

Loss Reserving Boot Camp

2017 CLRS
September 10 – 12, 2017
Philadelphia, Pennsylvania

Welcome

▶ Introductions

- Instructors

- Karin Rhoads, Moderator
- Jane Taylor, Scott Lamb, Pete Rauner

- Teams

- Logistics

▶ Schedule

- Breaks at: 10:30 and 3:00
- Lunch at 12:30

Overview

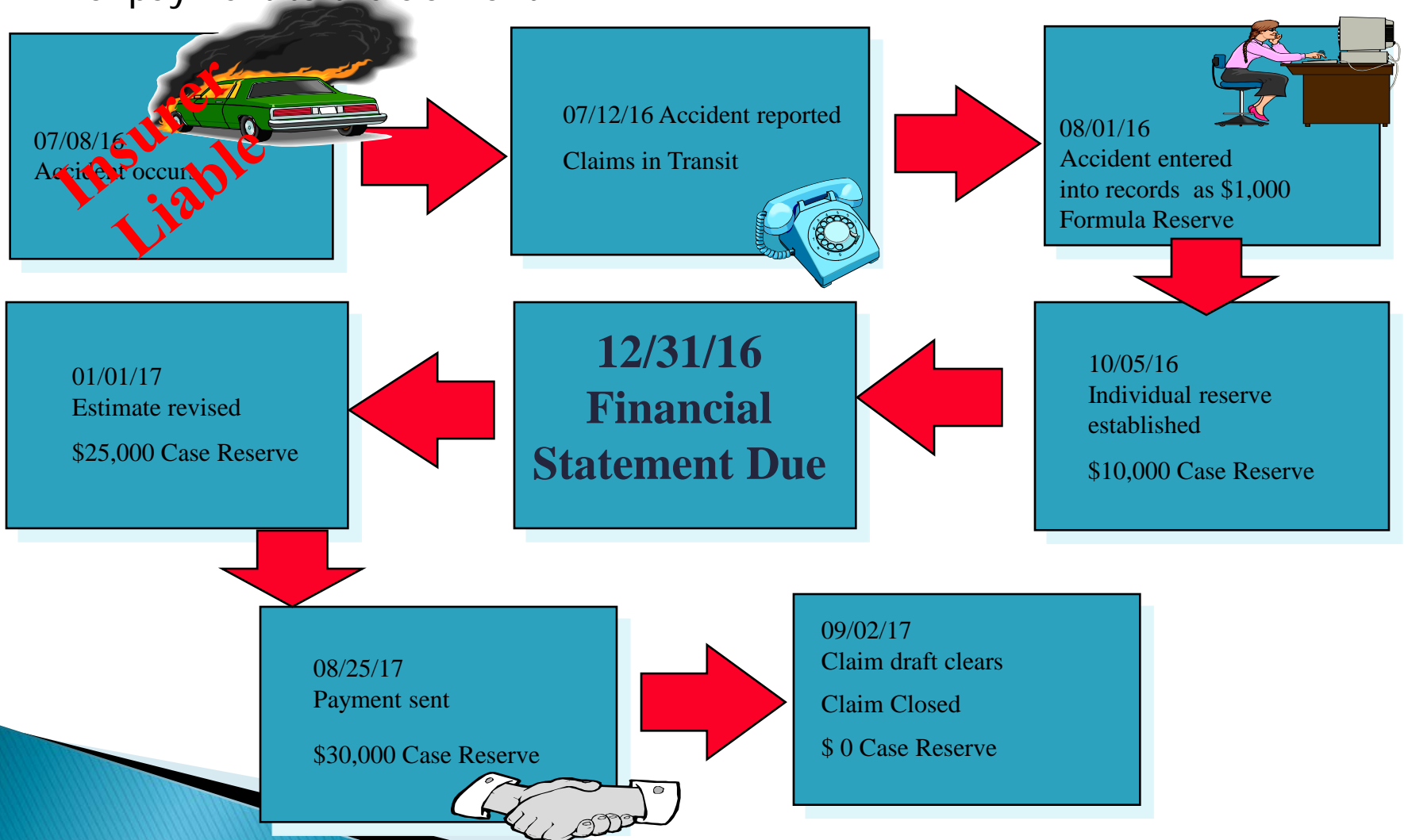
- ▶ Reserving Basics
- ▶ Basic Reserving Calculations
- ▶ Reserving Methods
- ▶ Comparison of Methods/Selections

