Benchmarking Effectiveness of P&C Claim Cost Management

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Agenda

1. Overview of the Study
   - Background of the Study
   - Claim Review System
2. Performance Metric
   - Steps of Building a Performance Metric
   - Illustration of Proposed Metric

Background of the Study

- Goldenson Center for Actuarial Research was invited to incorporate mathematical rigor into claim review process by a leading insurance consulting firm.
- Because academically and actuarially rigorous methods cannot be developed without a platform to collect and analyze both qualitative and quantative information of claims, we started the study by developing a claim review system.
- Claim review system was designed to review claims from following lines of business.
  - General Liability
  - Auto
  - Medical Malpractice
  - Construction Defects
  - Workers Compensation
  - Property
- This research is an independent and ongoing study preceded by the development of the claim review system.

Baseline Claim Handling Categories

General Liability	Auto
Assignment/Notification	Assignment/Notification
Coverage Verification	Coverage Verification
Contact	Contact
Investigation	Investigation
Damages Verification	Property Damages Verification
Damages Evaluation	BI Damages Verification
Exposure Evaluation	Exposure Evaluation
Follow Up and Case Control	Reserving
Reserving	Litigation
Litigation	Settlement
Settlement	Recovery/Offsets
Supervision	Supervision
Vendor Management	Vendor Management

Key Information Gathered from Review

- Claim overall and each baseline category rated using code below.
  - **ME** - Meets or exceeds the best practices standards.
  - **NI** - Needs improvement.
  - **UN** - Unsatisfactory.
  - **NA** - Not applicable to the claim being reviewed.
- Potential Savings Opportunities
  - Record by entering dollar amount of overpayments for both losses and expenses
  - Categorize into two types of savings:
    - **Hard** - Amounts are clearly excessive and leave little room for dispute
    - **Soft** - Amounts derived through professional judgment of the reviewer

Unmet Business Need

- Insurers trying to grow maket share through competitive differentiation are interested in comparing own performance in the claim cost management against it's close competition.
- Despite huge interest, there is no baseline performance metric in the industry or in the literature.

Measuring Effectiveness of Claim Cost Management

- Is best practices = effective claim cost management?
- **Key Performance Indicator:** Percentage of claims that overall handling were done in accordance with industry best practices (MEPctOverall).
- Proposed performance metric features an index called **Standard Index** that quantifies the performance.
  - Weighted average of claim management performance indicators
  - Relevant performance indicators are identified from a GLM fitted to MEPctOverall with a gamma error structure and log link function.
  - Multiplicative property of log link function is used to calculate relative weights correspond to significant performance incicators.

    If we choose link function $g(x) = \ln x$ then $g^{-1}(x) = \exp(x)$ results in

$$\begin{aligned}\mu_i &= g^{-1}(X_i\beta)\\ &= g^{-1}(\beta_1 x_{i1} + \beta_2 x_{i2} + \ldots + \beta_p x_{ip})\\ &= \exp(\beta_1 x_{i1}).\exp(\beta_2 x_{i2}) \ldots \exp(\beta_p x_{ip})\end{aligned}$$

