Workers Compensation Tail

A Practical Approach

A presentation to Casualty Loss Reserve Seminar

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Mortality based using actual data

- Limited data
  - Companies could provide incremental data, but not cumulative since inception
    - One sample had payments and claim counts with payments
    - Other, just payments
    - Oldest claim is from accident year 1930 (avg. weekly benefit = $10)

- Approach - remove impact of mortality from persistency factors and then estimate what's left
  1. Estimate persistency (decay) factors
  2. Remove mortality and reselect
  3. Calculate tail "annuity" value
  4. Estimate incremental % paid in last valuation of triangle as a percentage of cumulative paid
  5. Calculate tail development factors

Example

- Pension claim book
- Indemnity losses only
  - No escalation
  - Case reserves calculated using model that discounts at 3.5%

1a. Persistency factors – valuations 30 to 80 years

- Persistency (decay) factor defined as:
  - $pf_{a,v}$ = (calendar year paid loss)$_{a,v+1}$ ÷ (calendar year paid loss)$_{a,v}$
    - where *a* is accident year, and *v* is valuation

Incremental Paid Losses

Accident Year	Paid during calendar year: 2006	2007	2008	2009	2010	2011	Valuation (at 12/11)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	
1942	776	787	458	-	-	-	70
1943	970	-	-	-	-	-	69
1944	(523)	624	624	624	624	648	68
1945	2,587	**965**	**783**	664	642	642	67
1946	655	655	1,021	397	457	812	66

