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 aids

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developing actuaries

Case 1

Cumulative data; Case

	Ci1	Ci2	Ci3	Ci4	Ci5	Ci6	Ci7	Ci8	Ci9	Ci10
i=1998	5,012	8,269	10,907	11,805	13,539	16,181	18,009	18,608	18,662	18,834
i=1999	106	4,285	5,396	10,666	13,782	15,599	15,496	16,169	16,704	
i=2000	3,410	8,992	13,873	16,141	18,735	22,214	22,863	23,466		
i=2001	5,655	11,555	15,766	21,266	23,425	26,083	27,067			
i=2002	1,092	9,565	15,836	22,169	25,955	26,180				
i=2003	1,513	6,445	11,702	12,935	15,852					
i=2004	557	4,020	10,946	12,314						
i=2005	1,351	6,947	13,112							
i=2006	3,133	5,395								
i=2007	2,063									

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Standard chainladder coefficients; Case

	Ci1-Ci2	Ci2-Ci3	Ci3-Ci4	Ci4-Ci5	Ci5-Ci6	Ci6-Ci7	Ci7-Ci8	Ci8-Ci9	Ci9-Ci10	Ci10-Ult
Age-age										1.000
Multiplicative										1.000

Case 2

Cumulative paid data

	Ci1	Ci2	Ci3	Ci4	Ci5	Ci6	Ci7
i=1	266,354	432,926	465,255	518,865	526,989	543,913	583,022
i=2	246,981	606,361	835,377	904,916	1,023,551	1,123,843	
i=3	203,178	578,946	855,563	930,475	1,016,903		
i=4	395,630	656,273	823,982	1,094,674			
i=5	207,698	382,313	544,953				
i=6	167,681	447,859					
i=7	215,740						

x = x =

Standard chainladder coefficients;

	Ci1-Ci2	Ci2-Ci3	Ci3-Ci4	Ci4-Ci5	Ci5-Ci6	Ci6-Ci7	Ci7-Ult
Incremental							1.000
Cumulative							1.000

Question Calculate the age-to-age factors based on the standard chainladder model; enter the formula in the yellow row.
Question Calculate the multiplicative factors (age-to-ultimate). Note we again have assumed no tail to be needed.

One-year projected cumulative paid data

	Ci1	Ci2	Ci3	Ci4	Ci5	Ci6	Ci7
i=1							
i=2							
i=3							
i=4							
i=5							
i=6							
i=7							

Case 3

Pearson residual: $\frac{\text{(True incremental – smoothed incremental)}}{\sqrt{\text{(smoothed incremental)}}}$