Your Assignment

- ▶ Determine a reserve estimate for Boot Camp Insurance Company as of 12/31/2016.
- ▶ Prepare to present & defend estimates to Group
 - Boot Camp writes 3 Lines of business
 - Property
 - General Liability
 - Workers' Compensation
 - Work within teams at tables
 - Designate one PC and agree on "Team Answer"
 - Instructors/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:
 - Definitions
 - Principles
 - Considerations

Working Definitions

▶ **Policy**

- Document detailing the terms and conditions of a contract of insurance
- Terms specify indemnification or reimbursement

▶ **Premium**

- Amount paid to insurer for promise by the insurer to perform under the terms and conditions of a policy

Working Definitions

▶ Claim

- Formal request or demand to an insurance company asking for a payment on behalf of insured
- Coverage based on the terms and conditions of the insurance policy
- Counted as claim by insurer once deemed to be significant event with payment likely; otherwise incident

▶ Loss

- Amount of claim for which the insurance company is responsible

Working Definitions

▶ Case Reserve

- Amount of claim reported – not yet paid
- Claim assigned a value by a claims adjuster or by formula based on current information (aka Statistical Reserve)

▶ Case Incurred (aka Reported Incurred)

- Amount of claim reported – total amount
- Paid plus Case Reserve

Working Definitions

- ▶ **Bulk + IBNR reserves include:**
 - Claims in transit (reported, not yet recorded)
 - Reserves for reopened claims
 - Reserves for claims not yet reported (“pure” or “narrow” IBNR)
 - Development on known claims (Incurred But Not Enough = “IBNE”)

Working Definitions

▶ Elements of a Loss Reserve

- Formula Reserve/Case Reserve
- Claims in Transit (reported not yet recorded)
- Reopened Claims Reserve
- Incurred But Not Reported (“pure” or “narrow” definition IBNR)
- Development on Known Claims (Incurred But Not Enough = “IBNE”)

IBNR
(broad
definition)

Formulas to Derive IBNR Reserves

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

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

$$\begin{array}{c} \text{Ultimate Losses} \\ \text{Minus} \\ \text{Case} \\ \text{(or Reported)} \\ \text{Incurred Losses} \end{array}$$

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

Working Definitions

- ▶ **Carried Reserve** – The amount shown in a published statement or an internal statement of financial condition.
- ▶ **Indicated Reserve** – The amount that results from the application of a particular reserving method.
- ▶ **Reserve Margin/Deficit** – The difference between an indicated reserve and a carried reserve.
- ▶ **Loss Ratio** – $\text{Loss (??)} / \text{Earned Premium}$

Working 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) Expense**
 - Includes all claims adjusting expenses, i.e., claim department overhead, whether internal or external to a company.
 - In general, includes costs associated with recording and adjusting cases.

Important to Know

- ▶ Actuaries and other insurance professionals
 - Use “short hand” terms which differ with context
 - Use same terms for different things
 - Incurred Loss may mean:
 - Case Incurred Loss,
 - Case Incurred Loss & DCC,
 - Case Incurred Loss & LAE,
 - Case Incurred Loss & IBNR,
 - Case Incurred Loss & DCC and Including IBNR,
 - *Et cetera, et cetera, et cetera.....*
- ▶ If it is not absolutely clear by the context,
ASK!

Annual
Statement
Schedule P
Parts 1 & 2



Exercise 1

CLRS Boot Camp Co
Analysis of Loss & LAE Reserves as of 12/31/2016
General Liability