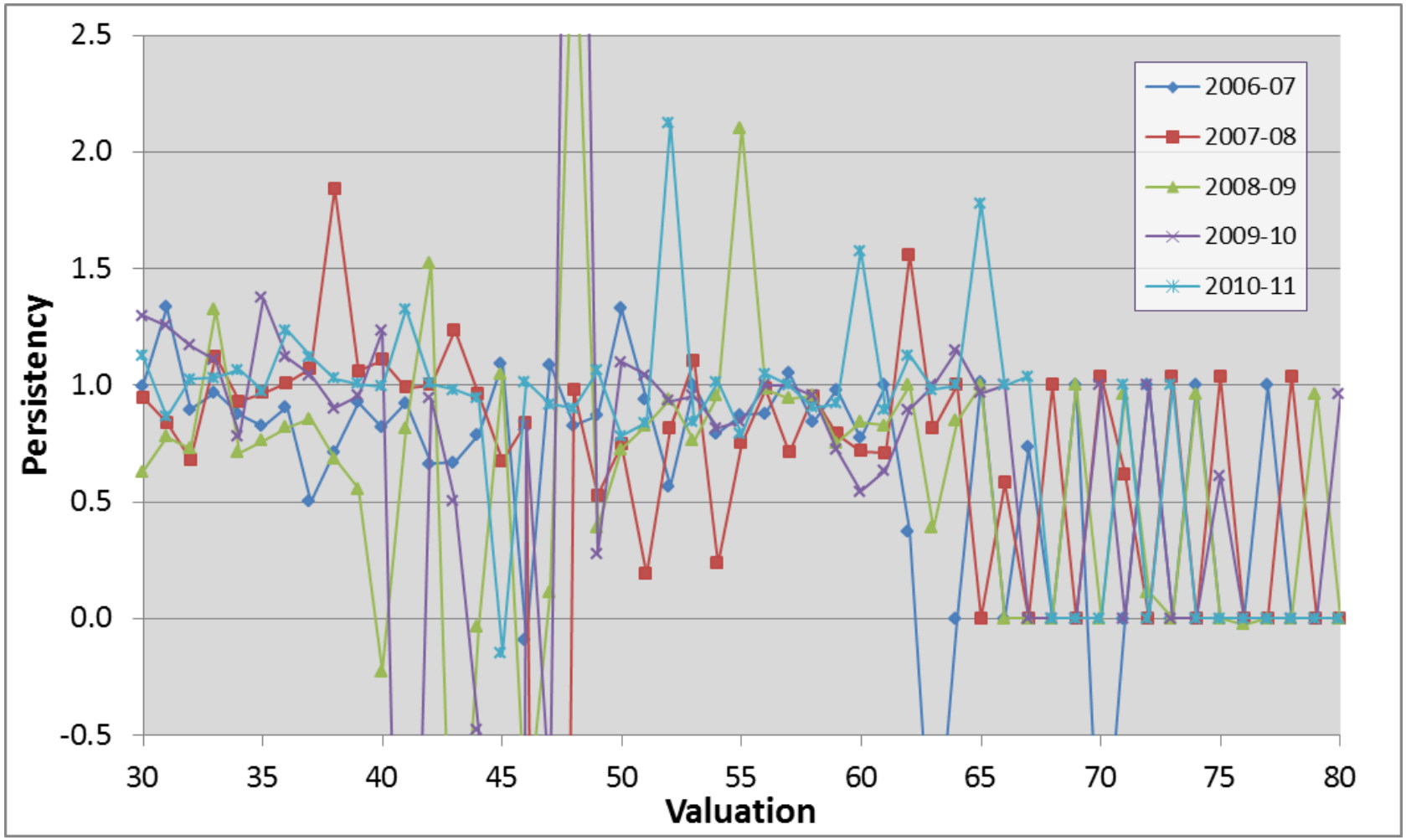
783 ÷ 965 = 0.812

No escalation, $pf_{a,v} > 1$ or $pf_{a,v} < 0$ implies data issues

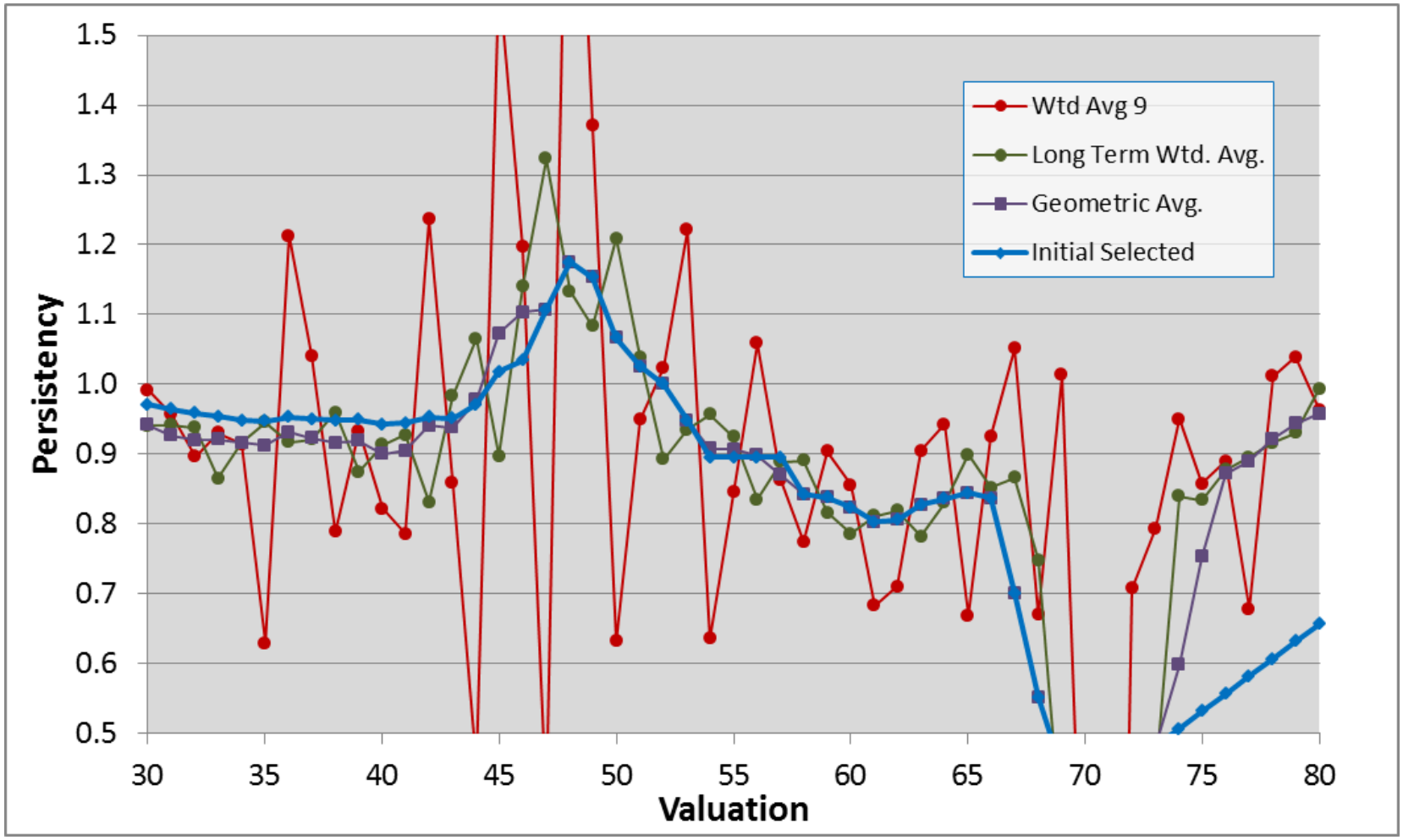
Persistency Factors

Valuation	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	Wtd Avg 9	Long Term Wtd Avg 5	Geometric Average	Initial Selected
(1)	(2)	(2)	(3)	(4)	(5)	(6)	(7)	(9)	(10)	(11)
66 - 67	0.000	--	0.582	--	1.000	1.000	0.926	0.851	0.837	0.837
65 - 66	1.000	1.013	--	1.000	0.967	1.779	0.669	0.899	0.845	0.845
64 - 65	0.885	0.000	1.000	0.848	1.149	1.000	0.942	0.830	0.835	0.835
63 - 64	-1.048	-1.192	**0.812**	0.389	1.000	0.982	0.905	0.782	0.827	0.827
62 - 63	0.911	0.373	1.559	1.000	0.895	1.128	0.710	0.819	0.805	0.805