Case 4

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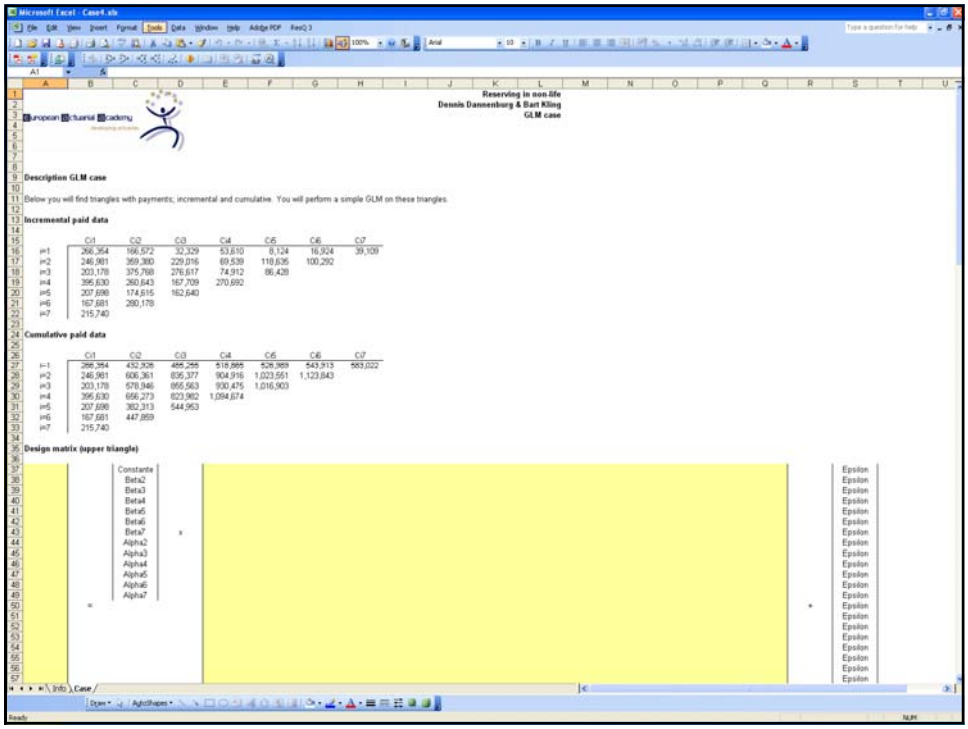
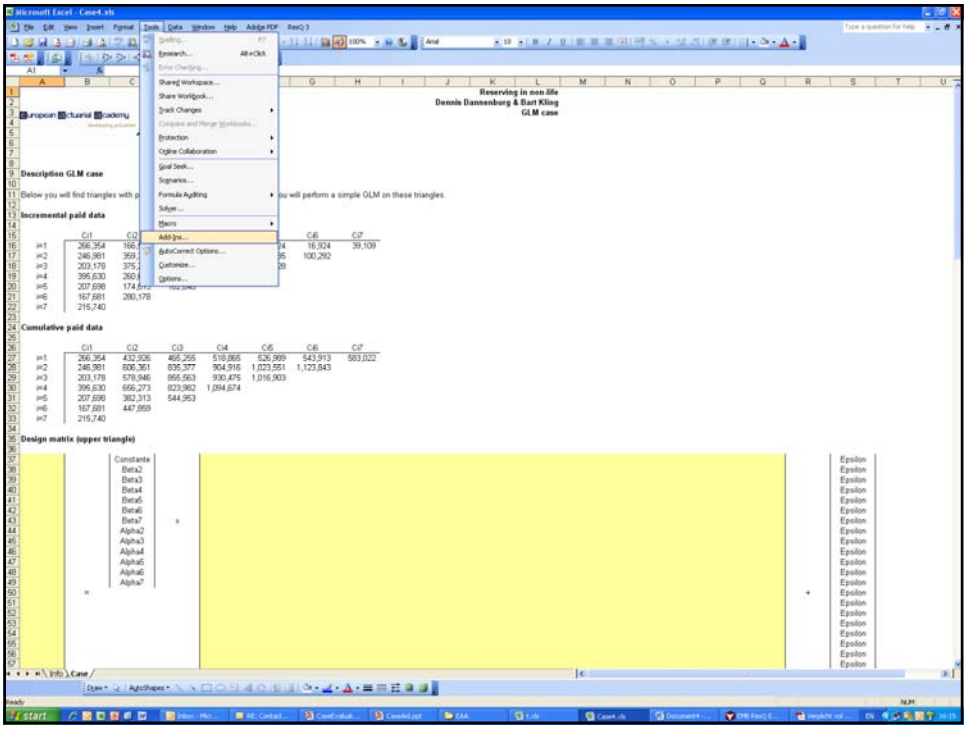