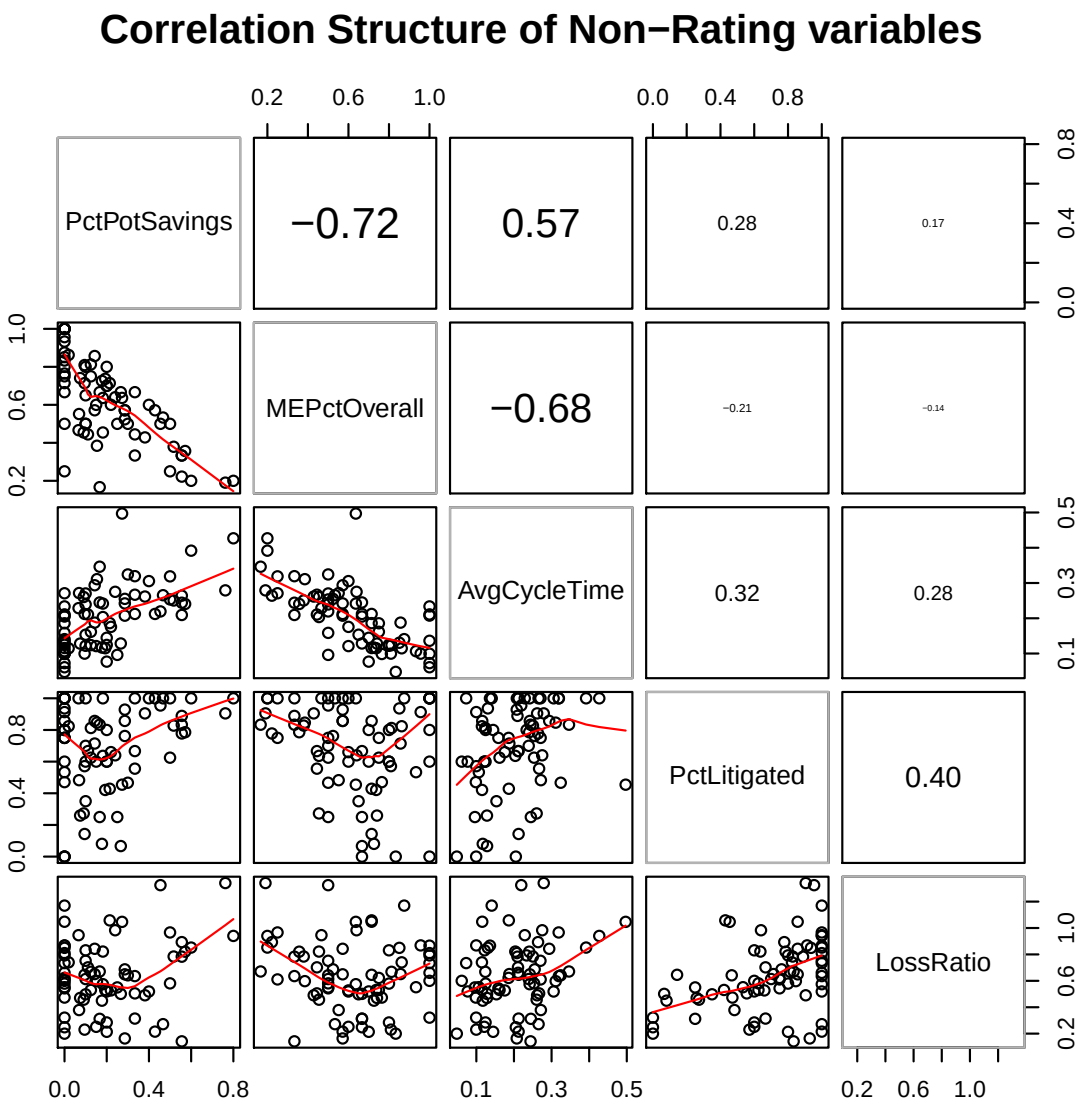
  - Values of **Standard Index** are normalized to the range $[0, 100]$ to ensure consistent comparisions.

Data Characteristics

- Due to inherent differences among lines of business in P&C business, a seperate analysis is required for each line of buiness.
- Under 6 different lines of business, data for following variables were gathered by accident year.
  - **MEPctOverall**: Percentage of claims where overall standard met industry best practice standard
  - **PctPotSavings**: Percentage of claims with potential savings
  - **PctLitigated**: Percentage of claims litigated
  - **AvgCycleTime**: Average cycle time as a percentile in the range of claim cycle times
  - **LossRatio**: Loss & LAE/Earned Premium (derived from SNL financials database)
  - For each baseline category, Percentage of claim a given baseline category was handled in accordance with industry best practice standard

    For Comparision purposes
  - **Class**: classified group based on type of organization, size of the insurance business, and regions it operates
- All numerical variables are defined on the same scale such that their range is $[0\%, 100\%]$.

