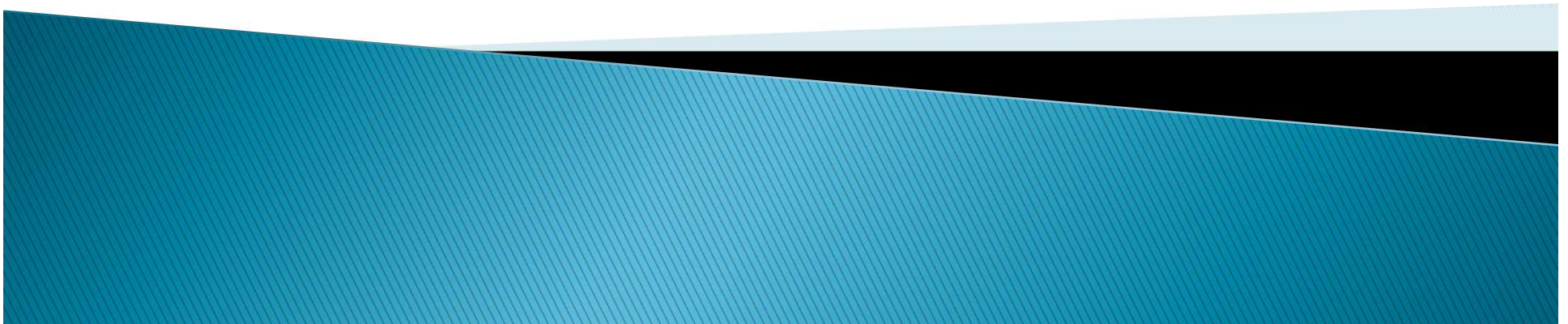


Loss Reserving Boot Camp

2013 CLRS
September 15–17, 2013
Boston, Massachusetts





Antitrust Notice

- **The Casualty Actuarial Society is committed to adhering strictly to the letter and spirit of the antitrust laws. Seminars conducted under the auspices of the CAS are designed solely to provide a forum for the expression of various points of view on topics described in the programs or agendas for such meetings.**
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Welcome

▶ Introductions

- Instructors

- Nancy Arico, Leslie Marlo, Donna Bono, Mike McKnight, Pete Rauner

- Teams

- Logistics

▶ Schedule

- Breaks at: 10:35 and 2:55

- Lunch at 12:25



Overview

- ▶ Reserving Basics
- ▶ Basic Reserving Calculations
- ▶ Reserving Methods
- ▶ Comparison of Methods/Selections

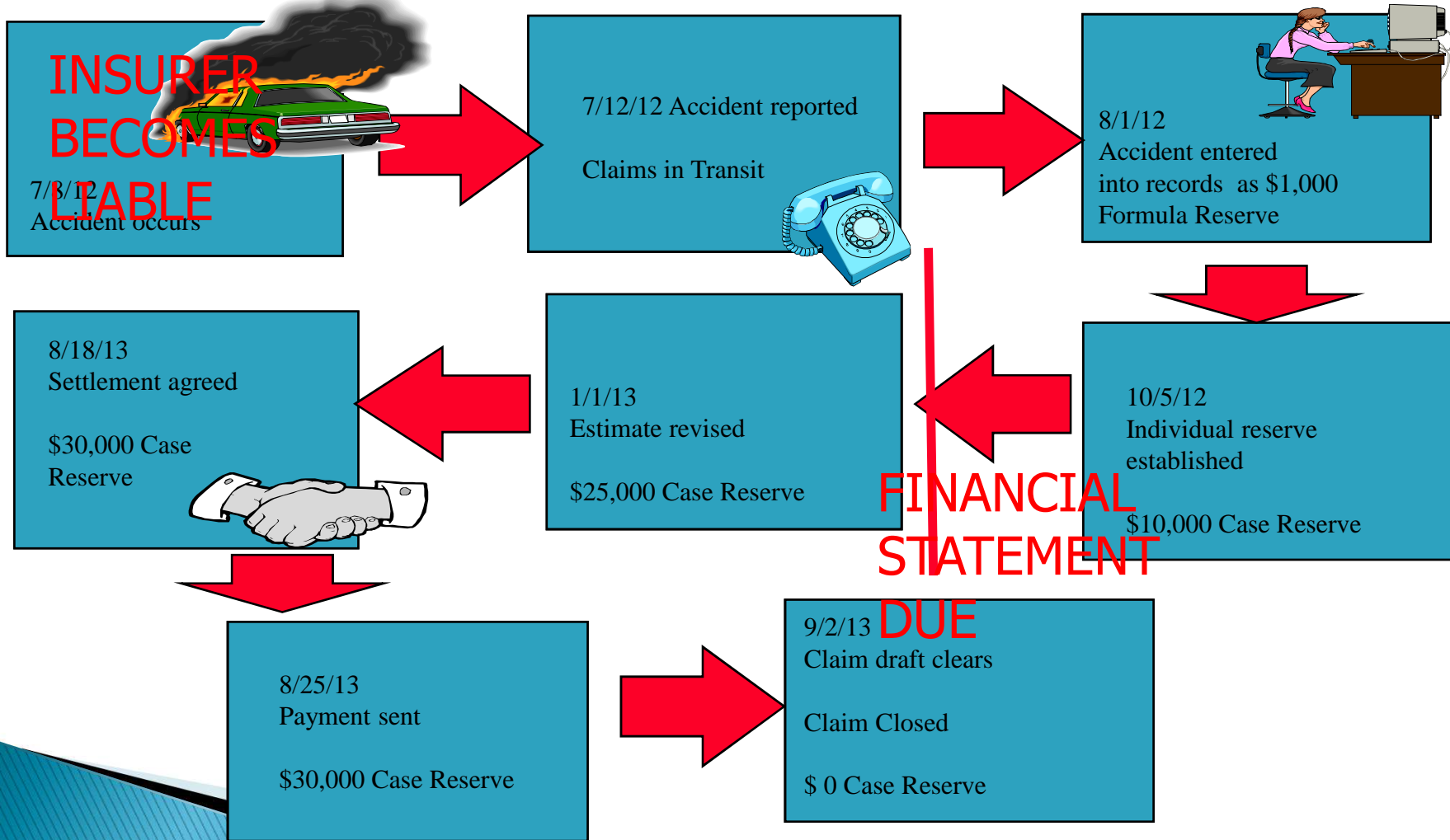


Your Assignment

- ▶ By the end of today have a reserve estimate for Boot Camp Insurance Company as of 12/31/2012.
 - Boot Camp Insurance Company writes 3 Lines of business
 - Automobile
 - General Liability
 - Workers Compensation
 - Work within teams at tables
 - Designate one PC and “Team Answer”
 - Instructors and mentors are available for consultation

Why is a reserve needed?

There is a lag between the occurrence of an insured event and the final payment to the claimant



Actuarial Statement of Principles on Loss Reserving

- ▶ Provides guidance to actuaries preparing loss reserve estimates.
- ▶ Contains:
 - Definition
 - Principles
 - Considerations



Definitions

- ▶ *Carried Loss Reserve* – The amount shown in a published statement or an internal statement of financial condition.
- ▶ *Indicated Loss Reserve* – The amount that results from the application of a particular loss reserving method.
- ▶ *Reserve Margin/Deficit* – The difference between an indicated loss reserve and a carried loss reserve.



Definitions

- ▶ Elements of a Loss Reserve
 - Formula Reserve/Case Reserve
 - Development on Known Claims
 - Reopened Claims Reserve
 - Incurred But Not Reported (“pure” IBNR)
 - Claims in Transit (reported not yet recorded)



Definitions

- ▶ **Case Reserves**
 - Claim reported but not yet paid
 - Assigned a value by a claims adjuster or by formula based on current information
- ▶ **Bulk + IBNR reserves include:**
 - Reserves for claims not yet reported (“pure” IBNR)
 - Claims in transit
 - Development on known claims
 - Reserves for reopened claims



Formulas to Derive IBNR Reserves

Once an estimate of ultimate loss has been obtained, the arithmetic of IBNR is straightforward.

$$\begin{array}{c} \text{Ultimate Losses} \\ \text{Minus} \\ \text{Paid Losses} \\ \text{Minus} \\ \text{Case Reserves} \end{array}$$

$$\begin{array}{c} \text{Ultimate Losses} \\ \text{Minus} \\ \text{Reported Losses} \end{array}$$

$$\begin{array}{c} \text{Unpaid Losses} \\ \text{Minus} \\ \text{Case Reserves} \end{array}$$

Exercise 1

CLRS Boot Camp Co						
Analysis of Loss & LAE Reserves as of 12/31/2012						
General Liability						
Summary of Loss Reserves						
	(1)	(2)	(3)	(4)	(5)	(6)
Accident Year	Paid Loss	Case Reserves	Incurred Loss	Selected Ultimate Loss	IBNR Reserves	Total Loss Reserves
1998	7,570,799	-	7,570,799	7,570,799	-	-
1999	8,584,298	-	8,584,298	8,584,298	-	-
2000	8,882,137	-	8,882,137	8,882,137	-	-
2001	10,834,258		11,358,062	11,358,062		
2002	9,409,962	-	9,409,962	9,409,962	-	-
2003	11,106,523	-	11,106,523	11,106,572	49	49
2004	13,879,959	599,629		14,558,437		
2005	13,253,108	370,184	13,623,292	13,687,843	64,551	434,735
2006	14,054,590	1,104,070			148,830	1,252,901
2007	13,322,089	1,041,422	14,363,510	14,504,326	140,816	1,182,238
2008		1,260,792				1,418,211
2009	11,283,605	2,238,746	13,522,351	14,133,190	610,839	2,849,585
2010	9,051,138	3,864,452	12,915,590	14,384,127	1,468,537	5,332,989
2011	5,799,550	5,198,194				8,348,139
2012	2,863,580	5,014,146	7,877,726	15,009,736	7,132,010	12,146,155

Definitions

- ▶ Loss Adjustment Expenses (LAE) are sum of:
 - Defense & Cost Containment (DCC) Expense
 - Includes all defense, litigation, and medical cost containment related expenses, whether internal or external to a company.
 - In general, includes costs associated with controlling the severity of cases.
 - Adjusting and Other (AO)
 - Includes all claims adjusting expenses, whether internal or external to a company.
 - In general, includes costs associated with recording and adjusting cases.

Principles

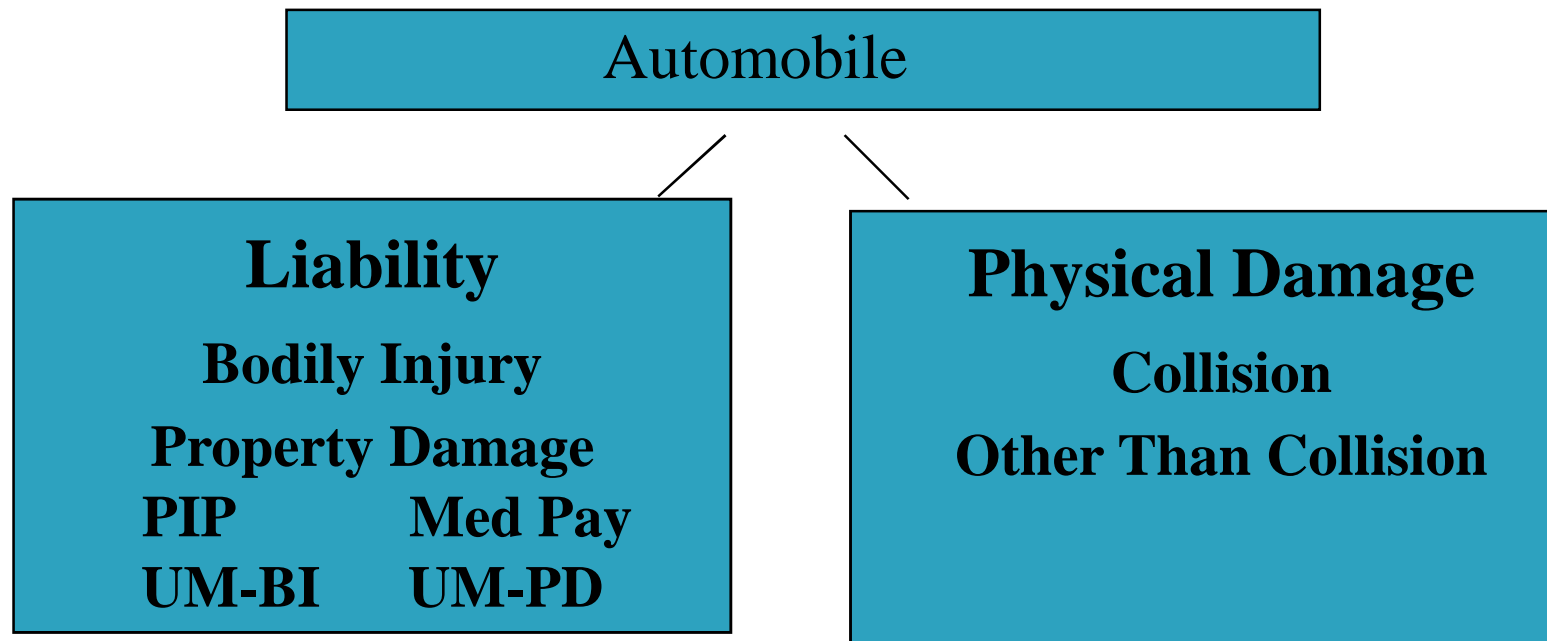
- ▶ Actuarially sound reserves
 - based on *estimates*
 - derived from reasonable *assumptions*
 - using appropriate *methods*
- ▶ Inherent Uncertainty
 - a range can be actuarially sound
 - true value known only after all claims settled
- ▶ Most appropriate reserve depends on:
 - relative likelihood of estimates in range
 - financial reporting context

