Errors in Claim-level Loss Reserving: Evidence from Medical Malpractice Claims

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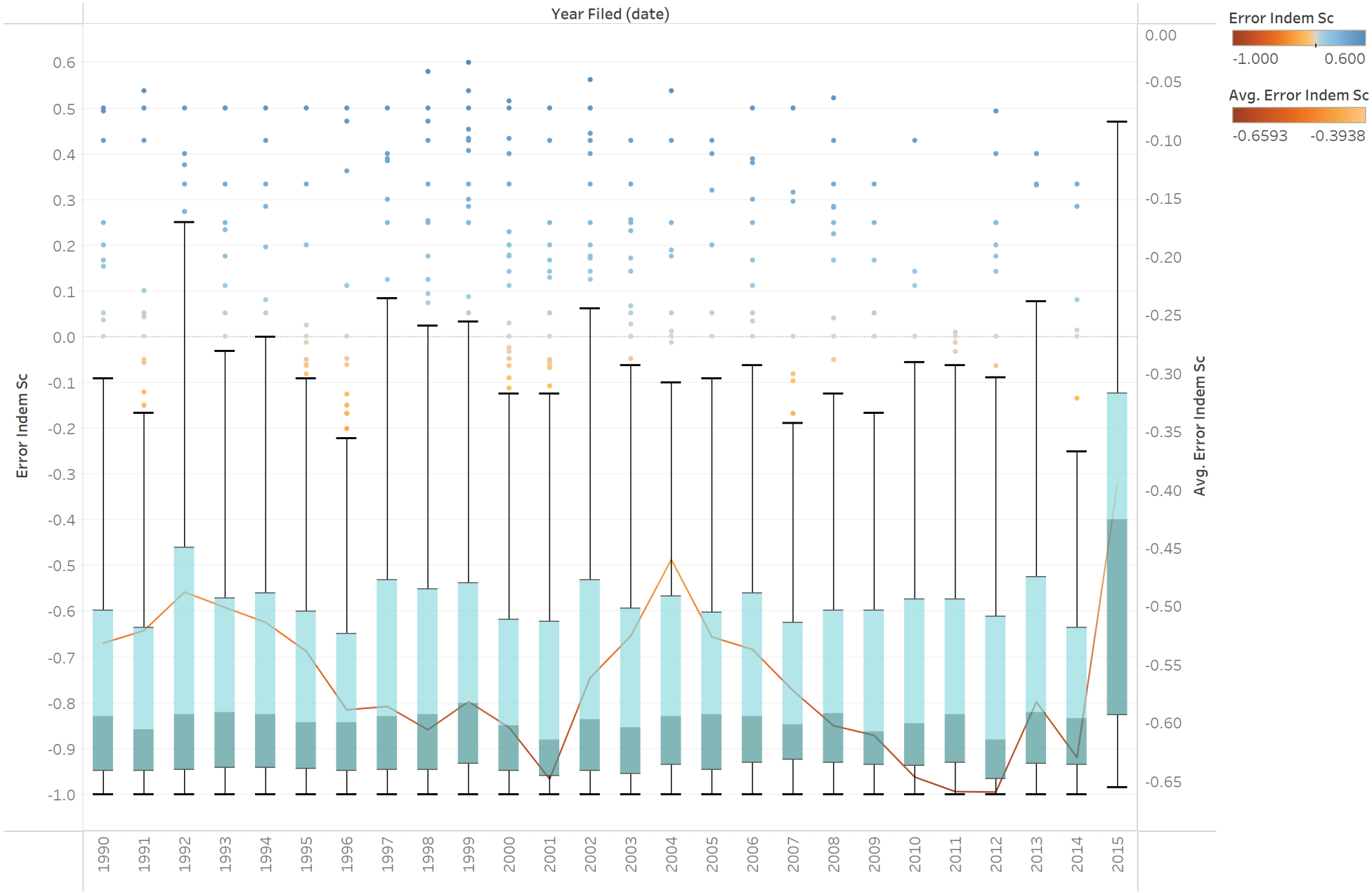
Motivation

- Relevant historic losses are used to establish estimates of expected losses and adequacy of premium rates
- Insurers hold an estimated amount in a reserve for claims
  - Development of reserves provides input into rate-setting process
  - Reserves that exhibit significant errors can affect adequacy of premiums
    - A smooth-functioning insurance market relies on adequate premiums
- Rate setting in liability lines, such as medical malpractice, is complicated by delays in insurer's ability to capture the actual loss associated with a claim, which stem from:
  - Duration of medical treatment
  - Duration of legal proceedings

Reserve errors over time

Sheet 1



The trends of Error Indem Sc and average of Error Indem Sc for Year Filed (date) Year. For pane Error Indem Sc: Color shows details about Error Indem Sc. For pane Average of Error Indem Sc: Color shows average of Error Indem Sc. The data is filtered on Year Filed, which ranges from 1990 to 2015. The view is filtered on Error Indem Sc, which ranges from -1.000 to 0.600.