1b. Persistency – valuations 30 to 80 years



1c. Average Persistency factors



2a. Re-estimation of persistency factors

- Requires selection of age at valuation = 0

	Persistency Factors				
			Selected Remainders		
Valuation	Initial Selected	Mortality	Initial (2)/(3)	Final	Total (3) x (5)
(1)	(2)	(3)	(4)	(5)	(6)
30-31	0.970	0.987	0.983	0.988	0.975
31-32	0.964	0.986	0.978	0.980	0.966
32-33	0.959	0.984	0.974	0.975	0.960
33-34	0.953	0.983	0.970	0.972	0.955
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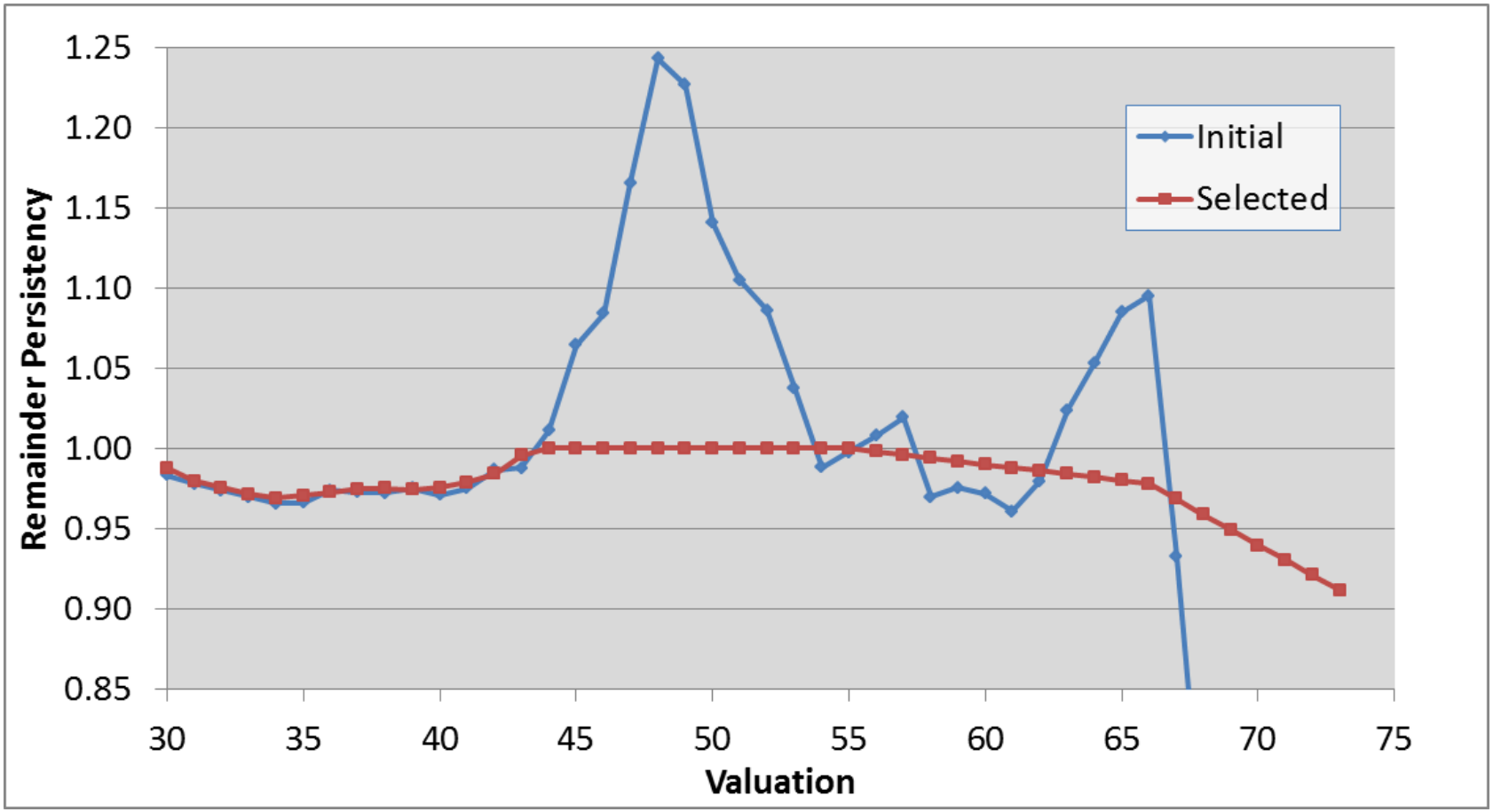
70-71	0.357	0.715	0.499	0.940	0.672
71-72	0.321	0.705	0.455	0.930	0.656
72-73	0.385	0.695	0.553	0.921	0.640
73-74	0.481	0.685	0.702	0.912	0.625

2. Persistency excluding mortality



3. Estimation of tail annuity value

	Persistency Factors						
			Selected Remainders				
Valuation	Initial Selected	Mortality	Initial (2)/(3)	Final	Total (3) x (5)	Cumulative	Discounted at 3.5%
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
30-31	0.970	0.987	0.983	0.988	0.975	1.000	0.983
31-32	0.964	0.986	0.978	0.980	0.966	0.966	0.917
32-33	0.959	0.984	0.974	0.975	0.960	0.927	0.851
33-34	0.953	0.983	0.970	0.972	0.955	0.886	0.785
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70-71	0.357	0.715	0.499	0.940	0.672	0.006	0.002
71-72	0.321	0.705	0.455	0.930	0.656	0.004	0.001
72-73	0.385	0.695	0.553	0.921	0.640	0.003	0.001
73-74	0.481	0.685	0.702	0.912	0.625	0.002	0.000
(9) Total (average adjusted annuity value from 30 years)						**16.29**	**11.39**

4. Selection of values at start of tail

Accident Year	Ratio of Incremental Paid in Year 30 to Cumulative Paid	Ratio of Cumulative Reported in Year 30 to Cumulative Paid
(1)	(2)	(3)
1977	1.6%	120.6%
1978	1.4%	120.3%
1979	1.6%	118.3%
1980	1.7%	121.4%
1981	1.9%	120.1%
1982	1.8%	120.7%
Selected	1.8%	120.5%