Considerations: Data Organization

- ▶ **Accident Date**
 - The date on which the loss occurred.
- ▶ **Report Date**
 - The date the loss is first reported to the insurer.
- ▶ **Recorded Date**
 - The date the loss is entered into statistical records.
- ▶ **Accounting Date**
 - Defines the group of claims for which liability is being estimated.
 - The cut-off date for liability projection.
- ▶ **Valuation Date**
 - Defines the time period for which transactions are included when evaluating the existing liability.

Considerations: Homogeneity

Accuracy is often improved by subdividing experience into groups exhibiting similar characteristics.



Considerations: Credibility

- ▶ A measure of the predictive value that is attached to a body of data.
- ▶ A group of claims should be large enough to be statistically reliable.
 - May be a point at which partitioning will divide the data into groups too small to provide credible development patterns.
- ▶ Use of supplementary data sources
 - Examples include industry data, countrywide data.



Considerations: Other

- ▶ **Reinsurance**
 - Is the data net or gross of reinsurance?
- ▶ **Policy Limits**
- ▶ **Type of Data**
 - Exposure
 - Losses
 - Loss Adjustment Expenses (LAE)
 - Salvage and Subrogation (S&S)



Data Organization: Definitions

- ▶ *Loss Development* – The financial activity on claims from the time they occur to the time they are eventually settled and paid.
- ▶ *Triangles* – Compiled to measure the changes in cumulative claim activity over time in order to estimate patterns of future activity.
- ▶ *Loss Development Factor* – The ratio of losses at successive evaluations for a defined group of claims (e.g. accident year).

Data Organization: Compilation of Triangle

- ▶ The data is sorted by the year in which the accident occurred.
- ▶ The data is summed at the end of each valuation point (e.g., year, quarter, month).
- ▶ Current valuation is shown on the last diagonal.
- ▶ The data is organized in this way to highlight historical patterns.

Data Organization: Sources of Data

- ▶ *Schedule P* – Insurance company financial statements contain a schedule showing data for 10 years of losses, LAE, S&S and Claim.
- ▶ *Claim system reports (Loss Run)*
 - ▶ *Summary of Loss Runs* – usually “as of” a particular date showing paid losses and expenses and number of claims by year/
 - ▶ *Detailed Claim Listing* – also “as of”, can be very large but allow more analysis detail if desired.

SCHEDULE P – PART 1

SUMMARY – PAID

Years in Which Premiums Were Earned and Losses Were Incurred	Premiums Earned			Loss and Loss Expense Payments								12 Number of Claims Reported - Direct and Assumed	
	1	2	3	Loss Payments		Defense and Cost Containment Payments		Adjusting and Other Payments		10	11		
	Direct and Assumed	Ceded	Net (Cols 1-2)	4	5	6	7	8	9	Salvage and Subrogation Received	Total Net Paid (Cols. 4-5+6- 7+8-9)		
				Direct and Assumed	Ceded	Direct and Assumed	Ceded	Direct and Assumed	Ceded				Direct and Assumed
1. Prior	XXX	XXX	XXX	(1)	(1)						0	0	XXX
2. 2002	5,826	3,540	2,284	3,810	2,445	90	58	562	37	44	1,921	2,681	
3. 2003	4,879	2,787	2,092	2,838	1,755	86	52	509	24	6	1,602	1,907	
4. 2004	4,528	2,695	1,833	2,476	1,605	120	78	461	39	14	1,334	721	
5. 2005	4,962	2,826	2,136	2,903	1,783	83	53	684	37	3	1,797	1,511	
6. 2006	4,340	1,789	2,551	2,627	1,132	103	50	572	36	7	2,083	1,234	
7. 2007	3,263	1,277	1,986	1,997	835	110	46	487	29	12	1,685	972	
8. 2008	4,116	1,554	2,561	2,533	1,039	90	36	521	34	3	2,034	1,182	
9. 2009	4,004	1,525	2,479	2,944	1,215	64	26	504	37	10	2,234	1,341	
10. 2010	3,624	1,387	2,237	2,209	898	52	21	399	29	10	1,712	1,078	
11. 2011	3,042	1,179	1,862	1,084	436	7	3	282	18	1	916	779	
12. Totals	XXX	XXX	XXX	25,420	13,142	805	423	4,980	322	110	17,319	XXX	

SCHEDULE P - PART 1 SUMMARY - UNPAID

	Losses Unpaid				Defense and Cost Containment Unpaid				Adjusting and Other Unpaid		23 Salvage and Subrogation Anticipated	24 Total Net Losses and Expenses Unpaid	25 Number of Claims Outstanding Direct and Assumed
	Case Basis		Bulk + IBNR		Case Basis		Bulk + IBNR		21 Direct and Assumed	22 Ceded			
	13 Direct and Assumed	14 Ceded	15 Direct and Assumed	16 Ceded	17 Direct and Assumed	18 Ceded	19 Direct and Assumed	20 Ceded					
1. Prior	-	-											
2. 2002	10	6					1	1	1			5	1
3. 2003	-	-										-	
4. 2004	-	-										-	
5. 2005	-	-										-	
6. 2006	20	13	1	-					1			8	1
7. 2007	-	-	2	1								1	-
8. 2008	14	6	5	2			4	2	3	-		16	4
9. 2009	173	78	22	9			6	2	11	1		122	13
10. 2010	341	136	79	32			18	7	31	2	3	292	39
11. 2011	1,023	413	133	58			11	5	215	19	4	887	252
12. Totals	1,581	652	242	102	-	-	40	17	262	22	7	1,331	310

SCHEDULE P - PART 2

Incurred Net Loss + DCC

SCHEDULE P - PART 2 - SUMMARY (\$000 omitted)												
Years in Which Losses Were Incurred	INCURRED NET LOSSES + DEFENSE & COST CONTAINMENT EXPENSES REPORTED AT YEAR END (\$000 OMITTED)										Development	
	1 2002	2 2003	3 2004	4 2005	5 2006	6 2007	7 2008	8 2009	9 2010	10 2011	11 One Year	12 Two Year
1. Prior	507	567	532	517	503	499	498	498	498	498	-	-
2. 2002	1,516	1,422	1,453	1,432	1,416	1,402	1,401	1,401	1,400	1,401	1	-
3. 2003	XXXX	1,120	1,189	1,154	1,168	1,124	1,119	1,118	1,118	1,117	(1)	(1)
4. 2004	XXXX	XXXX	1,087	1,024	930	936	916	915	913	913	(1)	(2)
5. 2005	XXXX	XXXX	XXXX	1,325	1,270	1,192	1,159	1,150	1,154	1,151	(4)	1
6. 2006	XXXX	XXXX	XXXX	XXXX	1,566	1,642	1,599	1,565	1,558	1,555	(3)	(9)
7. 2007	XXXX	XXXX	XXXX	XXXX	XXXX	1,289	1,212	1,210	1,260	1,228	(32)	18
8. 2008	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	1,596	1,598	1,575	1,561	(13)	(37)
9. 2009	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	1,885	1,834	1,878	44	(6)
10. 2010	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	1,491	1,604	113	XXXX
11. 2011	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	1,345	XXXX	XXXX
12. Totals												

SCHEDULE P - PART 3

Paid Net Loss + DCC

SCHEDULE P - PART 3 - SUMMARY												
(\$000 omitted)												
Years in Which Losses Were Incurred	CUMULATIVE PAID NET LOSSES + DEFENSE & COST CONTAINMENT EXPENSES REPORTED AT YEAR END (\$000 OMITTED)										11	12
	1	2	3	4	5	6	7	8	9	10	Number of Claims Closed With Loss Payment	Number of Claims Closed Without Loss Payment
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011		
1. Prior	-	268	425	488	495	498	498	498	498	498	1,022	214
2. 2002	689	1,143	1,297	1,375	1,395	1,396	1,396	1,196	1,396	1,397	2,038	642
3. 2003	XXXX	523	959	1,030	1,081	1,111	1,118	1,118	1,118	1,117	1,483	424
4. 2004	XXXX	XXXX	474	787	834	873	913	913	913	913	382	339
5. 2005	XXXX	XXXX	XXXX	590	1,033	1,105	1,131	1,144	1,150	1,151	838	673
6. 2006	XXXX	XXXX	XXXX	XXXX	801	1,301	1,486	1,509	1,547	1,548	774	459
7. 2007	XXXX	XXXX	XXXX	XXXX	XXXX	636	1,043	1,152	1,200	1,226	618	354
8. 2008	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	778	1,348	1,495	1,548	730	448
9. 2009	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	1,003	1,559	1,768	862	465
10. 2010	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	888	1,342	673	366
11. 2011	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	653	334	193

SCHEDULE P - PART 4

Bulk + IBNR Net Loss + DCC

SCHEDULE P - PART 4 - SUMMARY										
(\$000 omitted)										
Years in Which Losses Were Incurred	BULK+IBNR RESERVES ON NET LOSSES + DEFENSE & COST CONTAINMENT EXPENSES REPORTED AT YEAR END (\$000 OMITTED)									
	1	2	3	4	5	6	7	8	9	10
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1. Prior	189	96	35	10	4	1	-	-	-	-
2. 2002	322	107	58	23	99	2	1	-	-	-
3. 2003	XXXX	161	84	65	42	6	1	-	-	-
4. 2004	XXXX	XXXX	150	105	59	20	5	2	1	-
5. 2005	XXXX	XXXX	XXXX	175	99	49	15	5	3	-
6. 2006	XXXX	XXXX	XXXX	XXXX	168	66	24	9	4	1
7. 2007	XXXX	XXXX	XXXX	XXXX	XXXX	82	40	19	8	1
8. 2008	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	123	67	21	5
9. 2009	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	112	59	16
10. 2010	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	101	58
11. 2011	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	82

Claims System Summary Exhibit

IRM General Liability (The MacDonald Company)										
Policy Period	Carrier	Valuation Date	Claim Count	Open Claims	Closed Claims	Indemnity Paid	Expense Paid	Indemnity Reserve	Expense Reserve	Total Incurred
6/30/06-12/30/07	MacDonald (SLO0001633)	04/13/12	84	2	82	\$154,575	\$861,409	\$7,500	\$4,794	\$1,030,063
12/30/07-12/30/08	MacDonald (SLO0001640)	04/13/12	0	0	0	\$0	\$0	\$0	\$0	\$0
12/30/07-12/30/08	MacDonald (SLO0001641)	04/13/12	66	8	58	\$103,284	\$919,091	\$8,500	\$30,114	\$1,060,989
12/30/08-12/31/09	MacDonald (SLO0001645)	04/13/12	71	8	63	\$113,773	\$535,995	\$44,001	\$36,685	\$731,229
12/31/09-12/31/10	MacDonald (SLO0001651)	04/13/12	42	9	33	\$58,457	\$333,532	\$69,500	\$44,578	\$512,017
12/31/09-12/31/10	MacDonald (SLO0001653)	04/13/12	0	0	0	\$0	\$0	\$0	\$0	\$0
12/31/10-1/1/2012	MacDonald (GLO211230)	04/13/12	52	19	33	\$100,450	\$159,442	\$126,250	\$46,748	\$432,891
1/1/12-1/1/13	MacDonald (GLO318501)	04/13/12	0	0	0	\$0	\$0	\$0	\$0	\$0
All Years			315	46	269	\$530,540	\$2,809,469	\$255,751	\$162,919	\$3,767,189

