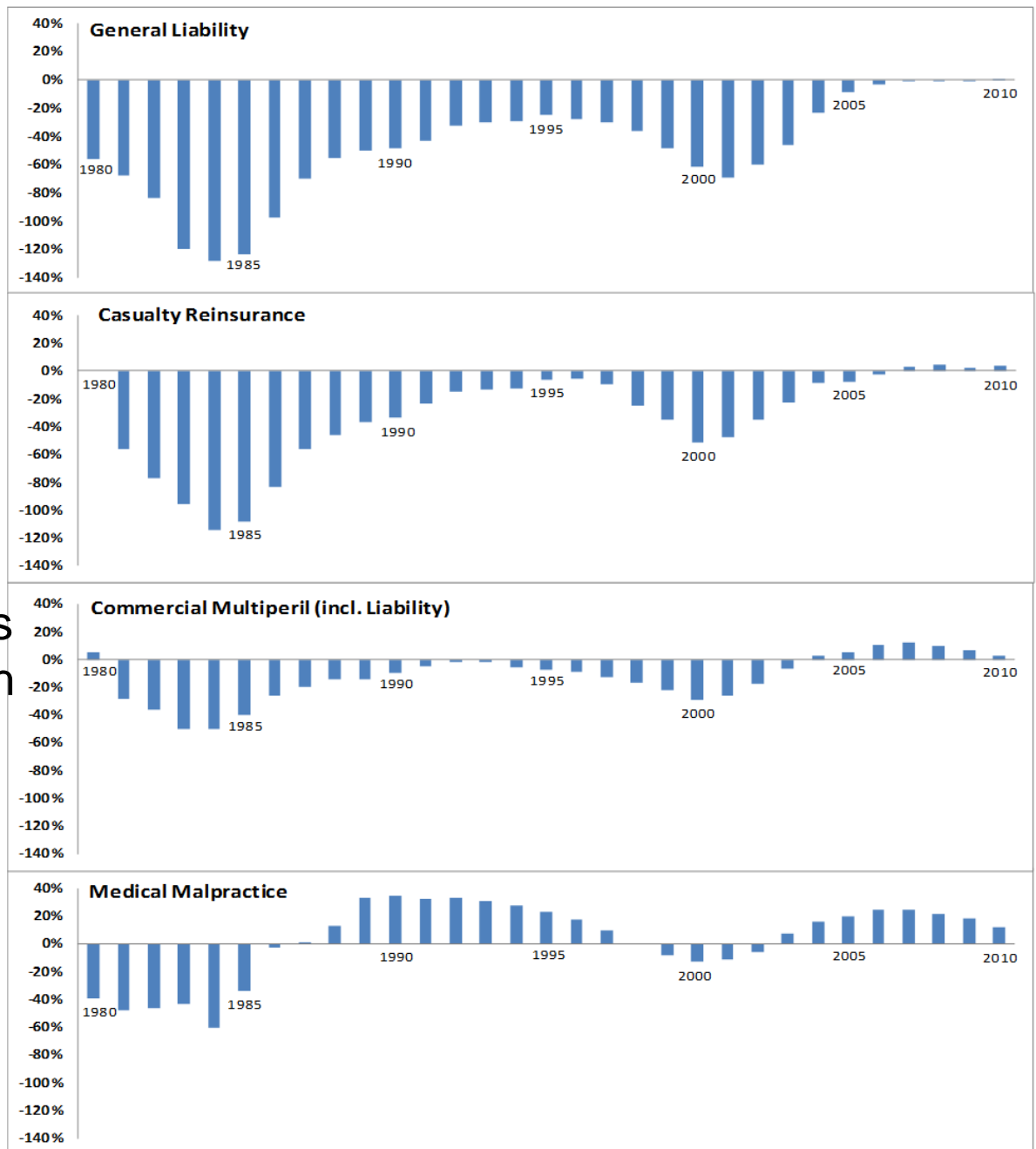
- The Data Set
- Reserve Risk – Historical Dependencies
- Underwriting Risk – Historical Dependencies
- Drivers
- Historical Loss Ratio Correlation – the Numbers
- Historical Loss Ratio Variability and Correlation – A Visual Representation
- Conclusions
- Questions / Discussion
- Appendix – our Hypothesis and Contact Details

