European actuarial academy

an initiative of the 'Deutsche Aktuarvereinigung', the Dutch 'Actuarieel Genootschap', the 'Schweizerische Aktuarvereinigung' and the 'Aktuarvereinigung Österreichs'

Reserving in Non-life insurance

Case evaluations

Case 1

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Case 1

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Two different incremental payments possible

Incremental payments

	Ci1	Ci2	Ci3	Ci4	Ci5	Ci6	Ci7	Ci8	Ci9	Ci10
i=1998	5,012	106	3,410	5,655	1,092	1,513	557	1,351	3,133	2,063
i=1999	3,257	4,179	5,582	5,900	8,473	4,932	3,463	5,596	2,262	4,125
i=2000	2,638	1,111	4,881	4,211	6,271	5,257	6,926	6,165	3,364	3,858
i=2001	898	5,270	2,268	5,500	6,333	1,233	1,368	3,552	2,373	2,721
i=2002	1,734	3,116	2,594	2,159	3,786	2,917	2,114	2,861	1,911	2,192
i=2003	2,642	1,817	3,479	2,658	225	1,797	1,636	2,214	1,479	1,696
i=2004	1,828	- 103	649	984	1,098	740	674	912	609	698
i=2005	599	673	603	900	907	612	557	753	503	577
i=2006	54	535	397	474	477	322	293	396	265	304
i=2007	172	154	220	262	264	178	162	219	147	168

Incremental payments

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Original incremental payments transposed

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Results of different incremental payments identical:

Cash flow and discounted reserve projections

	Cash flow	Risk Free Interest	Discounted Reserves
2008	17,501	3.50%	16,910
2009	13,069	3.52%	12,195
2010	8,871	3.55%	7,989
2011	5,725	3.58%	4,974
2012	3,529	3.60%	2,957
2013	1,760	3.61%	1,423
2014	1,061	3.61%	828
2015	450	3.61%	339
2016	168	3.61%	122
	Total discounted reserve		47,737

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Standard chainladder is translation invariant!

Is this right?