IRM General Liability (The MacDonald Company) Incident Only Claims										
Policy Period	Carrier	Valuation Date	Claim Count	Open Claims	Closed Claims	Indemnity Paid	Expense Paid	Indemnity Reserve	Expense Reserve	Total Incurred
6/30/06-12/30/07	MacDonald (SLO0001633)	04/13/12	147	0	147	\$0	\$139,028	\$0	\$0	\$139,028
12/30/07-12/30/08	MacDonald (SLO0001640)	04/13/12	0	0	0	\$0	\$0	\$0	\$0	\$0
12/30/07-12/30/08	MacDonald (SLO0001641)	04/13/12	106	0	106	\$0	\$105,394	\$0	\$0	\$105,394
12/30/08-12/31/09	MacDonald (SLO0001645)	04/13/12	141	0	141	\$0	\$149,934	\$0	\$0	\$149,934
12/31/09-12/31/10	MacDonald (SLO0001651)	04/13/12	109	1	108	\$0	\$202,165	\$0	\$3,032	\$205,197
12/31/09-12/31/10	MacDonald (SLO0001653)	04/13/12	0	0	0	\$0	\$0	\$0	\$0	\$0
12/31/10-12/31/11	MacDonald (GLO211230)	04/13/12	125	9	116	\$0	\$161,254	\$52,500	\$8,043	\$221,797
1/1/12-1/1/13	MacDonald (GLO318501)	04/13/12	0	0	0	\$0	\$0	\$0	\$0	\$0
All Years			628	10	618	\$0	\$757,776	\$52,500	\$11,075	\$821,351

Claims System Detail Report

Detail Loss Report

Losses From: 03/01/2008 To 03/02/2012

Claimant	Adj Off	FP	Claim Number	Accident Date	Notice Date	Close Date	O/C	Total	Claim	Medical	Expense	
Policy Number: 2843M700												
Policy Eff Date: 05/15/2010												
Accident State: NJ												
Accident Cause Text: PROP-OTHER FIRE												
Accident State: OK												
Accident Cause Text: PROP-ALL OTHER DAMAGES												
INTERSTATE REALTY MANAGE	877	FR	ELU7946	10/13/2010	10/13/2010	02/01/2011	C					
EARTHQUAKE CAUSED DAMAGE TO BUILDINGS, INCLUDING CRACKED WALLS.								Inc:	\$457,065.00	\$400,000.00	\$0.00	\$57,065.00
								Pd:	\$457,064.82	\$400,000.00	\$0.00	\$57,064.82
								O/S:	\$0.00	\$0.00	\$0.00	\$0.00
Accident Cause Text: PROP-HAIL												
MANAGEMENT INTERSTATE REA	877	FR	ELU8311	09/15/2010	10/18/2010		O					
APARTMENTS AT WILLOW ROCK, WILLOW CREEK, WILLOW GARDENS & WILLOW PARK SUSTAINED DAMAGE CAUSED BY HAIL.								Inc:	\$910,000.00	\$900,000.00	\$0.00	\$10,000.00
								Pd:	\$630,344.77	\$625,384.69	\$0.00	\$4,960.08
								O/S:	\$279,655.23	\$274,615.31	\$0.00	\$5,039.92
Accident Cause Text: UNKNOWN												
INTERSTATE REALTY MANAGE	039	FR	C6E7165	01/12/2011	01/14/2011	04/14/2011	C					
PIPE BREAK AT INSURED COMPLEX CAUSED DAMAGE TO 8 UNITS AND DISPLACED TENANTS.								Inc:	\$7,072.00	\$7,031.00	\$0.00	\$41.00
								Pd:	\$7,071.69	\$7,030.69	\$0.00	\$41.00
								O/S:	\$0.00	\$0.00	\$0.00	\$0.00
INTERSTATE REALTY MANAGE	039	FR	ENW1483	02/03/2011	03/14/2011	03/31/2011	C					
1STPP: OKLAHOMA LOCATIONS/PIPE BREAK AND WATER DAMAGE TO MULTIPLE LOCATIONS THROUGH OKLAHOMA. RELATED TO CAT FILE 36, FILE #EMY7755, AND FILE #EMY8065.								Inc:	\$0.00	\$0.00	\$0.00	\$0.00
								Pd:	\$0.00	\$0.00	\$0.00	\$0.00
								O/S:	\$0.00	\$0.00	\$0.00	\$0.00
Accident State: PA												
Accident Cause Text: PROP-OTHER FIRE												
BETHLEHEM TOWNHOUSES C/O	877	FR	EMQ5995	02/24/2011	03/09/2011		O					
FIRE IN TOWNHOME FROM UNKNOWN CAUSE.								Inc:	\$30,500.00	\$20,500.00	\$0.00	\$10,000.00
								Pd:	\$13,230.87	\$8,111.47	\$0.00	\$5,119.40
								O/S:	\$17,269.13	\$12,388.53	\$0.00	\$4,880.60
Accident Cause Text: PROP-OTHER NON-WEATHER WATER												
INTERSTATE REALTY MANA	145	FR	EMQ5783	03/01/2011	03/04/2011	02/08/2012	C					
WATER DAMAGE FROM SPRINKLER AFTER SELF-INDUCED FIRE IN TENANT'S UNIT.								Inc:	\$69,376.00	\$68,585.00	\$0.00	\$791.00
								Pd:	\$69,376.25	\$68,584.86	\$0.00	\$791.39
								O/S:	\$0.00	\$0.00	\$0.00	\$0.00

Losses as of: 02/29/2012

Run Date: 03/02/2012

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Data Organization: Compilation of Triangle

Accounting Configuration

Goal: Calculate the total paid-to-date

Accident Year	Cumulative Paid Losses (\$000 Omitted)									
	Cumulative Accident Year Paid as of Year End									
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
2002	689	1,143	1,297	1,375	1,395	1,396	1,396	1,396	1,396	1,397
2003		526	959	1,030	1,081	1,111	1,118	1,118	1,118	1,117
2004			474	787	834	873	912	913	913	913
2005				590	1,033	1,105	1,131	1,144	1,150	1,151
2006					801	1,301	1,486	1,509	1,547	1,548
2007						636	1,043	1,152	1,200	1,226
2008							778	1,348	1,495	1,548
2009								1,003	1,559	1,768
2010									888	1,342
2011										653

Data Organization: Compilation of Triangle

Actuarial Configuration

Goal: Estimate the total ultimately paid

Accident Year	Cumulative Paid Losses (\$000 Omitted)										Final Total Cost	
	Development Stage in Months											
	12	24	36	48	60	72	84	96	108	120		
2002	689	1,143	1,297	1,375	1,395	1,396	1,396	1,396	1,396	1,396	1,397	???
2003	526	959	1,030	1,081	1,111	1,118	1,118	1,118	1,118	1,117		???
2004	474	787	834	873	912	913	913	913	913			???
2005	590	1,033	1,105	1,131	1,144	1,150	1,151					???
2006	801	1,301	1,486	1,509	1,547	1,548						???
2007	636	1,043	1,152	1,200	1,226							???
2008	778	1,348	1,495	1,548								???
2009	1,003	1,559	1,768									???
2010	888	1,342										???
2011	653											???

Exercise 2

CLRS Boot Camp Co										
Analysis of Loss & LAE Reserves as of 12/31/2012										
General Liability										
Summary of Loss Reserves										
Cumulative Paid Losses (\$000 Omitted)										
Accident Year	Cumulative Accident Year Paid as of Year End									
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
2003	4,494	6,491	8,543	9,740	10,668	10,853	10,887	10,780	11,023	11,358
2004		5,381	7,777	9,092	9,379	9,353	9,240	9,328	9,448	9,448
2005			5,909	9,753	10,453	11,403	11,146	11,085	11,085	11,301
2006				8,565	11,615	12,942	14,416	14,400	14,339	14,384
2007					6,717	10,195	11,852	12,662	14,082	13,644
2008						7,718	10,947	13,650	14,387	14,017
2009							9,154	11,584	13,446	13,865
2010								8,900	11,557	13,889
2011									6,804	10,330
2012										7,313
Cumulative Paid Losses (\$000 Omitted)										
Accident Year	Development Stage in Months									
	12	24	36	48	60	72	84	96	108	120
2003										
2004										
2005										
2006										
2007										
2008										
2009										
2010										
2011										
2012										

Basic Reserving Calculations: Development Factors

Accident Year	Evaluation Intervals in Months									
	12-24	24-36	36-48	48-60	60-72	72-84	84-96	96-108	108-120	
2002	1.659	1.135	1.060	1.015	1.001	1.000	1.000	1.000	1.001	
2003	1.823	1.074	1.050	1.028	1.006	1.000	1.000	0.999		
2004	1.660	1.060	1.047	1.045	1.001	1.000	1.000			
2005	1.751	1.070	1.024	1.011	1.005	1.001				
2006	1.624	1.142	1.015	1.025	1.001					
2007	1.640	1.105	1.042	1.022						
2008	1.733	1.109	1.035							
2009	1.554	1.134								
2010	1.511									

Sample Calculation for Accident Year 2008

$$12\text{-}24 \text{ Months} \quad 1.733 = 1,348 / 778$$

From the end of the accident year (at 12 months) to the end of the following year (at 24 months), paid losses for 2008 grew 73.3%. During the next year (from 24 to 36 months), paid losses experienced an additional 10.9

% growth (or development) and so forth.

Basic Reserving Calculations:

Calculation of Loss Development Factors

Accident Year	Development Stage in Months			
	12	24	36	48
	2006	689	1,143	1,297
2007	526	959	1,030	1,081

Accident Year	Evaluation Intervals in Months		
	12-24	24-36	36-48
	2006	1,143 / 689	1,297 / 1,143
2007	959 / 526	1,030 / 959	1,081 / 1,030

Basic Reserving Calculations: Compilation of LDF Triangle

Accident Year	Evaluation Intervals in Months			
	12-24	24-36	36-48	
	2006	1,143 / 689	1,297 / 1,143	1,375 / 1,297
2007	959 / 526	1,030 / 959	1,081 / 1,030	

Accident Year	Evaluation Intervals in Months			
	12-24	24-36	36-48	
	2002	1.659	1.135	1.060
2003	1.823	1.074	1.050	

Basic Reserving Calculations: Development Factors – Averages

- ▶ **Simple Averages**
 - All years
 - Recent years
 - Excluding high and low value

- ▶ **Weighted Averages**
 - Weighted by data
 - All years
 - Recent years

NOTE: Observed changes may influence number of years included



Basic Reserving Calculations: Loss Development Factors

Accident Year	Evaluation Intervals in Months									
	12-24	24-36	36-48	48-60	60-72	72-84	84-96	96-108	108-120	
2002	1.659	1.135	1.060	1.015	1.001	1.000	1.000	1.000	1.001	
2003	1.823	1.074	1.050	1.028	1.006	1.000	1.000	0.999		
2004	1.660	1.060	1.047	1.045	1.001	1.000	1.000			
2005	1.751	1.070	1.024	1.011	1.005	1.001				
2006	1.624	1.142	1.015	1.025	1.001					
2007	1.640	1.105	1.042	1.022						
2008	1.733	1.109	1.035							
2009	1.554	1.134								
2010	1.511									
Average All Years	1.662	1.104	1.039	1.024	1.003	1.000	1.000	1.000		
Average 3 Years	1.599	1.116	1.031	1.019	1.002	1.000	1.000	1.000		
Average 5 Years	1.612	1.112	1.033	1.026	1.003	1.000	1.000	1.000		
Weighted Average	1.647	1.108	1.038	1.023	1.003	1.000	1.000	1.000		