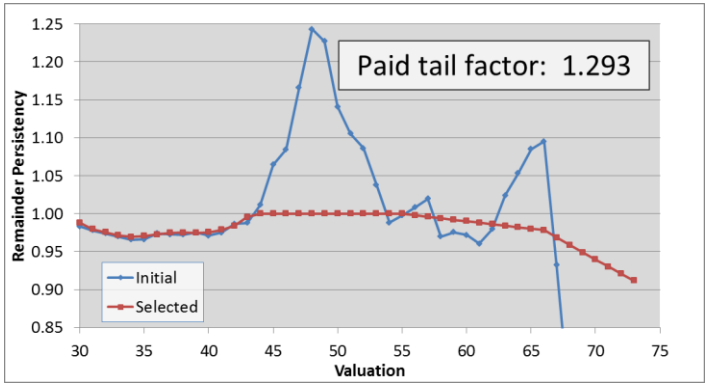
5. Estimation of tail development factor

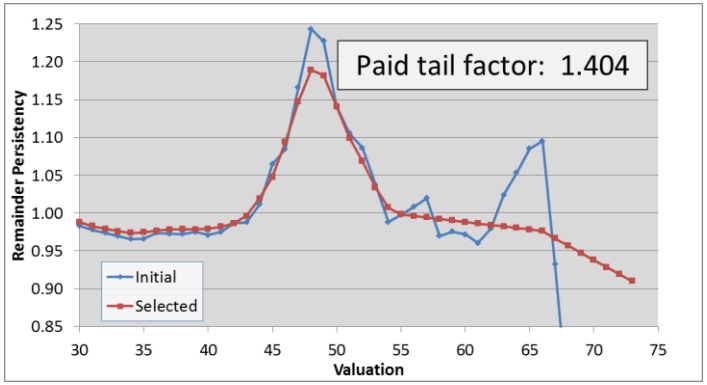
	Nominal (7)	Discounted at 3.5% (8)
(9) Total (average adjusted annuity value from 30 years)	**16.29**	**11.39**
(10) Average incremental paid in year 30 (as a % of cumulative paid)	1.8%	1.8%
(11) Expected future payments [(9)x(10)]	29.3%	20.5%
(12) Average expected paid through 30 years (as a % of cumulative paid)	100.0%	100.0%
(13) Average Reported to 30 years (as a percentage of cumulative paid)	120.5%	120.5%
(14) Average paid on closed at 30 years (% of paid)		
(15) Factors for 30 to ultimate		
(a) Paid [1+(11)/(12)]	**1.293**	**1.205**
(b) Reported [((11)+(12))/(13)]	**1.073**	**1.000**

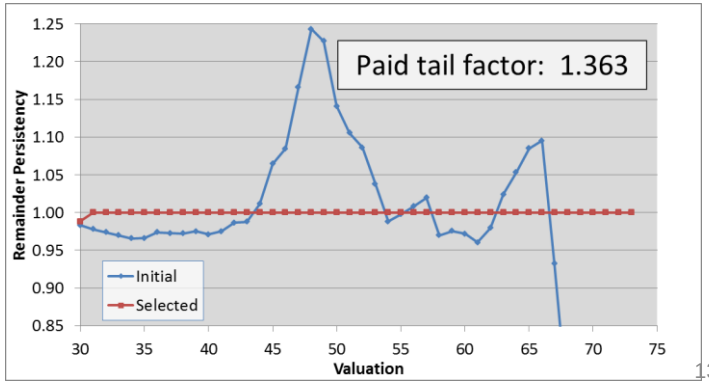
Sensitivity to assumptions

- Selected persistency factors
  - Especially for earlier valuations
  - Dropping values at $v > 66$ moves tail 0.001
- Mortality assumptions
  - Shifts remainder persistency factors
- Ratios at start of tail
  - A lot of leverage given annuity values at 30 years of 15.0 to 19.0
  - 2.0% incremental to cumulative paid ratio implies a tail of 1.372

Persistency factors excluding mortality







Summary

- Only needs incremental calendar year by accident year data
- Can select to obtain indemnity discounted reported tail of 1.000
- For medical, can remove inflation and put back at another rate
- Can also use “paid” claim counts and severity