Summary of Loss & LAE Reserves

	(1)	(2)	(3)	(4)	(5)	(6)
Accident Year	Paid Loss & LAE	Loss & LAE Case Reserves	Incurred Loss & LAE	Selected Ultimate Loss & LAE	Loss & LAE IBNR Reserves	Total Loss & LAE Reserves
2002	7,570,799	-	7,570,799	7,570,799	-	-
2003	8,584,298	-	8,584,298	8,584,298	-	-
2004	8,882,137	-	8,882,137	8,882,137	-	-
2005	10,834,258		11,358,062	11,358,062		
2006	9,409,962	-	9,409,962	9,409,962	-	-
2007	11,106,523	-	11,106,523	11,106,572	49	49
2008	13,879,959	599,629		14,558,437		
2009	13,253,108	370,184	13,623,292	13,687,843	64,551	434,735
2010	14,054,590	1,104,070			148,830	1,252,901
2011	13,322,089	1,041,422	14,363,510	14,504,326	140,816	1,182,238
2012		1,260,792				1,418,211
2013	11,283,605	2,238,746	13,522,351	14,133,190	610,839	2,849,585
2014	9,051,138	3,864,452	12,915,590	14,384,127	1,468,537	5,332,989
2015	5,799,550	5,198,194				8,348,139
2016	2,863,580	5,014,146	7,877,726	15,009,736	7,132,010	12,146,155
Total	452,688,623	21,215,439	173,904,062	186,855,908	12,951,845	34,167,284

Exercise 1 – Completed

CLRS Boot Camp Co

Analysis of Loss & LAE Reserves as of 12/31/2016

General Liability

Summary of Loss Reserves

	(1)	(2)	(3)	(4)	(5)	(6)
Accident Year	Paid Loss & LAE	Loss & LAE Case Reserves	Incurred Loss & LAE	Selected Ultimate Loss & LAE	Loss & LAE IBNR Reserves	Total Loss & LAE Reserves
2002	7,570,799	-	7,570,799	7,570,799	-	-
2003	8,584,298	-	8,584,298	8,584,298	-	-
2004	8,882,137	-	8,882,137	8,882,137	-	-
2005	10,834,258	523,804	11,358,062	11,358,062	-	523,804
2006	9,409,962	-	9,409,962	9,409,962	-	-
2007	11,106,523	-	11,106,523	11,106,572	49	49
2008	13,879,959	599,629	14,479,587	14,558,437	78,850	678,478
2009	13,253,108	370,184	13,623,292	13,687,843	64,551	434,735
2010	14,054,590	1,104,070	15,158,660	15,307,490	148,830	1,252,901
2011	13,322,089	1,041,422	14,363,510	14,504,326	140,816	1,182,238
2012	12,793,027	1,260,792	14,053,819	14,211,238	157,419	1,418,211
2013	11,283,605	2,238,746	13,522,351	14,133,190	610,839	2,849,585
2014	9,051,138	3,864,452	12,915,590	14,384,127	1,468,537	5,332,989
2015	5,799,550	5,198,194	10,997,744	14,147,689	3,149,945	8,348,139
2016	2,863,580	5,014,146	7,877,726	15,009,736	7,132,010	12,146,155
Total	152,688,623	21,215,439	173,904,062	186,855,908	12,951,845	34,167,284