Exercise 4

Calculate averages

CLRS Boot Camp Co															
Analysis of Loss & LAE Reserves as of 12/31/2012															
General Liability															
Incurred L&ALAE															
Accident Year	Evaluation Age (Months)														
	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180
1998	3,311,218	5,824,394	6,034,446	6,951,489	7,618,638	7,551,130	7,596,048	7,570,398	7,570,799	7,570,799	7,570,799	7,570,799	7,570,799	7,570,799	7,570,799
1999	6,131,137	7,337,824	8,675,061	9,602,820	8,593,760	8,700,426	8,609,156	8,611,737	8,584,098	8,584,098	8,584,298	8,584,298	8,584,298	8,584,298	8,584,298
2000	4,486,911	5,703,031	7,825,801	8,393,446	8,666,572	8,994,920	8,951,694	8,942,791	8,881,941	8,882,137	8,882,137	8,882,137	8,882,137	8,882,137	8,882,137
2001	4,494,489	6,491,388	8,543,398	9,740,369	10,668,442	10,852,838	10,887,328	10,779,717	11,023,221	11,358,062	11,358,062	11,358,062	11,358,062	11,358,062	11,358,062
2002	5,381,202	7,776,892	9,091,593	9,378,860	9,352,519	9,239,593	9,328,302	9,328,302	9,447,882	9,448,106	9,449,962	9,449,962	9,449,962	9,449,962	9,449,962
2003	5,908,831	9,752,969	10,453,457	11,403,381	11,145,915	11,085,104	11,084,827	11,301,107	11,095,428	11,106,523	11,106,523	11,106,523	11,106,523	11,106,523	11,106,523
2004	8,565,479	11,614,572	12,941,990	14,415,918	14,399,722	14,399,722	14,384,381	14,479,587	14,479,587	14,479,587	14,479,587	14,479,587	14,479,587	14,479,587	14,479,587
2005	6,717,086	10,194,738	11,851,717	12,661,864	14,081,734	13,643,777	13,488,408	13,623,292	13,623,292	13,623,292	13,623,292	13,623,292	13,623,292	13,623,292	13,623,292
2006	7,717,931	10,947,386	13,649,914	14,387,140	14,017,332	15,083,244	15,158,660	15,158,660	15,158,660	15,158,660	15,158,660	15,158,660	15,158,660	15,158,660	15,158,660
2007	9,153,615	11,583,639	13,445,812	13,865,237	14,717,899	14,363,510	14,363,510	14,363,510	14,363,510	14,363,510	14,363,510	14,363,510	14,363,510	14,363,510	14,363,510
2008	8,900,329	11,556,692	13,889,442	14,400,566	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616
2009	6,804,499	10,330,437	11,714,665	13,522,351	13,522,351	13,522,351	13,522,351	13,522,351	13,522,351	13,522,351	13,522,351	13,522,351	13,522,351	13,522,351	13,522,351
2010	7,312,509	11,373,571	12,915,590	12,915,590	12,915,590	12,915,590	12,915,590	12,915,590	12,915,590	12,915,590	12,915,590	12,915,590	12,915,590	12,915,590	12,915,590
2011	7,377,474	10,997,744	10,997,744	10,997,744	10,997,744	10,997,744	10,997,744	10,997,744	10,997,744	10,997,744	10,997,744	10,997,744	10,997,744	10,997,744	10,997,744
2012	7,877,726	7,877,726	7,877,726	7,877,726	7,877,726	7,877,726	7,877,726	7,877,726	7,877,726	7,877,726	7,877,726	7,877,726	7,877,726	7,877,726	7,877,726
Accident Year	Development Factors by Period:														
	12-24	24-36	36-48	48-60	60-72	72-84	84-96	96-108	108-120	120-132	132-144	144-156	156-168	168-180	180-Ult
1999	1.759	1.036	1.152	1.096	0.991	1.006	0.997	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2000	1.197	1.182	1.107	0.895	1.012	0.990	1.000	0.997	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2001	1.271	1.372	1.073	1.033	1.038	0.995	0.999	0.993	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2002	1.444	1.316	1.140	1.095	1.017	1.003	0.990	1.023	1.030	1.000	1.000	1.000	1.000	1.000	1.000
2003	1.445	1.169	1.032	0.977	0.988	1.010	1.013	1.000	0.996	1.000	1.000	1.000	1.000	1.000	1.000
2004	1.651	1.072	1.091	0.977	0.995	1.000	1.020	0.982	1.001	1.000	1.000	1.000	1.000	1.000	1.000
2005	1.356	1.114	1.114	0.999	0.996	1.003	1.007	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2006	1.518	1.163	1.068	1.112	0.969	0.989	1.010	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2007	1.418	1.247	1.054	0.974	1.076	1.005	1.005	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2008	1.265	1.161	1.031	1.061	0.976	0.976	0.976	0.976	0.976	0.976	0.976	0.976	0.976	0.976	0.976
2009	1.298	1.202	1.037	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998
2010	1.518	1.134	1.154	1.154	1.154	1.154	1.154	1.154	1.154	1.154	1.154	1.154	1.154	1.154	1.154
2011	1.555	1.136	1.136	1.136	1.136	1.136	1.136	1.136	1.136	1.136	1.136	1.136	1.136	1.136	1.136
2012	1.491	1.491	1.491	1.491	1.491	1.491	1.491	1.491	1.491	1.491	1.491	1.491	1.491	1.491	1.491
Numeric Averages															
3 Year				1.011	1.007	0.999	1.012	0.994	1.009	1.000	1.000	1.000	1.000	1.000	1.000
5 Year				1.029	1.002	1.001	1.008	1.000	1.005	1.000	1.000	1.000	1.000	1.000	1.000
5 Yr x H/L				1.019	0.989	1.003	1.010	0.998	1.000	1.000	1.000	1.000	1.000	1.000	1.000
All Year				1.022	1.006	1.000	1.005	0.999	1.005	1.000	1.000	1.000	1.000	1.000	1.000
3 Yr Wtd				1.011	1.006	0.999	1.011	0.994	1.010	1.000	1.000	1.000	1.000	1.000	1.000
5 Yr Wtd				1.027	1.002	1.001	1.008	1.000	1.006	1.000	1.000	1.000	1.000	1.000	1.000
All Year				1.019	1.005	1.000	1.005	0.999	1.005	1.000	1.000	1.000	1.000	1.000	1.000

Selecting Factors

Accident Year	Evaluation Intervals in Months									
	12-24	24-36	36-48	48-60	60-72	72-84	84-96	96-108	108-120	
2002	1.659	1.135	1.060	1.015	1.001	1.000	1.000	1.000	1.001	
2003	1.823	1.074	1.050	1.028	1.006	1.000	1.000	0.999		
2004	1.660	1.060	1.047	1.045	1.001	1.000	1.000			
2005	1.751	1.070	1.024	1.011	1.005	1.001				
2006	1.624	1.142	1.015	1.025	1.001					
2007	1.640	1.105	1.042	1.022						
2008	1.733	1.109	1.035							
2009	1.554	1.134								
2010	1.511									
Average All Years	1.662	1.104	1.039	1.024	1.003	1.000	1.000	1.000		
Average 3 Years	1.599	1.116	1.031	1.019	1.002	1.000	1.000	1.000		
Average 5 Years	1.612	1.112	1.033	1.026	1.003	1.000	1.000	1.000		
Weighted Average	1.647	1.108	1.038	1.023	1.003	1.000	1.000	1.000		
Selected	1.600	1.110	1.038	1.025	1.003	1.000	1.000	1.000		

Exercise 5

Select development factors

CLRS Boot Camp Co Analysis of Loss & LAE Reserves as of 12/31/2012															
General Liability															
Incurred L&ALAE															
Accident Year	Evaluation Age (Months)														
	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180
1998	3,311,218	5,824,394	6,034,446	6,951,489	7,618,638	7,551,130	7,596,048	7,570,398	7,570,799	7,570,799	7,570,799	7,570,799	7,570,799	7,570,799	7,570,799
1999	6,131,137	7,337,824	8,675,061	9,602,820	8,593,760	8,700,426	8,609,156	8,611,737	8,584,098	8,584,098	8,584,298	8,584,298	8,584,298	8,584,298	8,584,298
2000	4,486,911	5,703,031	7,825,801	8,393,446	8,666,572	8,994,920	8,951,694	8,942,791	8,881,941	8,882,137	8,882,137	8,882,137	8,882,137	8,882,137	8,882,137
2001	4,494,489	6,491,388	8,543,398	9,740,369	10,668,442	10,852,838	10,887,328	10,779,717	11,023,221	11,358,062	11,358,062	11,358,062	11,358,062	11,358,062	11,358,062
2002	5,381,202	7,776,892	9,091,593	9,378,860	9,352,519	9,239,593	9,328,302	9,447,882	9,448,106	9,409,962	9,409,962	9,409,962	9,409,962	9,409,962	9,409,962
2003	5,908,831	9,752,969	10,453,457	11,403,381	11,145,915	11,085,104	11,084,827	11,301,107	11,095,428	11,106,523	11,106,523	11,106,523	11,106,523	11,106,523	11,106,523
2004	8,565,479	11,614,572	12,941,990	14,415,918	14,399,722	14,339,193	14,384,381	14,479,587	14,479,587	14,479,587	14,479,587	14,479,587	14,479,587	14,479,587	14,479,587
2005	6,717,086	10,194,738	11,851,717	12,661,864	14,081,734	13,643,777	13,488,408	13,623,292	13,623,292	13,623,292	13,623,292	13,623,292	13,623,292	13,623,292	13,623,292
2006	7,717,931	10,947,386	13,649,914	14,387,140	14,017,332	15,083,244	15,158,660	15,158,660	15,158,660	15,158,660	15,158,660	15,158,660	15,158,660	15,158,660	15,158,660
2007	9,153,615	11,583,639	13,445,812	13,865,237	14,717,899	14,363,510	14,363,510	14,363,510	14,363,510	14,363,510	14,363,510	14,363,510	14,363,510	14,363,510	14,363,510
2008	8,906,329	11,556,692	13,889,442	14,400,566	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616
2009	6,804,499	10,330,437	11,714,665	13,522,351	13,522,351	13,522,351	13,522,351	13,522,351	13,522,351	13,522,351	13,522,351	13,522,351	13,522,351	13,522,351	13,522,351
2010	7,312,509	11,373,571	12,915,590	12,915,590	12,915,590	12,915,590	12,915,590	12,915,590	12,915,590	12,915,590	12,915,590	12,915,590	12,915,590	12,915,590	12,915,590
2011	7,377,474	10,997,744	10,997,744	10,997,744	10,997,744	10,997,744	10,997,744	10,997,744	10,997,744	10,997,744	10,997,744	10,997,744	10,997,744	10,997,744	10,997,744
2012	7,877,726	7,877,726	7,877,726	7,877,726	7,877,726	7,877,726	7,877,726	7,877,726	7,877,726	7,877,726	7,877,726	7,877,726	7,877,726	7,877,726	7,877,726
Accident Year	Development Factors by Period:														
	12-24	24-36	36-48	48-60	60-72	72-84	84-96	96-108	108-120	120-132	132-144	144-156	156-168	168-180	180-Ult
1999	1.759	1.036	1.152	1.096	0.991	1.006	0.997	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2000	1.197	1.182	1.107	0.895	1.012	0.990	1.000	0.997	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2001	1.271	1.372	1.073	1.033	1.038	0.995	0.999	0.995	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2002	1.444	1.316	1.140	1.095	1.017	1.003	0.990	1.023	1.030	1.000	1.000	1.000	1.000	1.000	1.000
2003	1.445	1.169	1.032	0.997	0.988	1.010	1.013	1.000	0.996	1.000	1.000	1.000	1.000	1.000	1.000
2004	1.651	1.072	1.091	0.977	0.995	1.000	1.020	0.982	1.001	1.000	1.000	1.000	1.000	1.000	1.000
2005	1.356	1.114	1.114	0.999	0.996	1.003	1.007	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2006	1.518	1.163	1.068	1.112	0.969	0.989	1.010	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2007	1.418	1.247	1.054	0.974	1.076	1.005	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2008	1.265	1.161	1.031	1.061	0.976	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2009	1.298	1.202	1.037	0.998	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2010	1.518	1.134	1.154	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2011	1.555	1.136	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2012	1.491	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Numeric Averages															
3 Year	1.521	1.157	1.074	1.011	1.007	0.999	1.012	0.994	1.009	1.000	1.000	1.000	1.000	1.000	1.000
5 Year	1.425	1.176	1.089	1.029	1.002	1.001	1.008	1.000	1.005	1.000	1.000	1.000	1.000	1.000	1.000
5 Yr x H/L	1.436	1.166	1.053	1.019	0.989	1.003	1.010	0.998	1.000	1.000	1.000	1.000	1.000	1.000	1.000
All Year	1.442	1.177	1.088	1.022	1.006	1.000	1.005	0.999	1.005	1.000	1.000	1.000	1.000	1.000	1.000
3 Yr Wtd	1.521	1.158	1.070	1.011	1.006	0.999	1.011	0.994	1.010	1.000	1.000	1.000	1.000	1.000	1.000
5 Yr Wtd	1.412	1.176	1.066	1.027	1.002	1.001	1.008	1.000	1.006	1.000	1.000	1.000	1.000	1.000	1.000
All Year	1.425	1.171	1.083	1.019	1.005	1.000	1.005	0.999	1.005	1.000	1.000	1.000	1.000	1.000	1.000
Benchmark															
Prior Select	1.330	1.130	1.070	1.027	1.010	1.004	1.002	1.001	1.001	1.001	1.000	1.000	1.000	1.000	1.000
Selection	1.411	1.200	1.070	1.020	1.010	1.005	1.005	1.001	1.001	1.000	1.000	1.000	1.000	1.000	1.000