Our Data Set

- 31 years of US insurance industry schedule P data (1980-2010)
 - Incorporating reserve development through year-end 2012
- Net reserve data – organized by year of financial statement
- Gross underwriting data – organized by accident year
- Mostly by annual statement line of business; have combined some similar lines
 - General Liability (“GL”) includes:
 - Other Liability – Occurrence Coverage
 - Other Liability – Claims Made Coverage
 - Products Liability – Occurrence Coverage
 - Products Liability – Claims Made Coverage

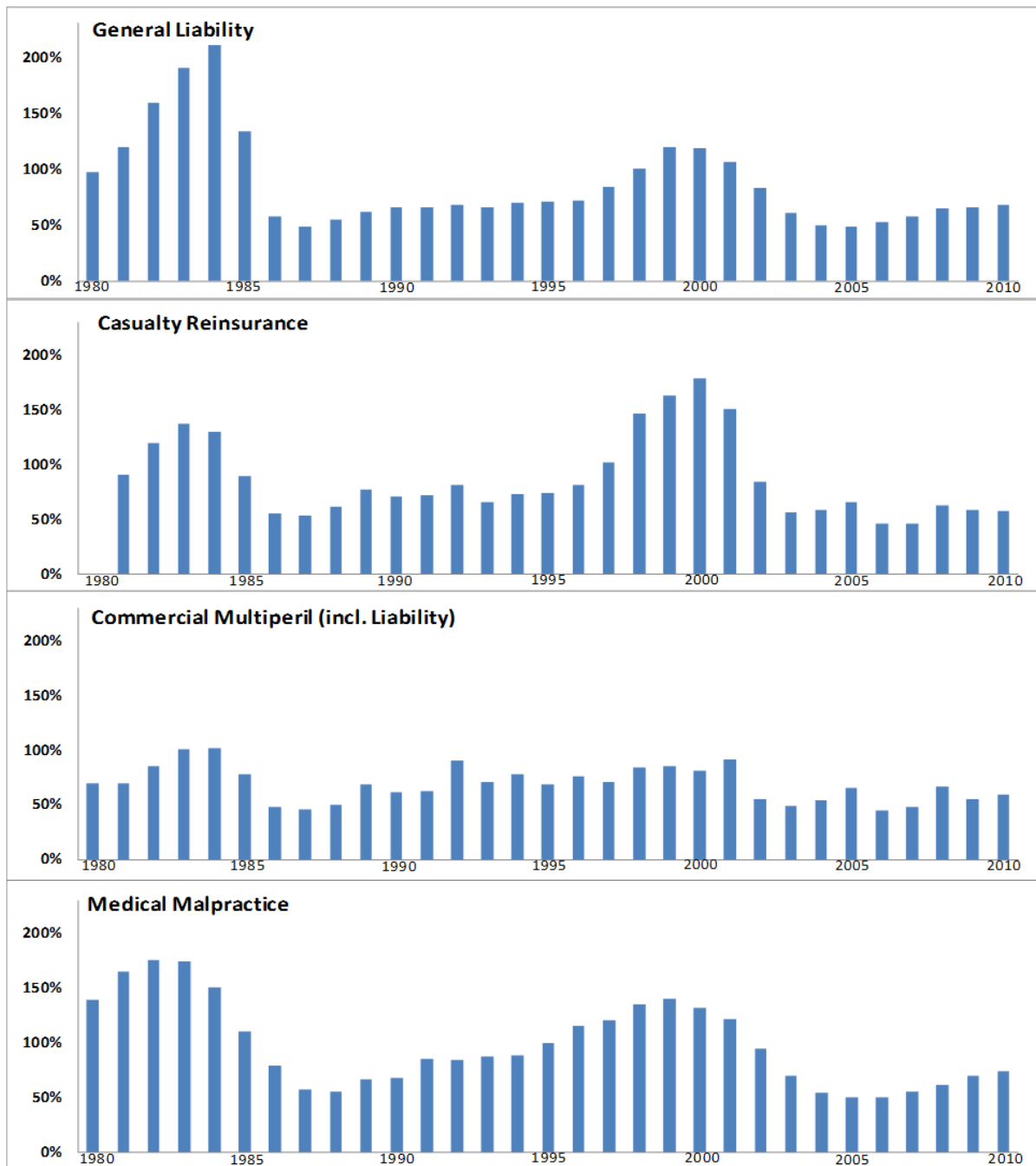
Net Reserve Development

- % redundancy / (inadequacy) in the original booked year-end reserves is displayed
- GL and Casualty Reinsurance reserves were booked as much as -125% inadequate in mid-1980s
- Most casualty lines highly correlated; medical malpractice less so