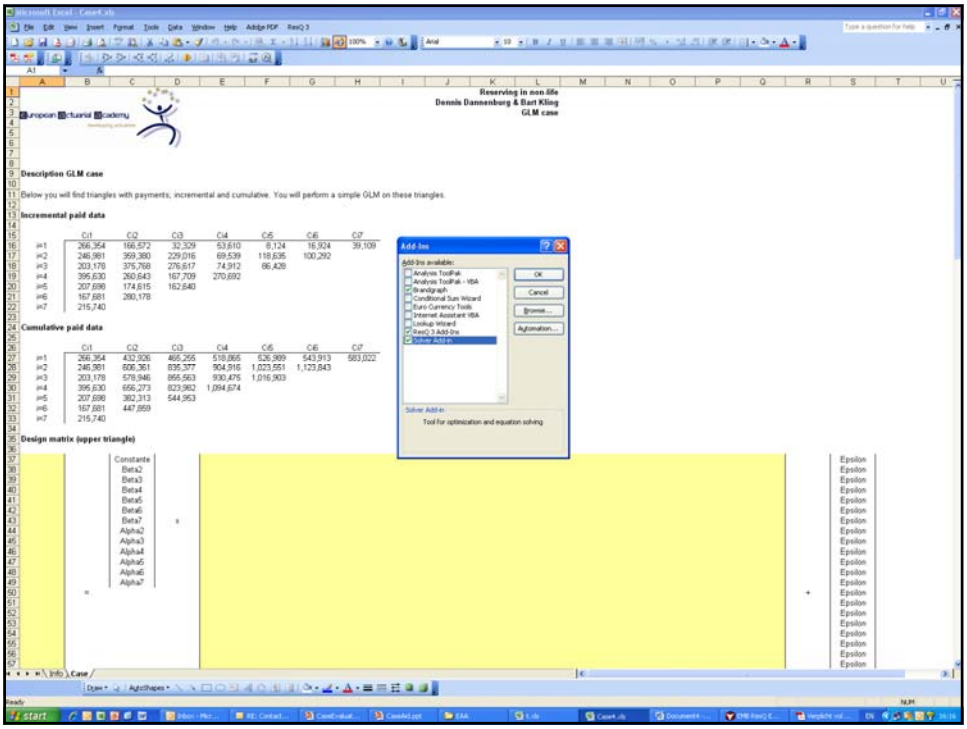
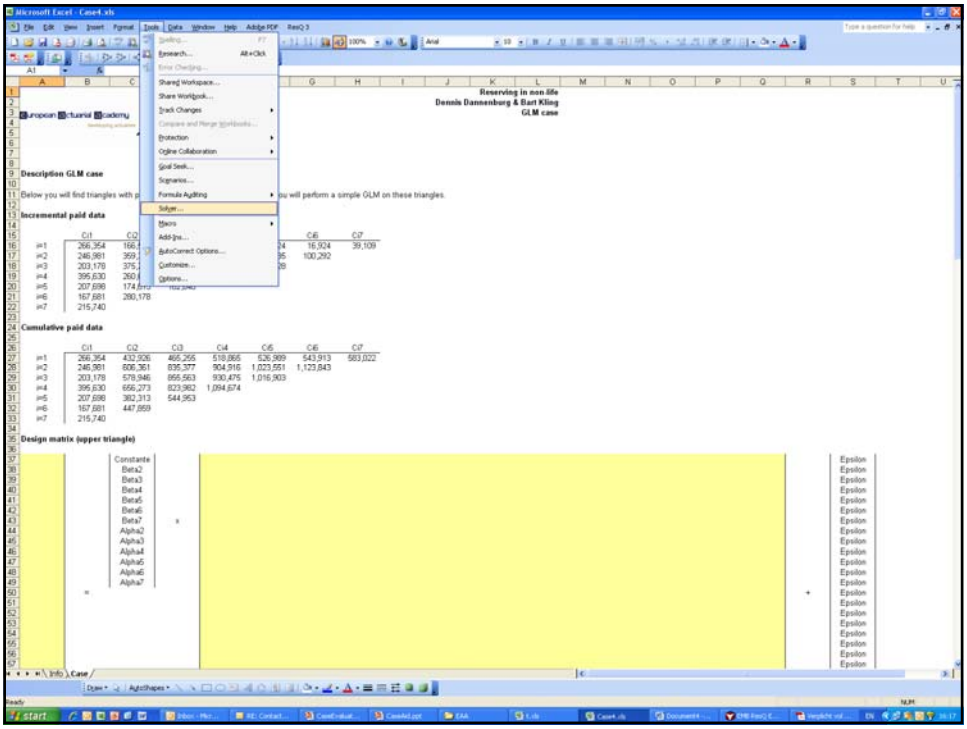
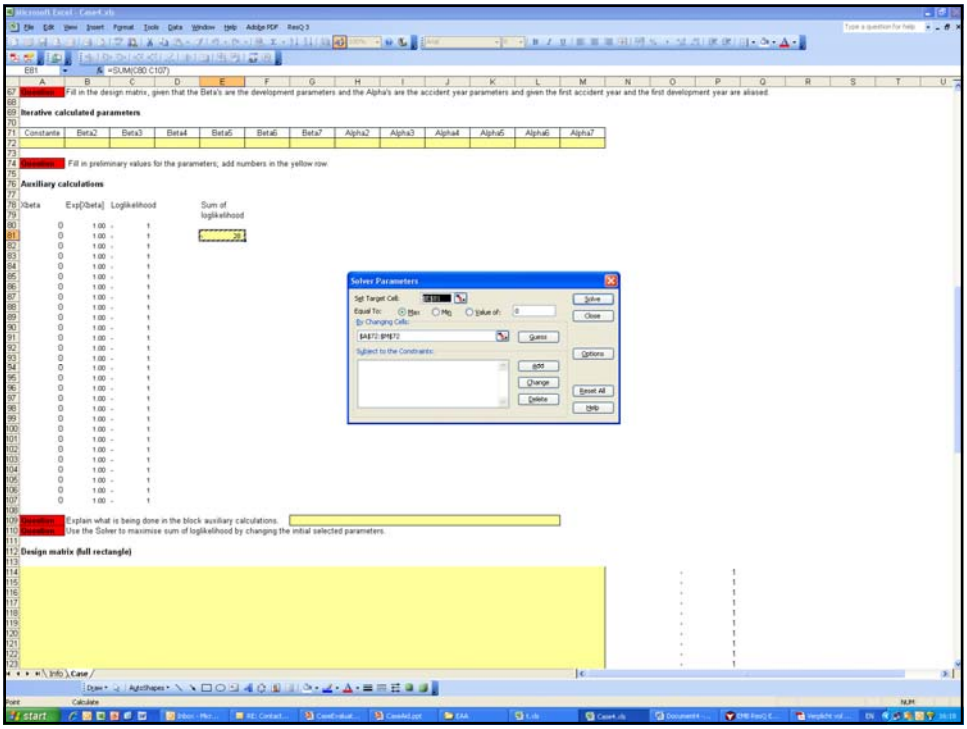
- You need the Excel Add-in Solver