Basic Reserving Techniques:

What the LDF represents

	Evaluation Intervals in Months									
	12-24	24-36	36-48	48-60	60-72	72-84	84-96	96-108	108-120	
Selected	1.600	1.110	1.038	1.025	1.003	1.000	1.000	1.000	1.000	1.000

Accident Year	Cumulative Paid Losses (\$000 Omitted)									
	Development Stage in Months									
	12	24	36	48	60	72	84	96	108	120
2002	689	1,143	1,297	1,375	1,395	1,396	1,396	1,396	1,396	1,397
2003	526	959	1,030	1,081	1,111	1,118	1,118	1,118	1,117	1,117
2004	474	787	834	873	912	913	913	913	913	913
2005	590	1,033	1,105	1,131	1,144	1,150	1,151	1,151	1,151	1,151
2006	801	1,301	1,486	1,509	1,547	1,548	1,548	1,548	1,548	1,548
2007	636	1,043	1,152	1,200	1,226	1,230	1,230	1,230	1,230	1,230
2008	778	1,348	1,495	1,548	1,587	1,591	1,591	1,591	1,591	1,591
2009	1,003	1,559	1,768	1,835	1,881	1,887	1,887	1,887	1,887	1,887
2010	888	1,342	1,490	1,546	1,585	1,590	1,590	1,590	1,590	1,590
2011	653	1,045	1,160	1,204	1,234	1,238	1,238	1,238	1,238	1,238

Sample Calculation for Accident Year 2011

At 24 months	1,045	= 653 * 1.600	
At 36 months	1,160	= 1,045 * 1.110	or = 653 * 1.600 * 1.110
At 120 months	1,238	= 653 * 1.600 * 1.110 * 1.038 * 1.025 * 1.003 * 1.00 * 1.00 * 1.00 * 1.00	

Basic Reserving Techniques: Cumulative development factor CDF

	Evaluation Intervals in Months									
	12-24	24-36	36-48	48-60	60-72	72-84	84-96	96-108	108-120	
Selected	1.600	1.110	1.038	1.025	1.003	1.000	1.000	1.000	1.000	1.000
CDF	1.895	1.185	1.067	1.028	1.003	1.000	1.000	1.000	1.000	1.000

Accident Year	Cumulative Paid Losses (\$000 Omitted)									
	Development Stage in Months									
	12	24	36	48	60	72	84	96	108	120
2002	689	1,143	1,297	1,375	1,395	1,396	1,396	1,396	1,396	1,397
2003	526	959	1,030	1,081	1,111	1,118	1,118	1,118	1,117	1,117
2004	474	787	834	873	912	913	913	913		913
2005	590	1,033	1,105	1,131	1,144	1,150	1,151			1,151
2006	801	1,301	1,486	1,509	1,547	1,548				1,548
2007	636	1,043	1,152	1,200	1,226					1,230
2008	778	1,348	1,495	1,548						1,591
2009	1,003	1,559	1,768							1,887
2010	888	1,342								1,590
2011	653									1,238

Sample Calculation for Accident Year 2011

At 72 months 1,238 = 653 * 1.895

Exercise 6

CLRS Boot Camp Co Analysis of Loss & LAE Reserves as of 12/31/2012 General Liability															
Incurred L&ALAE															
Accident Year	Evaluation Age (Months)														
	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180
1998	3,311,218	5,824,394	6,034,446	6,951,489	7,618,638	7,551,130	7,596,048	7,570,398	7,570,799	7,570,799	7,570,799	7,570,799	7,570,799	7,570,799	7,570,799
1999	6,131,137	7,337,824	8,675,061	9,602,820	8,593,760	8,700,426	8,609,156	8,611,737	8,584,098	8,584,098	8,584,298	8,584,298	8,584,298	8,584,298	8,584,298
2000	4,486,911	5,703,031	7,825,801	8,393,446	8,666,572	8,994,920	8,951,694	8,942,791	8,881,941	8,882,137	8,882,137	8,882,137	8,882,137	8,882,137	8,882,137
2001	4,494,489	6,491,388	8,543,398	9,740,369	10,668,442	10,852,838	10,887,328	10,779,717	11,023,221	11,358,062	11,358,062	11,358,062	11,358,062	11,358,062	11,358,062
2002	5,381,202	7,776,892	9,091,593	9,378,860	9,352,519	9,239,593	9,328,302	9,447,882	9,448,106	9,409,962	9,409,962	9,409,962	9,409,962	9,409,962	9,409,962
2003	5,908,831	9,752,969	10,453,457	11,403,381	11,145,915	11,085,104	11,084,827	11,301,107	11,095,428	11,106,523	11,106,523	11,106,523	11,106,523	11,106,523	11,106,523
2004	8,565,479	11,614,572	12,941,990	14,415,918	14,399,722	14,339,722	14,339,193	14,384,381	14,479,587	14,479,587	14,479,587	14,479,587	14,479,587	14,479,587	14,479,587
2005	6,717,086	10,194,738	11,851,717	12,661,864	14,081,734	13,643,777	13,488,408	13,623,292	13,623,292	13,623,292	13,623,292	13,623,292	13,623,292	13,623,292	13,623,292
2006	7,717,931	10,947,386	13,649,914	14,387,140	14,017,332	15,083,244	15,158,660	15,158,660	15,158,660	15,158,660	15,158,660	15,158,660	15,158,660	15,158,660	15,158,660
2007	9,153,615	11,583,639	13,445,812	13,865,237	14,717,899	14,363,510	14,363,510	14,363,510	14,363,510	14,363,510	14,363,510	14,363,510	14,363,510	14,363,510	14,363,510
2008	8,900,329	11,556,692	13,889,442	14,400,566	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616
2009	6,804,499	10,330,437	11,714,665	13,522,351	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616
2010	7,312,509	11,373,571	12,915,590	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616
2011	7,377,474	10,997,744	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616
2012	7,877,726	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616	14,367,616
Accident Year	Development Factors by Period:														
	12-24	24-36	36-48	48-60	60-72	72-84	84-96	96-108	108-120	120-132	132-144	144-156	156-168	168-180	180-Ur
1999	1.759	1.036	1.152	1.096	0.991	1.006	0.997	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2000	1.197	1.182	1.107	0.895	1.012	0.990	1.000	0.997	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2001	1.271	1.372	1.073	1.033	1.038	0.995	0.999	0.995	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2002	1.444	1.316	1.140	1.095	1.017	1.003	0.990	1.023	1.030	1.000	1.000	1.000	1.000	1.000	1.000
2003	1.445	1.169	1.032	0.997	0.988	1.010	1.013	1.000	0.996	1.000	1.000	1.000	1.000	1.000	1.000
2004	1.651	1.072	1.091	0.977	0.995	1.000	1.020	0.982	1.001	1.000	1.000	1.000	1.000	1.000	1.000
2005	1.356	1.114	1.114	0.999	0.996	1.003	1.007	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2006	1.518	1.163	1.068	1.112	0.969	0.989	1.010	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2007	1.418	1.247	1.054	0.974	1.076	1.005	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2008	1.265	1.161	1.031	1.061	0.976	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2009	1.298	1.202	1.037	0.998	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2010	1.518	1.134	1.154	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2011	1.555	1.136	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2012	1.491	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Numeric Averages															
3 Year	1.521	1.157	1.074	1.011	1.007	0.999	1.012	0.994	1.009	1.000	1.000	1.000	1.000	1.000	1.000
5 Year	1.425	1.176	1.069	1.029	1.002	1.001	1.008	1.000	1.005	1.000	1.000	1.000	1.000	1.000	1.000
5 Yr x H/L	1.436	1.166	1.053	1.019	0.989	1.003	1.010	0.998	1.000	1.000	0.667	1.000	1.000	1.000	1.000
All Year	1.442	1.177	1.088	1.022	1.006	1.000	1.005	0.999	1.005	1.000	1.000	1.000	1.000	1.000	1.000
3 Yr Wtd	1.521	1.158	1.070	1.011	1.006	0.999	1.011	0.994	1.010	1.000	1.000	1.000	1.000	1.000	1.000
5 Yr Wtd	1.412	1.176	1.066	1.027	1.002	1.001	1.008	1.000	1.006	1.000	1.000	1.000	1.000	1.000	1.000
All Year	1.425	1.171	1.083	1.019	1.005	1.000	1.005	0.999	1.005	1.000	1.000	1.000	1.000	1.000	1.000
Benchmark	1.330	1.130	1.070	1.027	1.010	1.004	1.002	1.001	1.001	1.001	1.001	1.000	1.000	1.000	1.000
Prior Select	1.411	1.200	1.070	1.020	1.010	1.005	1.005	1.001	1.001	1.001	1.000	1.000	1.000	1.000	1.000
Selection															
Cumulative LDF															

Loss Development Methods

- ▶ Development Methods
 - Paid Losses
 - Incurred Losses
 - LAE
 - Counts
- ▶ Expected Ratio Method
- ▶ Bornhuetter–Ferguson Method
- ▶ Paid to Paid Method



Development Methods:

Paid LDM

Accident Year	Actual Paid Losses 12/31/11	Cumulative Development Factors to Ultimate	Estimated Ultimate Losses [(2) x (3)]
(1)	(2)	(3)	(4)
2002	1,397	1.000	1,397
2003	1,117	1.000	1,117
2004	913	1.000	913
2005	1,151	1.000	1,151
2006	1,548	1.000	1,548
2007	1,226	1.003	1,230
2008	1,548	1.028	1,591
2009	1,768	1.067	1,887
2010	1,342	1.185	1,590
2011	653	1.895	1,238
Total	12,663		13,661

Exercise 7

CLRS Boot Camp Co					
Analysis of Loss & LAE Reserves as of 12/31/2012					
Liability					
Paid Loss Development Method					
	(1)	(2)	(3)	(4)	(5)
Accident Year	Age	Premium	Paid Loss	Paid CDF	Paid Loss Development Method
1998		6,953,372			
1999		6,567,116			
2000		6,690,146			
2001		7,103,262			
2002		7,959,030			
2003		9,363,418			
2004		10,597,562			
2005		11,036,360			
2006		11,402,928			
2007		11,099,580			
2008		10,683,363			
2009		10,430,225			
2010		10,106,327			
2011		9,889,744			
2012		9,998,036			
Total			-		-

Development Methods:

Paid LDM

Accident Year	Actual Paid Losses 12/31/11	Cumulative Development Factors to Ultimate	Estimated Ultimate Losses [(2) x (3)]	Estimated Loss Reserves [(4) -(2)]
(1)	(2)	(3)	(4)	
2002	1,397	1.000	1,397	-
2003	1,117	1.000	1,117	-
2004	913	1.000	913	-
2005	1,151	1.000	1,151	-
2006	1,548	1.000	1,548	-
2007	1,226	1.003	1,230	4
2008	1,548	1.028	1,591	43
2009	1,768	1.067	1,887	119
2010	1,342	1.185	1,590	248
2011	653	1.895	1,238	585
Total	12,663		13,661	998