Research Questions

- What types of claims are most problematic for insurers?
  - Difficult to forecast → inaccurate rates → market failure
- What are the main sources of uncertainty that can explain why insurers don't accurately estimate ultimate loss payments?
  - Are awards for certain types of injury more difficult to forecast?
  - Is a longer time to resolution associated with larger adjustments to reserves?
  - What role does the legal stage of resolution play?
- Why do we care if insurers are not accurate in establishing reserves?

Background

- Loss reserves are the largest single account for most P/C insurers
- Prior research focuses on aggregate loss reserve errors
  - Claim-level determinants of errors are implied, but not evaluated
- Insurers have considerable discretion
  - Accounting literature argues that firms opportunistically set loss reserves to achieve financial or regulatory goals, e.g., earnings management, tax avoidance
- Non-discretionary determinants of errors
  - Variation in distribution of past claims
  - Unanticipated changes in economic conditions, e.g., medical costs
  - Unanticipated regulatory or legal decisions

Hypotheses

H1: *Reserve errors will be larger the more uncertain the medical consequences of the injury.*

H2: *Reserve errors will be larger the longer it takes to resolve the claim.*

H3: *Reserve errors will be larger for claims for which a lawsuit is filed versus claims that are settled out of court.*

Research Design—Data

- Texas Department of Insurance Closed Claims Database
  - Bodily injury claims between 1988 and 2015
- Keep only claims with payments of $25,000 or more
  - “Long form” claims
- 22,723 claims for medical malpractice insurance

Claim Reserve Error

- In general, a reserving error compares the initial estimate to the "ultimate" losses
  - Studies examining aggregate, insurer-level reserves use loss development triangles
  - Typically use five-year development periods
- We have reporting on the initial and final indemnity reserve:

$$Indemnity\ Error_i = \frac{Initial\ Indemnity\ Reserve_i - Final\ Indemnity\ Reserve_i}{Final\ Indemnity\ Reserve_i}$$

Research Design—Error Determinants

$$Abs(Indemnity\ Error)_i = \psi \boldsymbol{X}_i + \epsilon_{i,t}$$

- Estimate using ordinary least squares (OLS)
  - Positive values indicate less initial accurate reserve estimates
  - Estimate separately for the four lines of business

- Include a set of control variables for injury types (e.g., death, eye injury)
- Include natural log of days from reported to settled and whether claim ever entered the court system
- Other controls related to insurance policy characteristics

Results:
Dependent Variable = Abs(Reserve Error)

N=22,723

	Estimate	Standard Error	P-value
Entered_system	**0.0443**	**0.0108**	**0.0000**
Ln(Policy Limit)	**0.0067**	**0.0027**	**0.0115**
occ	**-0.0851**	**0.0055**	**0.0000**
diff_county	**-0.0274**	**0.0094**	**0.0035**
MULTIDEF	**-0.0221**	**0.0052**	**0.0000**
Age of injured party	**-0.0005**	**0.0001**	**0.0000**
Death	**0.0226**	**0.0056**	**0.0001**
Amputation	0.0177	0.0156	0.2570
Burns_all	-0.0039	0.0216	0.8553
Pois_all	**0.0848**	**0.0253**	**0.0008**
Eye	0.0276	0.0155	0.0758
Resp_cond	0.0230	0.0210	0.2725
Nerv_cond	0.0130	0.0285	0.6490
hearing	0.0297	0.0285	0.2966
circ_cond	0.0209	0.0194	0.2806
multiple	**0.0344**	**0.0158**	**0.0291**
back	-0.0022	0.0151	0.8835
skin	-0.0038	0.0243	0.8746
Brain	**0.0915**	**0.0084**	**0.0000**
Scarring	**-0.0271**	**0.0158**	**0.0855**
Spinal	**0.0845**	**0.0132**	**0.0000**
ln_time_repins_closed	**0.0544**	**0.0054**	**0.0000**
ln_inhousedef	**0.0124**	**0.0014**	**0.0000**
ln_outsidedef	**0.0130**	**0.0011**	**0.0000**
set_at_limit	**-0.5368**	**0.0080**	**0.0000**
medinflation	-0.0103	0.0239	0.6658
Constant	0.0604	0.0483	0.2106

Conclusions

- Our three hypotheses are confirmed
- We extend the literature on understanding claim-level non-discretionary factors affecting loss reserve errors
- Our findings raise further questions:
  - Should insurers settle sooner?
  - What information, if any, would help reduce the size of errors?

Thank You!