Microsoft Excel - Case4.xls
Reserving in non life
Dennis Dannenburg & Bart Kling
GLM case
Description GLM case
Below you will find triangles with p
ou will perform a simple GLM on these triangles.
Incremental paid data
Cumulative paid data
Design matrix (upper triangle)
Info
Case


Reserving in non life
Dennis Dannenburg & Bart Kling
GLM case
Description GLM case
Below you will find triangles with payments, incremental and cumulative. You will perform a simple GLM on these triangles.
Incremental paid data
Cumulative paid data
Design matrix (upper triangle)
Add-Ins
Add-Ins available:
Analysis ToolPak
Analysis ToolPak - VBA
Brandgraph
Conditional Sum Wizard
Euro Currency Tools
Internet Assistant VBA
Lookup Wizard
ResQ 3 Add-Ins
Solver Add-In
OK
Cancel
Browse...
Automation...
Solver Add-In
Tool for optimization and equation solving
Info
Case


Reserving in non life
Dennis Dannenburg & Bart Kling
GLM case
Description GLM case
Incremental paid data
Cumulative paid data
Design matrix (upper triangle)


Iterative calculated parameters
Auxiliary calculations
Solver Parameters
Design matrix (full rectangle)

Case 4

$$y = \mathbf{X}\,\beta + \varepsilon$$

		β(1)	β(2)
	A	B	C
α(1)	D	E	
α(2)	F		

$$\begin{vmatrix} A \\ D \\ F \\ B \\ E \\ C \end{vmatrix} = \begin{vmatrix} 1 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 & 1 \\ 1 & 1 & 0 & 0 & 0 \\ 1 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 0 \end{vmatrix} \times \begin{vmatrix} \text{constant} \\ \beta(1) \\ \beta(2) \\ \alpha(1) \\ \alpha(2) \end{vmatrix} + \varepsilon$$

Please note: order in Excel-file of **X** and β is reversed for simplicity