Exercise 8

CLRS Boot Camp Co							
Analysis of Loss & LAE Reserves as of 12/31/2012							
Liability							
Paid Loss Development Method							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Accident Year	Age	Premium	Paid Loss	Paid CDF	Paid Loss Development Method	Estimated Reserves PLDM	Estimated Loss Ratio
1998		6,953,372					
1999		6,567,116					
2000		6,690,146					
2001		7,103,262					
2002		7,959,030					
2003		9,363,418					
2004		10,597,562					
2005		11,036,360					
2006		11,402,928					
2007		11,099,580					
2008		10,683,363					
2009		10,430,225					
2010		10,106,327					
2011		9,889,744					
2012		9,998,036					
Total			-		-	-	

Tail Factors: Impact of Selection

Accident Year	Actual Paid Losses 12/31/11	Loss Development Factors	Cumulative Development Factors to Ultimate	Estimated Ultimate Losses [(2) x (4)]	Premium	Estimated Loss Ratio [(5) / (6)]	Estimated Loss Reserves [(4) -(2)]
(1)	(3)	(4)	(5)	(6)	(7)	(8)	(8)
2002	1,397	1.000	1.000	1,397	2,284	61.16%	-
2003	1,117	1.000	1.000	1,117	2,092	53.39%	-
2004	913	1.000	1.000	913	1,833	49.81%	-
2005	1,151	1.000	1.000	1,151	2,136	53.89%	-
2006	1,548	1.000	1.000	1,548	2,551	60.68%	-
2007	1,226	1.003	1.003	1,230	1,986	61.92%	4
2008	1,548	1.028	1.031	1,596	2,561	62.33%	48
2009	1,768	1.067	1.100	1,945	2,479	78.48%	177
2010	1,342	1.185	1.303	1,749	2,237	78.20%	407
2011	653	1.895	2.470	1,613	1,862	86.63%	960
Total	12,663			14,260	22,021	64.76%	1,597
						Case	927
						IBNR	670

Tail Factors: Impact of Selection

Accident Year (1)	Actual Paid Losses 12/31/11 (2)	Loss Development Factors (3)	Cumulative Development Factors to Ultimate (4)	Estimated Ultimate Losses [(2) x (4)] (5)	Premium (6)	Estimated Loss Ratio [(5) / (6)] (7)	Estimated Loss Reserves [(4) -(2)] (8)
2002	1,397	1.020	1.020	1,425	2,284	62.39%	28
2003	1,117	1.000	1.020	1,139	2,092	54.46%	22
2004	913	1.000	1.020	931	1,833	50.81%	18
2005	1,151	1.000	1.020	1,174	2,136	54.96%	23
2006	1,548	1.000	1.020	1,579	2,551	61.90%	31
2007	1,226	1.003	1.023	1,254	1,986	63.16%	28
2008	1,548	1.028	1.052	1,628	2,561	63.58%	80
2009	1,768	1.067	1.122	1,984	2,479	80.05%	216
2010	1,342	1.185	1.330	1,784	2,237	79.76%	442
2011	653	1.895	2.520	1,645	1,862	88.37%	992
Total	12,663			14,545	22,021	66.05%	1,882
						Case	927
						IBNR	955
Estimated reserves based on original LDFs							1,597
Percent Increase							17.86%

Selection of Tail Factors

- ▶ Ultimate losses increase by:
 - \$285 thousand
 - 2.0% increase in ultimate losses
- ▶ Loss reserves also increase by:
 - \$285 thousand
 - 17.86% increase in overall reserve levels!
- ▶ IBNR reserves
 - Original =
 - \$285 million
 - **43% in overall IBNR levels!!!!**
- ▶ Biggest impacts are in the most recent year.

Exercise 9

Boot Camp Insurance Company															
Analysis of Loss & LAE Reserves as of 12/31/2012															
Liability															
Paid Loss															
Evaluation Age (Months)															
Accident Year	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180
1998	341,628	1,034,837	1,898,517	2,466,775	2,991,937	3,152,844	3,241,243	3,278,555	3,335,054	3,388,572	3,792,652	4,006,045	4,026,076	4,066,336	4,066,336
1999	283,763	1,117,577	2,132,067	2,570,624	2,641,818	2,728,291	2,752,957	2,785,455	2,804,471	2,808,770	2,835,273	2,886,516	3,289,147	3,271,028	
2000	391,721	1,101,914	2,347,778	2,952,878	3,774,844	3,845,423	3,865,494	3,865,843	3,865,843	3,866,000	3,935,115	4,574,883	4,586,913		
2001	349,400	885,020	1,215,707	1,876,822	2,559,148	2,884,818	3,105,277	3,184,368	3,334,848	3,490,945	4,607,569	4,556,737			
2002	367,060	650,672	1,463,556	2,459,693	2,861,392	3,302,088	3,455,868	3,605,837	3,848,064	3,934,578	4,357,830				
2003	327,139	667,826	1,221,064	1,697,078	2,239,890	2,468,219	2,574,439	2,819,279	3,233,905	3,174,353					
2004	303,593	704,762	1,193,812	1,517,649	1,631,896	1,735,293	1,904,538	2,243,619	2,329,891						
2005	501,760	1,005,937	1,340,913	1,545,589	2,213,662	2,370,115	2,452,890	2,463,992							
2006	301,145	658,664	1,212,189	2,430,778	2,881,963	3,049,911	3,156,139								
2007	266,685	1,109,352	1,959,118	3,213,095	6,149,641	6,907,218									
2008	912,098	1,686,868	1,917,266	2,745,786	4,132,680										
2009	338,919	901,700	1,345,545	1,766,813											
2010	338,929	801,962	1,655,619												
2011	345,581	629,188													
2012	383,397														
Development Factors by Period:															
Accident Year	12-24	24-36	36-48	48-60	60-72	72-84	84-96	96-108	108-120	120-132	132-144	144-156	156-168	168-180	180-Ult
1999	3.029	1.835	1.299	1.213	1.054	1.028	1.012	1.017	1.016	1.119	1.056	1.005	1.010	1.000	
2000	3.938	1.908	1.206	1.028	1.033	1.009	1.012	1.007	1.002	1.009	1.018	1.139	0.994		
2001	2.813	2.131	1.258	1.278	1.019	1.005	1.000	1.000	1.000	1.018	1.163	1.003			
2002	2.533	1.374	1.544	1.364	1.127	1.076	1.025	1.047	1.047	1.320	0.989				
2003	1.773	2.249	1.681	1.163	1.154	1.047	1.043	1.067	1.022	1.108					
2004	2.041	1.828	1.390	1.320	1.102	1.043	1.095	1.147	0.982						
2005	2.321	1.694	1.271	1.075	1.063	1.098	1.178	1.038							
2006	2.005	1.333	1.153	1.432	1.071	1.035	1.005								
2007	2.187	1.840	2.005	1.186	1.058	1.035									
2008	4.160	1.766	1.640	1.914	1.123										
2009	1.849	1.137	1.432	1.505											
2010	2.661	1.492	1.313												
2011	2.366	2.064													
2012	1.821														
Numeric Averages															
3 Year	2.283	1.564	1.462	1.535	1.084	1.056	1.093	1.084	1.017	1.149	1.057	1.049			
5 Year	2.571	1.660	1.509	1.422	1.083	1.052	1.069	1.060	1.011	1.115	1.057				
5 Yr x H/L	2.292	1.699	1.462	1.374	1.079	1.042	1.054	1.051	1.008	1.082	0.691				
All Year	2.536	1.742	1.433	1.316	1.080	1.042	1.046	1.046	1.012	1.115	1.057	1.049	1.002	1.000	
3 Yr Wid															
3 Yr Wid	2.279	1.451	1.479	1.569	1.096	1.050	1.086	1.086	1.018	1.142	1.056	1.038	1.003		
5 Yr Wid	2.329	1.568	1.505	1.485	1.094	1.048	1.061	1.057	1.011	1.117	1.056				
All Year	2.413	1.696	1.415	1.338	1.083	1.038	1.038	1.044	1.012	1.117	1.056	1.038	1.003	1.000	
Benchmark															
Prior Select	1.985	1.585	1.350	1.217	1.113	1.082	1.048	1.031	1.030	1.100	1.000	1.000	1.000	1.000	1.000
	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Selection															
Cumulative LDF															
Cumulative LDF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Expected Ratio Method

EXPECTED LOSS RATIO (ELR)

The anticipated ratio of projected ultimate losses to earned premiums.

Sources:

- Pricing assumptions
- Historical data
- Industry data



Expected Ratio Method Pricing Assumptions

	Percent of Premium
Commissions	20.0%
Taxes	5.0%
General Expenses	15.0%
Profit	-2.0%
Total	38.0%
Expected Loss Ratio (Available for Loss and LAE)	62.0%

Expected Ratio Method Historical data– Sch. P

	Loss and Loss Expense % (Incurred/Premiums Earned)		
	29 Direct and Assumed	30 Ceded	31 Net
1. Prior	XXXX	XXXX	XXXX
2. 2002	76.8	71.9	84.3
3. 2003	70.4	65.7	76.6
4. 2004	67.5	63.9	72.8
5. 2005	74.0	66.3	84.1
6. 2006	76.6	68.9	82.0
7. 2007	79.6	71.3	84.8
8. 2008	77.0	72.0	80.1
9. 2009	93.0	89.7	95.0
10. 2010	86.3	81.2	89.5
11. 2011	90.6	80.7	96.9
12. Totals	XXXX	XXXX	XXXX
Avg 3	90.0	83.8	93.8
Avg 5	85.3	79.0	89.3

Expected Ratio Method

- ▶ **Estimating Reserves Based on ELR**
- ▶ Earned Premium \times ELR = Expected Ultimate Losses
- ▶ Ultimate Losses – Paid Losses = Total Reserve
- ▶ Total Reserves – Case Reserve = IBNR Reserve



Expected Ratio Method

Estimating Reserves Based on ELR

Earned Premium	=	\$ 100,000
Expected Loss Ratio	=	0.65
Paid Losses	=	\$ 10,000
Case Reserves	=	\$ 13,000

$$\begin{aligned} \text{Total Reserve} &= (\$100,000 \times 0.65) - \$10,000 \\ &= \$65,000 - \$10,000 \\ &= \$55,000 \end{aligned}$$

$$\begin{aligned} \text{IBNR Reserve} &= \$55,000 - \$13,000 \\ &= \$42,000 \end{aligned}$$



Expected Ratio Method

Estimating Reserves Based on ELR

Use when you have no history such as:

New product lines

Radical changes in product lines

Immature accident years for long tailed lines

Can generate negative reserves or negative IBNR if

Ultimate Losses < Paid Losses—MOST
LIKELY ILLOGICAL!!!

Ultimate Losses < Incurred Losses



Exercise 10

CLRS Boot Camp Co							
Analysis of Loss & LAE Reserves as of 12/31/2012							
Liability							
Expected Loss Ratio Method							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Accident Year	Premium	Paid LDM	Inc LDM	Loss Ratio Paid LDM	Loss Ratio Inc LDM	Expected Loss Ratio	ELM Estimated Ultimate
1998	6,953,372	-	-	0.00%	0.00%		
1999	6,567,116	-	-	0.00%	0.00%		
2000	6,690,146	-	-	0.00%	0.00%		
2001	7,103,262	-	-	0.00%	0.00%		
2002	7,959,030	-	-	0.00%	0.00%		
2003	9,363,418	-	-	0.00%	0.00%		
2004	10,597,562	-	-	0.00%	0.00%		
2005	11,036,360	-	-	0.00%	0.00%		
2006	11,402,928	-	-	0.00%	0.00%		
2007	11,099,580	-	-	0.00%	0.00%		
2008	10,683,363	-	-	0.00%	0.00%		
2009	10,430,225	-	-	0.00%	0.00%		
2010	10,106,327	-	-	0.00%	0.00%		
2011	9,889,744	-	-	0.00%	0.00%		
2012	9,998,036	-	-	0.00%	0.00%		
Total	139,880,469	-	-	0.00%	0.00%	N/A	-
				Avg 04-07:	0.00%	0.00%	

Bornhuetter–Ferguson Method

Reserves Based on ELR and Actual Loss

$$(EP \times ELR) \times (\text{IBNR Factor}) = (\text{IBNR Reserves})$$

$$\text{Where IBNR Factor} = (1.000 - 1.000/\text{CDF})$$

$$\text{Actual} + \text{IBNR Reserve} = \text{Ultimate Losses}$$

$$\text{Case Reserve} + \text{IBNR Reserve} = \text{Total Reserve}$$

The IBNR Factor is the percent of expected losses unreported.