Principles

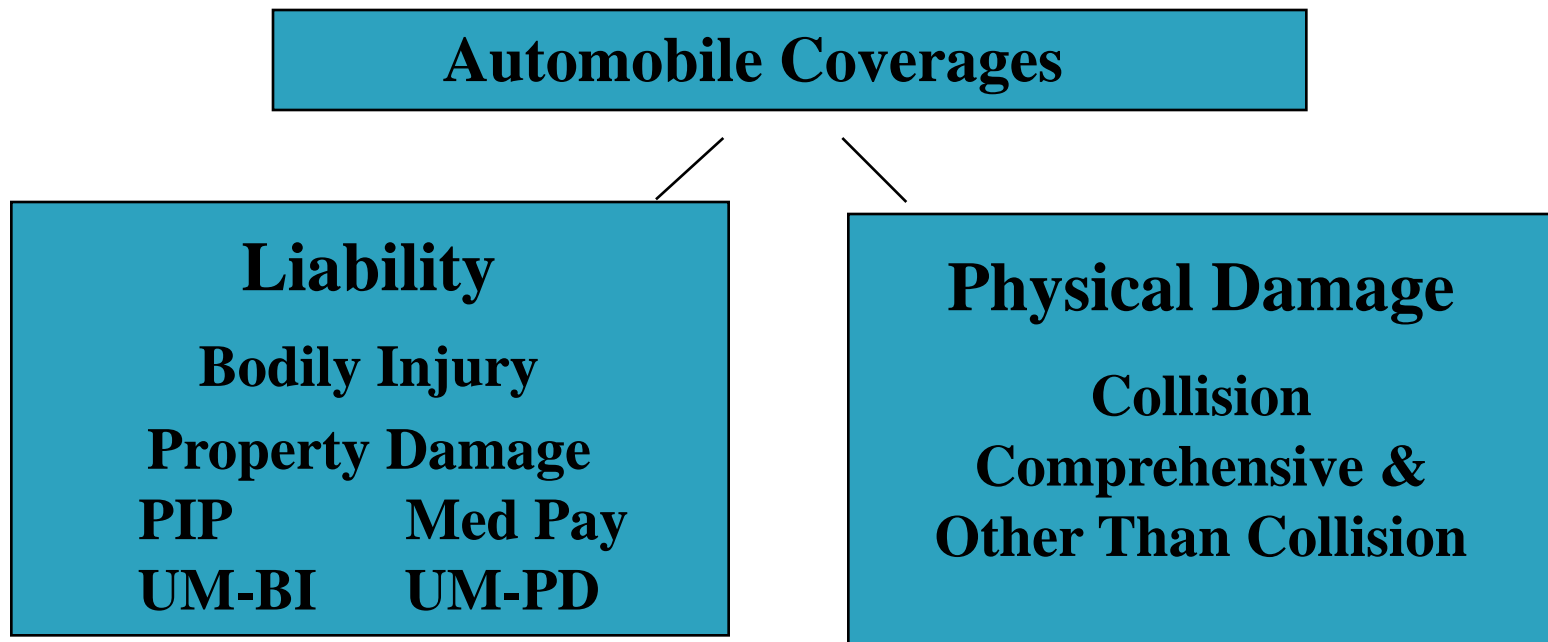
- ▶ **Actuarially sound reserves**
 - based on *estimates*
 - derived from reasonable *assumptions*
 - using appropriate *methods*
- ▶ **Inherent Uncertainty**
 - a range can be actuarially sound
 - true value known only after all claims settled
- ▶ **Most appropriate reserve depends on:**
 - relative 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 – “crumbs”.
- ▶ Use of supplementary data sources
 - Examples include industry data, countrywide data.

Considerations: Other Concepts

▶ **Direct Insurance**

- Insurance written directly with insured.
- May be personal or commercial

▶ **Reinsurance (*aka* Assumed Insurance)**

- Insurance between insurance companies
- One company “cedes” premium and loss, (and possibly expenses) to another insurance company which “assumes” the business
- May be *pro rata* (quota share) or excess of loss

▶ **Gross Insurance = Direct + Assumed**

- Without reduction for ceded reinsurance

▶ **Net = Gross + Assumed - Ceded Reinsurance**

Considerations: Other Concepts

▶ Catastrophe – Property

- Event designated a catastrophe when claims are expected to reach a certain dollar threshold, currently set at \$25 million, and
- Event includes multiple policyholders and multiple insurance companies

▶ Catastrophe – Workers' Compensation

- Two or more employees injured in the same accident / event

Considerations:

Other Data Considerations

▶ Reinsurance

- Is the data net or gross of reinsurance?

▶ Catastrophes

- Identified and handled separately?

▶ Policy Limits

▶ Type of Data

- Exposures – the measure of exposure
- Losses – claims paid or to be paid by insurance
- Loss Adjustment Expenses (LAE) – defense costs and claim department costs
- Salvage and Subrogation (S&S) – recoveries by insurer

Data Organization: Definitions

- ▶ *Loss Development* – Financial activity on claims from occurrence to settlement and final payment.
- ▶ *Triangles* – Compiled to measure the changes in cumulative claim activity over time in order to estimate patterns of future activity.
- ▶ *Loss Development Factor (LDF)* – Ratio of losses at successive evaluations for a defined group of claims (e.g., accident year/report year).