Gross Accident Year Loss Ratios

- Gross casualty LRs were highest in the early 1980s; again spiked around 2000
- All major casualty lines are at least 50% correlated with GL
- Property lines also positively correlated with GL, but in a range of 10-25%



Common Drivers

- External socio-economic drivers affected many lines similarly
 - Inflation
 - Interest rates
 - High rates at times contributed to under-pricing, leading to under-reserving
 - Tort liability costs (including asbestos/pollution)
 - Special liability issues (municipal crisis, construction defect)
- Internal industry drivers also at work
 - Underwriting cycle leading to over/under-pricing/reserving
 - Increased role of actuary throughout period
 - Requirements to hold reserves at best estimate, in total and by line
 - Sarbanes-Oxley
- MedMal not immune
 - In fact, it experienced its crises in the 1970s
 - By the 1980s, separate transformations were underway (conversion to claims-made coverage; bed-pan mutual/offshore captives)

Historical Loss Ratio Correlation – the Numbers

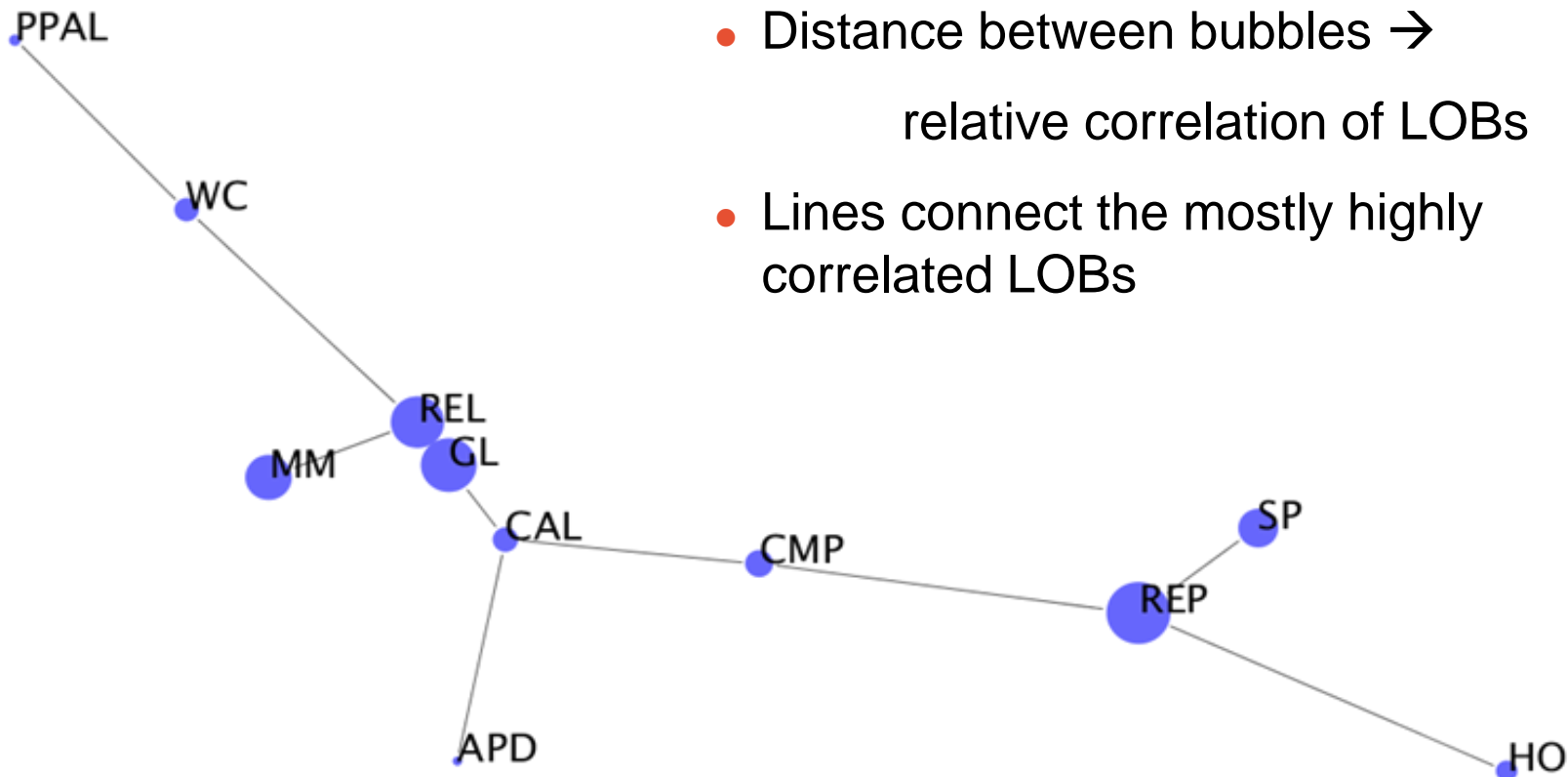
**Table 2: Commercial Lines Historical Loss Ratio Correlation
Accident Years 1980-2010, Unadjusted**

