



CP Risk Solutions, LLC

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Application of Simulation Modeling

Enterprise Risk Management

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Prepared by
Lina Cheung, FSA, MAAA, FCA
Partner
lina@cprisksolutions.com
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About CP Risk Solutions, LLC

CP Risk Solutions, LLC is a consulting risk management company, servicing clients on a wide spectrum of accident and health products. We help our clients manage risks and achieve optimal financial results using financial and medical expertise.

Principals:

Lina Cheung, FSA, MAAA, FCA

Mary Pozuelo, RN, LHRM, CMS



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Enterprise Risk Management

- Risk categories for insurance companies
 - Operational Risk
 - Insurance Risk
 - Market Risk
 - Credit Risk

- Presentation Focus – Insurance Risk



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Risk management Process

- Risk Identification
- Risk Quantification
- Enterprise Tolerance and Limits
- Risk Modeling
- Hedging



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Case Study

- A small insurance company has a major medical policy with huge risk exposure relative to the insurer's capital size.
- The policy covers the group up to \$800,000 per individual after the group pays for the first \$200,000 for each individual.
- The claim experience of this group in the earlier policy periods was unstable. Great return in one year and significantly damaging to the insurance company's capital position in another, despite a 50% quote share reinsurance already in place.
- The insurance company wanted to employ its capital and made a return (i.e. renew the group) and preserve its capital to not fall below the Insurance Department's watch list.



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Risk Management Process

- Risk Identification
 - Examine the insurer client's total portfolio risk exposure and correlation risks
 - Low volatility risk
 - Minimal or no correlation risk
 - Exception: this major medical stop loss policy
- Risk Quantification
 - Model the expected risk and volatility risk of this policy
 - The policy's own experience
 - Expected known claims
 - Empirical experience
- Enterprise tolerance and limits
 - Assess company's expectation, internal and external requirements
 - Determine the tolerable level of the aggregation risk
- Risk Modeling
 - Set parameters based on outcome from the Risk Quantification process
 - Scenario test using @ Risk simulation
- Hedging
 - Devise a strategy to preserve the insurer client's capital beyond the tolerable level



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Considerations

- Insurer's capital
- Premium revenue
- Ceding Commission from quota share reinsurance
- Maximum exposure per life
- Number of lives with claims approaching or exceeding \$200,000
- Claims severity of those whose claims approach or exceed \$200,000
- Medical trend rate
- Known medical conditions
- Cost of reinsurance (covering the intolerable risk)



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Model Parameters and Assumptions

	Expected or Current Position	
Client's capital position	\$15,000,000	
Premium Revenue	\$3,240,000	
Quote share reinsurance %	50%	
Ceding Commission % (charging to quota share reinsurer)	10%	
Ceding Commission \$ (charging to quota share reinsurer)	\$162,000	
50% of Estimated Administrative Expenses and Taxes	\$139,100	
Number of Lives	20,000	
Maximum exposure per life per coverage period	\$800,000	



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Model Parameters and Assumptions

If Medical Trend were 12%	Expected	CV
Claim frequency/20,000 lives	17	53%
Claim severity	\$114,187	33%
4 Known Medical Conditions	\$768,000	30%-75%

If Medical Trend were 15%	Expected	CV
Claim frequency/20,000 lives	21	44%
Claim severity	\$118,508	41%
4 Known Medical Conditions	\$810,000	25%-55%



MODEL DEMONSTRATION



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Model Outcome

- If Medical Trend were 12%,

Expected Profit after FIT		147,629	
ROE		14%	
Percentile	Number of Claims	Total Claims Net of Quota Share Reinsurance	Capital Position
5th	8	609,208	15,581,485
10th	8	687,792	15,530,405
15th	12	746,739	15,492,089
20th	9	799,666	15,457,687
25th	11	849,997	15,424,972
30th	13	901,695	15,391,368
35th	15	950,601	15,359,579
40th	14	1,001,855	15,326,264
45th	15	1,052,370	15,293,430
50th	14	1,102,400	15,260,910
55th	14	1,161,329	15,222,606
60th	16	1,224,877	15,181,300
65th	16	1,289,643	15,139,202
70th	18	1,367,239	15,088,765
75th	20	1,458,146	15,029,675
80th	21	1,560,697	14,943,103
85th	23	1,698,206	14,805,594
90th	28	1,894,176	14,609,624
95th	36	2,200,735	14,303,065
96th	33	2,312,852	14,190,948
97th	40	2,446,345	14,057,455
98th	43	2,650,804	13,852,996
99th	49	2,999,710	13,504,090

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Model Outcome

- If Medical Trend were 15%,

Expected Profit after FIT		(71,482)	
ROE		-7%	
Percentile	Number of Claims	Total Claims Net of Quota Share Reinsurance	Capital Position
5th	10	790,868	15,463,406
10th	12	894,374	15,396,127
15th	18	968,028	15,348,252
20th	11	1,032,956	15,306,049
25th	18	1,099,026	15,263,103
30th	21	1,157,078	15,225,369
35th	16	1,215,230	15,187,571
40th	17	1,275,042	15,148,693
45th	18	1,332,679	15,111,229
50th	20	1,390,379	15,073,723
55th	23	1,460,073	15,028,422
60th	26	1,528,899	14,974,901
65th	23	1,604,813	14,898,987
70th	28	1,682,473	14,821,327
75th	23	1,785,490	14,718,310
80th	27	1,892,255	14,611,545
85th	32	2,038,585	14,465,215
90th	36	2,244,103	14,259,697
95th	40	2,553,954	13,949,846
96th	41	2,662,794	13,841,006
97th	38	2,779,749	13,724,051
98th	45	3,002,644	13,501,156
99th	48	3,330,157	13,173,643