Bornhuetter–Ferguson Method

Accident Year	Evaluation Intervals in Months									
	12-24	24-36	36-48	48-60	60-72	72-84	84-96	96-108	108-120	
2002	1.659	1.135	1.060	1.015	1.001	1.000	1.000	1.000	1.001	
2003	1.823	1.074	1.050	1.028	1.006	1.000	1.000	0.999		
2004	1.660	1.060	1.047	1.045	1.001	1.000	1.000			
2005	1.751	1.070	1.024	1.011	1.005	1.001				
2006	1.624	1.142	1.015	1.025	1.001					
2007	1.640	1.105	1.042	1.022						
2008	1.733	1.109	1.035							
2009	1.554	1.134								
2010	1.511									
Average All Years	1.662	1.104	1.039	1.024	1.003	1.000	1.000	1.000		
Average 3 Years	1.599	1.116	1.031	1.019	1.002	1.000	1.000	1.000		
Average 5 Years	1.612	1.112	1.033	1.026	1.003	1.000	1.000	1.000		
Weighted Average	1.647	1.108	1.038	1.023	1.003	1.000	1.000	1.000		
Selected	1.600	1.110	1.038	1.025	1.003	1.000	1.000	1.000	1.000	
CDF	1.895	1.185	1.067	1.028	1.003	1.000	1.000	1.000	1.000	

IBNR Factor = $1 - 1 / \text{Cumulative Development Factor}$										
	$+ 1 - 1 / 1.895$		$+ 1 - 1 / 1.895$							
IBNR Factor	0.472	0.156	0.063	0.027	0.003	-	-	-	-	-

Bornhuetter–Ferguson Method

Accident Year	Earned Premium	Assumed Expected Loss Ratio	Assumed Expected Losses	IBNR Factor	Estimated IBNR	Actual Paid Losses	Estimated Ultimate Losses
1	2	3	4 (2) x (3)	5	6 (4) x (5)	7	8 (6) + (7)
2002	2,284	62.0%	1,416	-	-	1,397	1,397
2003	2,092	62.0%	1,297	-	-	1,117	1,117
2004	1,833	62.0%	1,136	-	-	913	913
2005	2,136	62.0%	1,324	-	-	1,151	1,151
2006	2,551	62.0%	1,582	-	-	1,548	1,548
2007	1,986	62.0%	1,231	0.003	4	1,226	1,230
2008	2,561	62.0%	1,588	0.027	43	1,548	1,591
2009	2,479	62.0%	1,537	0.063	97	1,768	1,865
2010	2,237	62.0%	1,387	0.156	216	1,342	1,558
2011	1,862	62.0%	1,154	0.472	545	653	1,198
Total	159,680		99,002		5,372	5,372	93,163

Exercise 11

CLRS Boot Camp Co								
Analysis of Loss & LAE Reserves as of 12/31/2012								
Liability								
Paid Bornhuetter-Ferguson Method								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Accident Year	Age	Premium	ELM Ultimate	IBNR Factor	Estimated IBNR	Paid Loss	Paid BF Method Ultimate	Estimated Reserves PBFM
1998	180	6,953,372	-			-		
1999	168	6,567,116	-			-		
2000	156	6,690,146	-			-		
2001	144	7,103,262	-			-		
2002	132	7,959,030	-			-		
2003	120	9,363,418	-			-		
2004	108	10,597,562	-			-		
2005	96	11,036,360	-			-		
2006	84	11,402,928	-			-		
2007	72	11,099,580	-			-		
2008	60	10,683,363	-			-		
2009	48	10,430,225	-			-		
2010	36	10,106,327	-			-		
2011	24	9,889,744	-			-		
2012	12	9,998,036	-			-		
Total		139,880,469	-		-	-	-	-

Paid to Paid Method

- ▶ Paid DCC to Paid Loss
- ▶ Recovered Salvage and Subrogation to Paid Loss
- ▶ Used for items that are related to paying losses



Paid to Paid Method

<u>Cumulative Paid DCC to Cumulative Paid Losses</u>							
(\$ 000s)							
EZ INSURANCE COMPANY AUTO LIABILITY							
Accident	----- CUMULATIVE PAID DCC -----						
Year	<u>12</u>	<u>24</u>	<u>36</u>	<u>48</u>	<u>60</u>	<u>72</u>	<u>84</u>
2005	71	166	286	416	527	611	677
2006	83	189	313	458	584	672	
2007	93	213	361	523	657		
2008	103	226	394	581			
2009	108	245	437				
2010	128	280					
2011	132						
Accident	----- CUMULATIVE PAID LOSSES -----						
Year	<u>12</u>	<u>24</u>	<u>36</u>	<u>48</u>	<u>60</u>	<u>72</u>	<u>84</u>
2005	3,361	5,991	7,341	8,259	8,916	9,408	9,759
2006	3,780	6,671	8,156	9,205	9,990	10,508	
2007	4,212	7,541	9,351	10,639	11,536		
2008	4,901	8,864	10,987	12,458			
2009	5,708	10,268	12,699				
2010	6,093	11,172					
2011	6,962						

Paid to Paid Method

Cumulative Paid DCC to Cumulative Paid Losses

EZ INSURANCE COMPANY AUTO LIABILITY

Accident Year	----- CUM PAID DCC TO CUM PAID LOSSES -----						
	<u>12</u>	<u>24</u>	<u>36</u>	<u>48</u>	<u>60</u>	<u>72</u>	<u>84</u>
2005	0.021	0.028	0.039	0.050	0.059	0.065	0.069
2006	0.022	0.028	0.038	0.050	0.058	0.064	
2007	0.022	0.028	0.039	0.049	0.057		
2008	0.021	0.025	0.036	0.047			
2009	0.019	0.024	0.034				
2010	0.021	0.025					
2011	0.019						

0.025 = 280 Paid DCC / 11,172 Paid Loss

Paid to Paid Method

Cumulative Paid DCC to Cumulative Paid Losses EZ INSURANCE COMPANY AUTO LIABILITY

Accident	PAID TO PAID DEVELOPMENT FACTORS						
Year	<u>12-24</u>	<u>24-36</u>	<u>36-48</u>	<u>48-60</u>	<u>60-72</u>	<u>72-84</u>	<u>84-Ult</u>
2005	1.312	1.406	1.293	1.173	1.099	1.068	
2006	1.290	1.355	1.297	1.175	1.094		
2007	1.279	1.367	1.273	1.159			
2008	1.213	1.406	1.301				
2009	1.261	1.442					
2010	1.193						
Average	1.258	1.395	1.291	1.169	1.096	1.068	
4 point avg.	1.237	1.393	1.291				
Avg. X high/low	1.261	1.393	1.295				
SELECTED	1.237	1.393	1.291	1.169	1.096	1.068	1.068
CDF	3.252	2.629	1.887	1.462	1.251	1.141	1.068

Paid to Paid Method

DCC Reserves Based on Cumulative Paid DCC to Cumulative Paid Loss Development EZ INSURANCE COMPANY AUTO LIABILITY (\$000s)

<u>Accident Year</u> (1)	<u>Ratio to Date</u> (2) slide 46	<u>Devel. Factor</u> (3) slide 47	<u>Developed Paid/Paid Ratio</u> (4) (2) x (3)	<u>Ultimate Losses</u> (5)	<u>Ultimate DCC</u> (6) (4) x (5)	<u>Paid DCC to Date</u> (7) slide 45	<u>Indicated DCC Reserves</u> (8) (6) - (7)
2005	0.069	1.068	0.074	10,292	762	677	85
2006	0.064	1.141	0.073	11,261	822	672	150
2007	0.057	1.251	0.071	12,751	905	657	248
2008	0.047	1.462	0.068	14,500	986	581	405
2009	0.034	1.887	0.065	16,326	1,061	437	624
2010	0.025	2.629	0.066	17,641	1,164	280	884
2011	0.019	3.252	0.062	<u>20,716</u>	<u>1,284</u>	<u>132</u>	<u>1,152</u>
Total				103,487	6,985	3,436	3,549

Exercise 13

CLRS Boot Camp Co					
Analysis of Loss & LAE Reserves as of 12/31/2012					
Liability					
Paid to Paid DCC Development Method					
	(1)	(2)	(3)	(4)	(5)
Accident Year	Age	PD to PD Ratio	Pd Pd CDF	Pd Pd DCC Development Method	Estimated Ultimate DCC Ratio
1998	180	17.7%	-	0.0%	-17.7%
1999	168	26.2%	-	0.0%	-26.2%
2000	156	19.0%	-	0.0%	-19.0%
2001	144	21.9%	-	0.0%	-21.9%
2002	132	22.0%	-	0.0%	-22.0%
2003	120	38.3%	-	0.0%	-38.3%
2004	108	55.4%	-	0.0%	-55.4%
2005	96	45.7%	-	0.0%	-45.7%
2006	84	33.4%	-	0.0%	-33.4%
2007	72	16.0%	-	0.0%	-16.0%
2008	60	25.3%	-	0.0%	-25.3%
2009	48	41.6%	-	0.0%	-41.6%
2010	36	33.5%	-	0.0%	-33.5%
2011	24	50.4%	-	0.0%	-50.4%
2012	12	44.8%	-	0.0%	-44.8%
Total					

Diagnostics

- ▶ Paid to Incurred Ratios
- ▶ Closed to Reported Claims
- ▶ Average Paid
- ▶ Average Outstanding
- ▶ Loss Ratios



Ratios – Paid to Incurred

		Cumulative Paid Losses (\$000 Omitted)					Cumulative Incurred Losses (\$000 Omitted)			
Accident		Development Stage in Months			Accident		Development Stage in Months			
Year		12	24	36	Year		12	24	36	
2006		3,780	6,671	8,156	2006		9,337	10,847	11,092	
2007		4,212	7,541		2007		10,540	12,205		
2008		4,901			2008		11,875			

		Ratio Paid to Case Reported		
Accident		Development Stage in Months		
Year		12	24	36
2006		+3,780 / 9,337	+6,671 / 10,847	
2007		+4,212 / 10,540		
2008				

Ratios – Paid to Incurred

Accident Year	Cumulative Paid Losses (\$000 Omitted)			Accident Year	Cumulative Incurred Losses (\$000 Omitted)		
	Development Stage in Months				Development Stage in Months		
	12	24	36		12	24	36
2006	3,780	6,671	8,156	2006	9,337	10,847	11,092
2007	4,212	7,541		2007	10,540	12,205	
2008	4,901			2008	11,875		

Accident Year	Ratio Paid to Case Reported Development Stage in Months		
	12	24	36
2006	0.405	0.615	0.735
2007	0.400	0.618	
2008	0.413		

Ratios – Paid to Incurred

Accident Year	Ratio Paid to Case Reported Development Stage in Months					
	12	24	36	48	60	72
2006	0.405	0.615	0.735	0.822	0.889	0.934
2007	0.400	0.618	0.745	0.838	0.907	
2008	0.413	0.641	0.772	0.864		
2009	0.428	0.661	0.790			
2010	0.421	0.666				
2011	0.420					

Closed to Reported

Accident Year	Ratio Closed to Reported Claims Development Stage in Months					
	12	24	36	48	60	72
2006	0.740	0.950	0.990	1.000	1.000	1.000
2007	0.760	0.956	0.980	1.000	1.000	
2008	0.820	0.972	1.000	1.000		
2009	0.800	0.982	1.000			
2010	0.830	0.974				
2011	0.810					

Sensitivity Analysis: Ratios – Average Paid or Incurred

Accident Year	Average Reported Loss Development Stage in Months					
	12	24	36	48	60	72
2006	6,539	3,913	3,892	3,905	3,915	3,895
2007	6,164	4,025	4,067	4,101	4,092	
2008	8,744	4,976	4,762	4,804		
2009	8,836	6,005	6,049			
2010	9,724	6,442				
2011	10,325					



Average Outstanding

Accident Year	Average Case Reserves Development Stage in Months					
	12	24	36	48	60	72
2006	4,839	5,464	8,413	-	-	-
2007	4,684	6,452	6,941	-	-	-
2008	7,170	6,941	9,458	-	-	-
2009	7,069	8,155	-	-	-	-
2010	8,071	9,145	-	-	-	-
2011	8,363	-	-	-	-	-