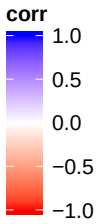
GL Data Exploration



GL Data Exploration - Contd

Correlations Between Rating Variables

MEPctSup	0.16	0.03	−0.01	0.57 *	0.25 *	0.25 *	0.15	0.06	0.48 *	0.31 *	0.51 *	−0.02
0.16	MEPctSet	0.55 *	0.15	0.24 *	0.28 *	0.28 *	0.42 *	0.51 *	0.1	0.12	0.01	0.47 *
0.03	0.55 *	MEPctLit	0.07	0.22	−0.08	−0.08	0.37 *	0.36 *	−0.03	0.05	−0.21	0.53 *
−0.01	0.15	0.07	MEPctRes	0.31 *	0.14	0.14	0.38 *	0.32 *	0.24 *	−0.01	−0.05	0.43 *
0.57 *	0.24 *	0.22	0.31 *	MEPctFCC	0.31 *	0.31 *	0.42 *	0.38 *	0.62 *	0.36 *	0.48 *	0.32 *
0.25 *	0.28 *	−0.08	0.14	0.31 *	MEPctEE	1 *	0.1	0.08	0.29 *	0.27 *	0.3 *	−0.04
0.25 *	0.28 *	−0.08	0.14	0.31 *	1 *	MEPctDE	0.1	0.08	0.29 *	0.27 *	0.3 *	−0.04
0.15	0.42 *	0.37 *	0.38 *	0.42 *	0.1	0.1	MEPctDV	0.62 *	0.16	−0.06	0.05	0.62 *
0.06	0.51 *	0.36 *	0.32 *	0.38 *	0.08	0.08	0.62 *	MEPctInv	0.4 *	0.17	0.05	0.59 *
0.48 *	0.1	−0.03	0.24 *	0.62 *	0.29 *	0.29 *	0.16	0.4 *	MEPctCont	0.53 *	0.68 *	0.17
0.31 *	0.12	0.05	−0.01	0.36 *	0.27 *	0.27 *	−0.06	0.17	0.53 *	MEPctCV	0.57 *	−0.03
0.51 *	0.01	−0.21	−0.05	0.48 *	0.3 *	0.3 *	0.05	0.05	0.68 *	0.57 *	MEPctAN	−0.06
−0.02	0.47 *	0.53 *	0.43 *	0.32 *	−0.04	−0.04	0.62 *	0.59 *	0.17	−0.03	−0.06	MEPctOverall



Final GLM fitted to General Liability

- Iterative regression procedures and professional judgement was used to select the final set of explanatory variables in the GLM.

	Estimate	**Std. Error**	**t-value**	**Pr($>\|t\|$)**	
Intercept	-0.9343	0.2060	-4.535	2.50e-05	***
PctPotSavings	-0.8912	0.1556	-5.729	2.71e-07	***
AvgCycleTime	-0.7382	0.3471	-2.127	0.0372	*
MEPctLit	0.1829	0.1000	1.830	0.0718	.
MEPctDV	0.3581	0.1621	2.208	0.0307	*
MEPctSet	0.1806	0.1212	1.490	0.1411	.
MEPctRes	0.1545	0.1444	1.070	0.2886	
MEPctInv	0.1253	0.1600	0.783	0.4364	

Structure of Performance Metric

Let index $l = 1, \ldots, 6$ indicate lines of business General Liability, Auto, Medical Malpractice, Construction Defects, Workers Compensation and Property respectively. Letting S_l be an sub index for line of business l, we define

$$\textbf{Standard Index} = \sum_{l=1}^{6} e_l S_l$$

where e_l is the percentage of earned premiums of the line of business l.

$$S_l = \text{Max}\left(\sum_{i=1}^{m_l} c_{li} x_{li}, 0\right)$$

where

m_l = number of regressor variables in the final GLM fitted under line of business l

c_{li} = weight given to the ith covariate x_{li} in the final GLM fit

$$c_{li} = \frac{\exp(\beta_0 + \beta_i) - \exp(\beta_0)}{\sum_{i=1}^{m_l} [\exp(\beta_0 + \beta_i) - \exp(\beta_0)]} = \frac{\exp(\beta_i) - 1}{\sum_{i=1}^{m_l} |\exp(\beta_i) - 1|}$$

Illustration

Scenario:

- The companies A and B write GL and Auto coverages.
- Both companies have nationwide operations and their distribution channels include a similar network of agents.
- The challenge here is to determine which company performs better when it comes to claim cost management.
- The table given below lists out few of the key statistics revealed from the conducted claim reviews.

Company	General Liabilitiy		Auto	
	MEPctOverall	Loss Ratio	MEPctOverall	Loss Ratio
A	81%	62%	82%	60%
B	62%	79%	92%	57%

- It seems company A peforms better when managing General Liability claims, company B performs better when managing Auto claims.
- In overall, which company performs better in the area of claim cost management?

Illustration

LOB	Variable	A	B
General Liability	% of Earned Premium	48	84
	MEPctOverall	81	62
	PctPotSavings	10.75	27.43
	AvgCycleTime	10.41	19.63
	MEPctLit	96	92
	MEPctDV	100	98.57
	MEPctSet	88.24	75
	MEPctRes	92.86	64.29
	MEPctInv	83.86	72.29
Auto	% of Earned Premium	52	16
	MEPctOverall	82	92
	LossRatio	60.48	57.23
	PctPotSavings	12.75	4.25
	MEPctCV	100	100
	MEPctInv	78.75	97.92
	MEPctLit	82.43	94.12
	MEPctRes	71.43	86.48
Standard Index		46%	36%

Future Improvements

- Weights c_{ij}s used in the illustration are based of 13 different companies. A sufficiently large data set that can represent whole P&C insurance industry should be used to recalculate them.
- Investigate what other variables that could be used as a performance indicators in Standard Index.

Thank You