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Business Decision

- Very concerned about having another bad year
- Risk Management perception to rating agencies and insurance departments.
- Don't want to lose the opportunity of potentially making over \$145,000 in profit
- Wanted to eliminate the risk at the tail

- Solution:
 - Hedge the tail risk via aggregate reinsurance!
 - Aggregate Reinsurance needs to provide meaningful risk protection
 - 5% or less probability that capital will fall 5%
 - Aggregate Reinsurance Premium needs to be affordable, i.e., much less than the expected profit
 - Minimum premium in the open market is generally \$100,000
 - high compared to expected profit
 - value of the aggregate reinsurance protection must be significant
 - Able to obtain \$1,000,000 aggregate coverage from an A rated reinsurer for \$100,000 with an aggregate attachment at \$1,700,000 on the company's retained share.

MODEL
DEMONSTRATION
With
Aggregate Reinsurance



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Model Outcome with Aggregate Reinsurance

- If Medical Trend rate were 12%
 - Expected profit dropped from \$147,629 to \$135,580
 - ROE dropped from 14% to 13%
 - Probability of a net loss increased from 22% to 28% *due to cost of aggregate insurance*
 - Probability of capital could drop 5% or more decreased from 5.5% to 0.7%

- If Medical Trend rate were 15%
 - Expected profit increased from a negative \$71,482 to a negative \$25,727
 - ROE increased from a negative 7% to a negative 2%
 - Probability of a net loss dropped from 42% to 49% *due to cost of aggregate insurance*
 - Probability of capital could drop 5% or more decreased from 9.8% to 1.4%



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Model Outcome with Aggregate Reinsurance

- If Medical Trend were 12%,

Expected Profit after FIT					135,580
ROE					13%
			Total Claims Net of Quota Share and Aggregate	Total Claims Net of Quota Share and Aggregate	Capital Position
Percentile	Number of Claims	Reinsurance	Reinsurance	Reinsurance	Capital Position
5th	8	609,208	709,208	709,208	15,516,485
10th	8	687,792	787,792	787,792	15,465,405
15th	12	746,739	846,739	846,739	15,427,089
20th	9	799,666	899,666	899,666	15,392,687
25th	11	849,997	949,997	949,997	15,359,972
30th	13	901,695	1,001,695	1,001,695	15,326,368
35th	15	950,601	1,050,601	1,050,601	15,294,579
40th	14	1,001,855	1,101,855	1,101,855	15,261,264
45th	15	1,052,370	1,152,370	1,152,370	15,228,430
50th	14	1,102,400	1,202,400	1,202,400	15,195,910
55th	14	1,161,329	1,261,329	1,261,329	15,157,606
60th	16	1,224,877	1,324,877	1,324,877	15,116,300
65th	16	1,289,643	1,389,643	1,389,643	15,074,202
70th	18	1,367,239	1,467,239	1,467,239	15,023,765
75th	20	1,458,146	1,558,146	1,558,146	14,945,654
80th	21	1,560,697	1,660,697	1,660,697	14,843,103
85th	23	1,698,206	1,798,206	1,798,206	14,705,594
90th	28	1,894,176	1,800,000	1,800,000	14,703,800
95th	36	2,200,735	1,800,000	1,800,000	14,703,800
96th	33	2,312,852	1,800,000	1,800,000	14,703,800
97th	40	2,446,345	1,800,000	1,800,000	14,703,800
98th	43	2,650,804	1,800,000	1,800,000	14,703,800
99th	49	2,999,710	2,099,710	2,099,710	14,404,090

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Model Outcome with Aggregate Reinsurance

- If Medical Trend were 15%,

Expected Profit after FIT					(25,727)
ROE					-2%
Percentile	Number of Claims	Total Claims Net of Quota Share Reinsurance	Total Claims Net of Quota Share and Aggregate Reinsurance	Capital Position	
5th	10	790,868	890,868	15,398,406	
10th	12	894,374	994,374	15,331,127	
15th	18	968,028	1,068,028	15,283,252	
20th	11	1,032,956	1,132,956	15,241,049	
25th	18	1,099,026	1,199,026	15,198,103	
30th	21	1,157,078	1,257,078	15,160,369	
35th	16	1,215,230	1,315,230	15,122,571	
40th	17	1,275,042	1,375,042	15,083,693	
45th	18	1,332,679	1,432,679	15,046,229	
50th	20	1,390,379	1,490,379	15,008,723	
55th	23	1,460,073	1,560,073	14,943,727	
60th	26	1,528,899	1,628,899	14,874,901	
65th	23	1,604,813	1,704,813	14,798,987	
70th	28	1,682,473	1,782,473	14,721,327	
75th	23	1,785,490	1,800,000	14,703,800	
80th	27	1,892,255	1,800,000	14,703,800	
85th	32	2,038,585	1,800,000	14,703,800	
90th	36	2,244,103	1,800,000	14,703,800	
95th	40	2,553,954	1,800,000	14,703,800	
96th	41	2,662,794	1,800,000	14,703,800	
97th	38	2,779,749	1,879,749	14,624,051	
98th	45	3,002,644	2,102,644	14,401,156	
99th	48	3,330,157	2,430,157	14,073,643	

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Questions?

Contact Information:

Lina Cheung

lina@cprisksolutions.com

212-580-0564

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