	REL	MM	CMP	CAL	WC	PPAL	HO	SP	REP	Average
All years	0.96	0.86	0.78	0.92	0.52	0.52	0.10	0.10	0.25	0.56
1994-2003	0.98	0.86	0.70	0.82	0.98	0.73	0.17	0.26	0.53	0.67
Difference	0.03	(0.00)	(0.08)	(0.10)	0.46	0.21	0.07	0.16	0.29	0.11

- Correlations of AY loss ratios with GL line of business
- Generally higher in strong UW cycle years
 - Supports the use of variable dependency parameters (e.g., copulas)

Historical Loss Ratio Variability and Correlation – A Visual Representation

- Size of bubble → Variability of LR
- Distance between bubbles → relative correlation of LOBs
- Lines connect the mostly highly correlated LOBs



Credit to the software used to create this graph must be given to Kimmo Soramaki and his website: <http://www.fna.fi/>

Conclusions

- Historical industry LOB performance is highly correlated
 - Highest when the UW cycle is most prevalent, but always high, particularly among liability lines
 - Higher than many models contemplate, especially if assuming independence
- Common drivers influence both UW and reserve risk
 - Common liability drivers
 - Pricing, the UW cycle, and “herd mentality” influence both
- Your modeling may benefit from industry correlation benchmarks
 - Should be adjusted for your situation
 - Using your data in isolation, especially if low correlation is indicated, may lead to understated aggregate volatility
- Diversification benefits may be overstated

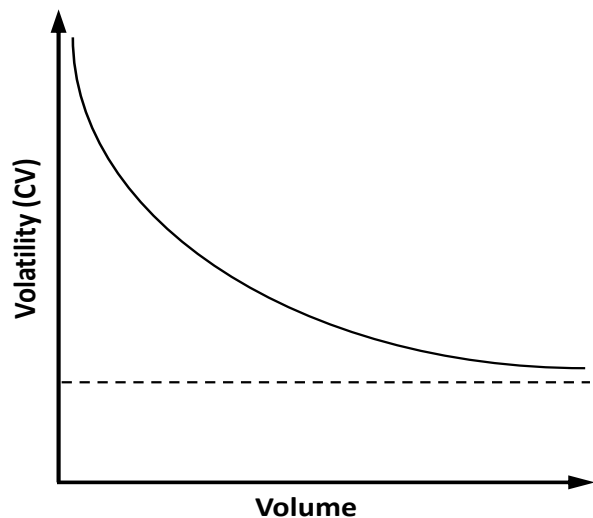
Questions / Discussion



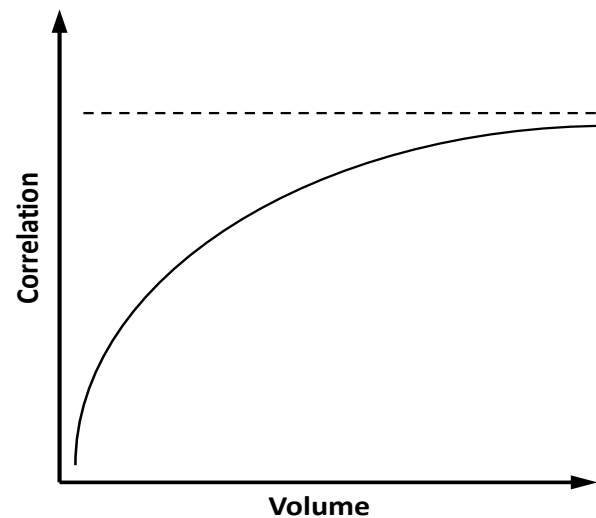
Appendix – Our Hypothesis: Volume's Influence on Dependency

Figure 1: The influence of volume on volatility and dependency

(a) Sample volatility decreases with volume, as unsystematic risk (i.e., noise) is diversified away, leaving only systematic risk



(b) Sample correlation increases with volume, as unsystematic risk (i.e., noise) is diversified away, exposing systematic correlation



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