Case 2

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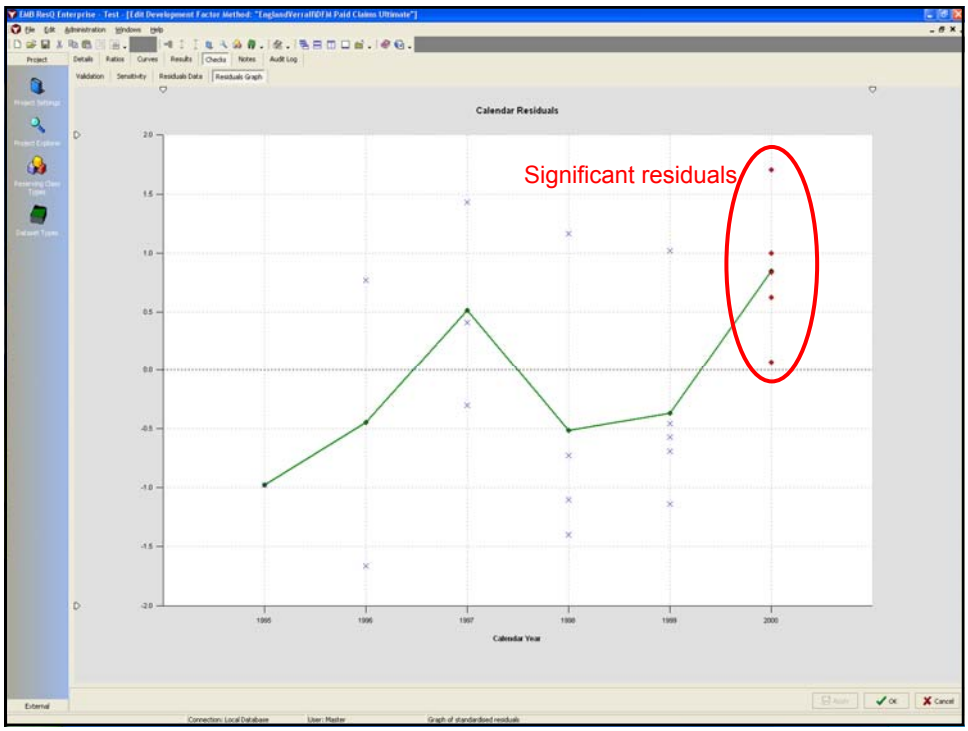
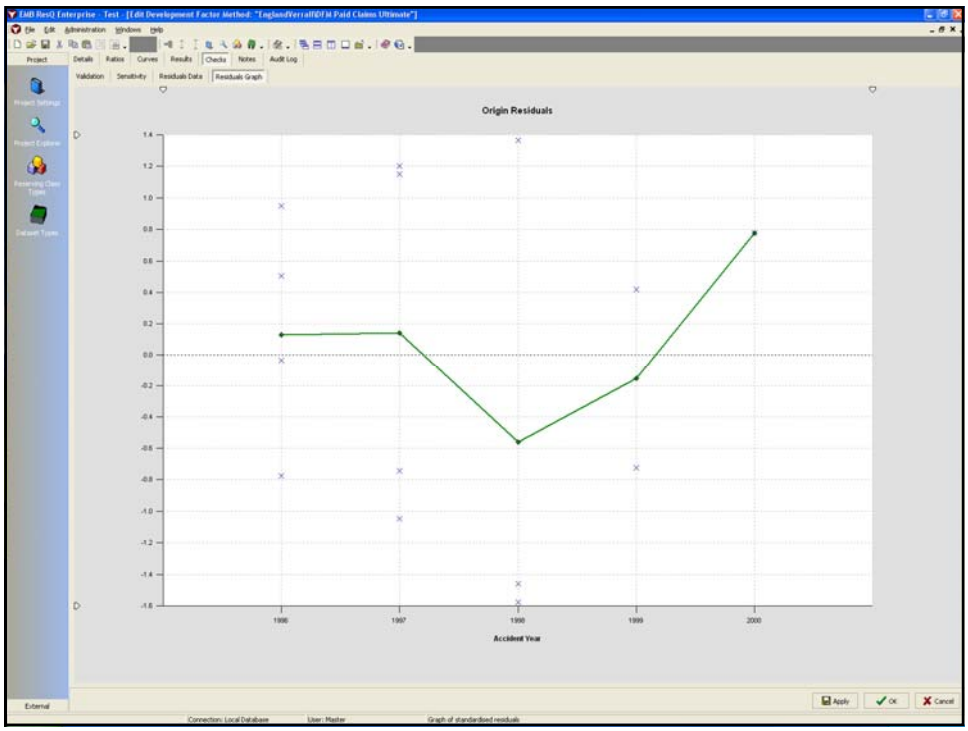
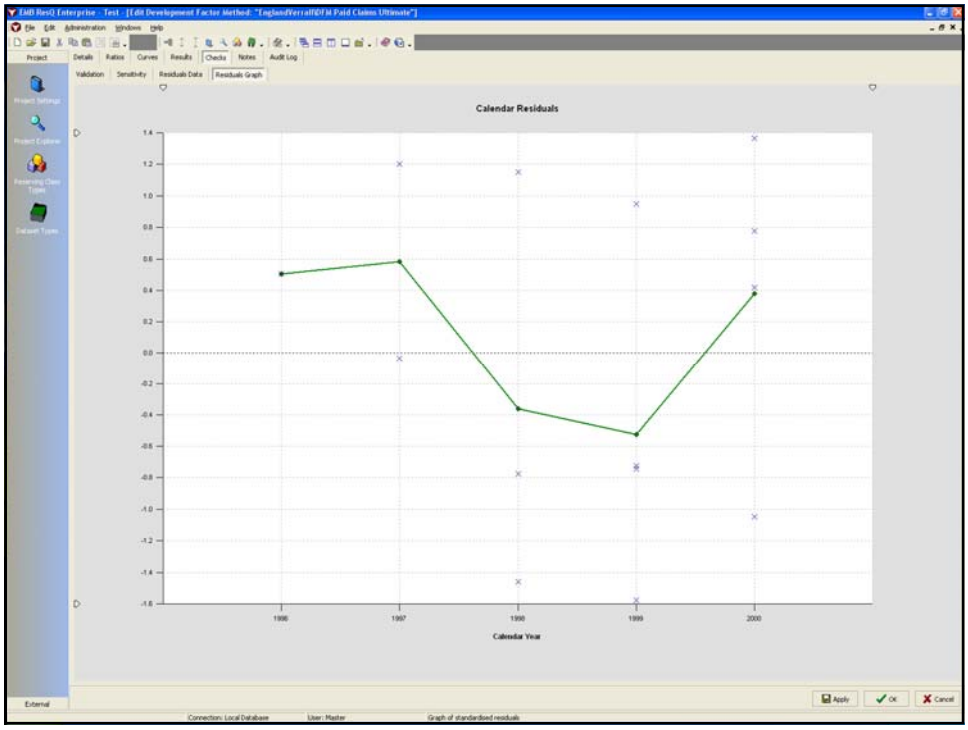


Manual adjusted chainladder

- Is this a good model?
- Significant residuals: reasons to reject the model!
- Test:
  - Remove accident year development factors (except Ci6-Ci7)
  - Look again at residuals


Origin Residuals
Accident Year


Calendar Residuals
Calendar Year

Manual adjusted chainladder

- Is the model better?
- No information to reject the model, but

- IS IT REALLY BETTER?

- More judgment is needed and….

- INFORMATION:
  - Claim handlers
  - Underwriters

Case 3

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Case 3

- Bootstrap based on standard chainladder, but
  - Identical manual manipulations possible
  - BF methodology possible

- Other remarks
  - Negative incrementals result in difficulties
  - I.I.D. adjusted Pearson residuals not always guaranteed; adjustments needed

  - Think about your information needs!
    (e.g. variability of ultimate incurred, next years incurred or reserve)

Case 4

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Case 4

- Model can be reasonably overspecified:
  - Reduce parameters by grouping α's and β's

- Calendar year effect can be added (extra parameters ζ)
  - Note that
    - Overspecification might occur
    - There will be three dimensions in a two dimensional world: optimising might be difficult