Exercise 14

CLRS Boot Camp Co															
Analysis of Loss & LAE Reserves as of 12/31/2012															
Liability															
Paid To Incurred Loss Ratios															
Accident Year	Evaluation Age (Months)														
	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180
1998															
1999															
2000															
2001															
2002															
2003															
2004															
2005															
2006															
2007															
2008															
2009															
2010															
2011															
2012															



Comparison of Methods

Accident Year	Premium	Paid Loss	Case Reserves	Incurred Loss	Indicated Ultimate Loss					
					Paid Loss Development Method	Incurred Loss Development Method	Expected Loss Ratio Method	Paid Bornhuetter Ferguson Method	Incurred Bornhuetter Ferguson Method	Average of Methods
2002	2,284	1,397	4	1,401	1,397	1,401	1,416	1,397	1,401	1,402
2003	2,092	1,117	-	1,117	1,117	1,117	1,297	1,117	1,117	1,153
2004	1,833	913	-	913	913	913	1,136	913	913	958
2005	2,136	1,151	-	1,151	1,151	1,151	1,324	1,151	1,151	1,186
2006	2,551	1,548	6	1,554	1,548	1,554	1,582	1,548	1,554	1,557
2007	1,986	1,226	1	1,227	1,230	1,227	1,231	1,230	1,227	1,229
2008	2,561	1,548	8	1,556	1,591	1,590	1,588	1,591	1,590	1,590
2009	2,479	1,768	94	1,862	1,887	1,869	1,537	1,865	1,899	1,811
2010	2,237	1,342	204	1,546	1,590	1,555	1,387	1,558	1,548	1,528
2011	1,862	653	610	1,263	1,238	1,300	1,154	1,198	1,250	1,228
Total	22,021	12,663	927	13,590	13,661	13,677	13,653	13,568	13,650	13,642

Reasonableness

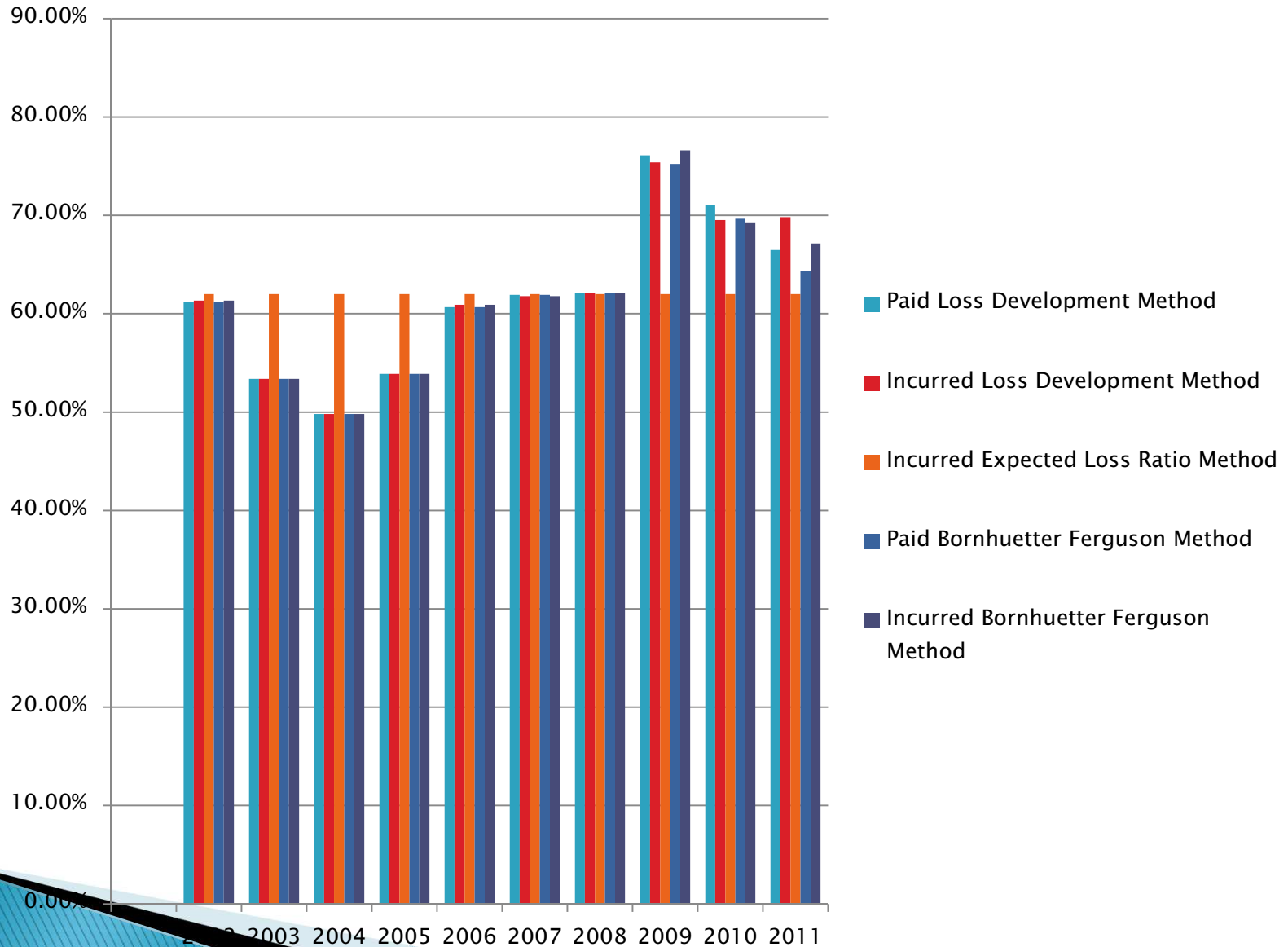
- ▶ Check results from projection methods for reasonableness against relevant indicators:
 - Premium
 - Loss Ratios (LR)
 - Exposures or Number of Policies
 - Frequency
 - Pure Premium (PP)
 - Claim Counts
 - Implied Severity



Comparison of Methods

Accident Year	Premium	Paid Loss	Case Reserves	Incurred Loss	Indicated Ultimate Loss Ratio					
					Paid Loss Development Method	Incurred Loss Development Method	Expected Loss Ratio Method	Paid Bornhuetter Ferguson Method	Incurred Bornhuetter Ferguson Method	Average of Methods
2002	2,284	61.2%		61.3%	61.2%	61.3%	62.0%	61.2%	61.3%	61.4%
2003	2,092	53.4%		53.4%	53.4%	53.4%	62.0%	53.4%	53.4%	55.1%
2004	1,833	49.8%		49.8%	49.8%	49.8%	62.0%	49.8%	49.8%	52.2%
2005	2,136	53.9%		53.9%	53.9%	53.9%	62.0%	53.9%	53.9%	55.5%
2006	2,551	60.7%		60.9%	60.7%	60.9%	62.0%	60.7%	60.9%	61.0%
2007	1,986	61.7%		61.8%	61.9%	61.8%	62.0%	61.9%	61.8%	61.9%
2008	2,561	60.4%		60.8%	62.1%	62.1%	62.0%	62.1%	62.1%	62.1%
2009	2,479	71.3%		75.1%	76.1%	75.4%	62.0%	75.2%	76.6%	73.1%
2010	2,237	60.0%		69.1%	71.1%	69.5%	62.0%	69.6%	69.2%	68.3%
2011	1,862	35.1%		67.8%	66.5%	69.8%	62.0%	64.4%	67.1%	66.0%
Total	22,021	57.5%		61.7%	62.0%	62.1%	62.0%	61.6%	62.0%	61.9%

Comparison of Methods



Sensitivity Analysis: Current Year Analysis

- ▶ Improvements in results may stem from:
 - Higher rates
 - Lower claim frequency
 - Lower claim severity
- ▶ Better results would *appear* to be present if:
 - Claims were being processed or paid more slowly
 - Case reserves were less adequate
 - Mix of business is different



Sensitivity Analysis: Ratios

Review historical relationships

- Losses
 - Paid losses to reported losses
- Claim counts
 - Settlement
 - Ratio of claims closed with no payment to total closed claims
- Losses and Claim Counts
 - Severities or average values



Exercise 16 – Summary

CLRS Boot Camp Co							
Analysis of Loss & LAE Reserves as of 12/31/2012							
Liability							
Summary of Loss Reserves							
	(1)	(2)	(3)	(2)+(3) (4)	(5)	(6)	(7)
Accident Year	Exposure	Paid Loss	Case Reserves	Incurred Loss	Selected Ultimate Loss	IBNR Reserves	Total Loss Reserves
1998	6,953,372	4,066,336	164,372	4,230,708	-		
1999	6,567,116	3,271,028	49,523	3,320,551	-		
2000	6,690,146	4,586,913	35,227	4,622,140	-		
2001	7,103,262	4,556,737	73,107	4,629,844	-		
2002	7,959,030	4,357,830	363,442	4,721,272	-		
2003	9,363,418	3,174,353	70,004	3,244,357	-		
2004	10,597,562	2,329,891	-	2,329,891	-		
2005	11,036,360	2,463,992	210,753	2,674,745	-		
2006	11,402,928	3,156,139	475,724	3,631,863	-		
2007	11,099,580	6,907,218	535,550	7,442,768	-		
2008	10,683,363	4,132,680	1,315,614	5,448,294	-		
2009	10,430,225	1,766,813	1,144,218	2,911,031	-		
2010	10,106,327	1,655,619	1,389,906	3,045,525	-		
2011	9,889,744	629,188	1,768,759	2,397,947	-		
2012	9,998,036	383,397	1,981,673	2,365,070	-		
Total	139,880,469	47,438,135	9,577,871	57,016,006	-	-	-

Exercise 16 – Diagnostics

CLRS Boot Camp Co									
Analysis of Loss & LAE Reserves as of 12/31/2012									
Liability									
Metrics									
	(1)	(2)	(3)	(2) / (3)	(5)	(5) / (1)	(7)	(7) / (1)*100K	(5) / (7)
				(4)		(6)		(8)	(9)
Accident Year	Exposure	Case Reserves	IBNR Reserves	IBNR to Case	Ultimate Loss	Ultimate Loss Ratio	Ultimate Counts	Ultimate Frequency	Ultimate Severity
1998	6,953,372	164,372	(4,230,708)	-2573.9%	-	0.0%	522	7.51	-
1999	6,567,116	49,523	(3,320,551)	-6705.1%	-	0.0%	528	8.04	-
2000	6,690,146	35,227	(4,622,140)	-13121.0%	-	0.0%	514	7.68	-
2001	7,103,262	73,107	(4,629,844)	-6333.0%	-	0.0%	530	7.47	-
2002	7,959,030	363,442	(4,721,272)	-1299.0%	-	0.0%	562	7.07	-
2003	9,363,418	70,004	(3,244,357)	-4634.5%	-	0.0%	434	4.64	-
2004	10,597,562	-	(2,329,891)	0.0%	-	0.0%	474	4.47	-
2005	11,036,360	210,753	(2,674,745)	-1269.1%	-	0.0%	503	4.55	-
2006	11,402,928	475,724	(3,631,863)	-763.4%	-	0.0%	509	4.47	-
2007	11,099,580	535,550	(7,442,768)	-1389.7%	-	0.0%	455	4.10	-
2008	10,683,363	1,315,614	(5,448,294)	-414.1%	-	0.0%	498	4.66	-
2009	10,430,225	1,144,218	(2,911,031)	-254.4%	-	0.0%	477	4.58	-
2010	10,106,327	1,389,906	(3,045,525)	-219.1%	-	0.0%	459	4.54	-
2011	9,889,744	1,768,759	(2,397,947)	-135.6%	-	0.0%	-	-	#DIV/0!
2012	9,998,036	1,981,673	(2,365,070)	-119.3%	-	0.0%	-	-	#DIV/0!
Total	139,880,469	9,577,871	(57,016,006)	-595.3%	-	0.0%	6,467	4.62	-

Final Answer

CLRS Boot Camp Co

Analysis of Loss & LAE Reserves as of 12/31/2011

Summary of Loss Reserves

Line of Business	Case Reserves	IBNR Reserves	Total Reserves
Liability	9,577,871	-	-
Workers Compensation	15,059,449	-	-
Property	3,012,454	-	-
Total	27,649,774	-	-