Data Organization: Compilation of Triangle

- ▶ Data sorted by the year (or quarter or month) in which the accident occurred or was reported.
- ▶ Data 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 Counts.
- ▶ *Claim system reports (Loss Run)*
 - ▶ *Summary of Loss Runs* – usually “as of” a particular date showing paid and unpaid losses and expenses and number of claims by year/ quarter / month or by policy inception date
 - ▶ *Detailed Claim Listing* – also “as of”, can be very large but allow more analysis detail

SCHEDULE P – PART 1

SUMMARY – PAID

Years in Which Premiums Were Earned and Losses Were Incurred	Premiums Earned			Loss and Loss Expense Payments								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 2 - 3)	4 Direct and Assumed	5 Ceded	6 Direct and Assumed	7 Ceded	8 Direct and Assumed	9 Ceded	Salvage and Subrogation Received	Total Net Paid (Cols 4 - 5 + 6 - 7 + 8 - 9)	
1. Prior	XXXX	XXXX	XXXX	(1)	(1)					0	0	XXXX
2. 2007	5,826	3,540	2,286	3,810	2,445	90	58	562	37	44	1,922	2,681
3. 2008	4,879	2,787	2,092	2,838	1,755	86	52	509	24	6	1,602	1,907
4. 2009	4,528	2,695	1,833	2,476	1,605	120	78	461	39	14	1,335	721
5. 2010	4,962	2,826	2,136	2,903	1,783	83	53	684	37	3	1,797	1,511
6. 2011	4,340	1,789	2,551	2,627	1,132	103	50	572	36	7	2,084	1,234
7. 2012	3,263	1,277	1,986	1,997	835	110	46	487	29	12	1,684	972
8. 2013	4,116	1,554	2,562	2,533	1,039	90	36	521	34	3	2,035	1,182
9. 2014	4,004	1,525	2,479	2,944	1,215	64	26	504	37	10	2,234	1,341
10. 2015	3,624	1,387	2,237	2,209	898	52	21	399	29	10	1,712	1,078
11. 2016	3,042	1,179	1,863	1,084	436	7	2	282	18	1	917	779
12. Totals	XXXX	XXXX	XXXX	25,421	13,143	805	422	4,981	320	110	17,322	XXXX

SCHEDULE P - PART 1

SUMMARY - UNPAID

	Losses Unpaid				Defense and Cost Containment Unpaid				Adjusting and Other		23	24	25
	Case Basis		Bulk + IBNR		Case Basis		Bulk + IBNR		Unpaid				
	13	14	15	16	17	18	19	20	21	22			
	Direct and Assumed	Ceded	Direct and Assumed	Ceded	Direct and Assumed	Ceded	Direct and Assumed	Ceded	Direct and Assumed	Ceded	Salvage and Subrogation Anticipated	Total Net Losses and Expenses Unpaid	Number of Claims Outstanding Direct and Assumed
1. Prior	-	-											
2. 2007	10	6					1	1	1			5	1
3. 2008	-	-										-	
4. 2009	-	-										-	
5. 2010	-	-										-	
6. 2011	20	13	1	-					1			9	1
7. 2012	-	-	2	1								1	-
8. 2013	14	6	5	2			4	2	3	-		16	4
9. 2014	173	90	34	9			6	2	11	1		122	13
10. 2015	341	186	129	32			18	7	31	2	3	292	39
11. 2016	1,023	513	233	58			11	5	215	19	4	887	
12. Totals	1,581	814	404	102	-	-	40	17	262	22	7	1,332	58

SCHEDULE P - PART 1

SUMMARY - RESULTS

	Total Loss and Loss Expense Incurred			Loss and Loss Expense Percentage (Incurred / Premiums Earned)			Nontabular Discount		34	Net Balance Sheet Reserves After Discount	
	26 Direct and Assumed	27 Ceded	28 Net	29 Direct and Assumed	30 Ceded	31 Net	32 Loss	33 Loss Expense	Inter- Company Pooling Participation Percentage	35 Losses Unpaid	36 Loss Expenses Unpaid
1. Prior	(1)	(1)	-							-	-
2. 2007	4,474	2,547	1,927	76.79%	71.95%	84.30%				4	1
3. 2008	3,433	1,831	1,602	70.36%	65.70%	76.58%				-	-
4. 2009	3,057	1,722	1,335	67.51%	63.90%	72.83%				-	-
5. 2010	3,670	1,873	1,797	73.96%	66.28%	84.13%				-	-
6. 2011	3,324	1,231	2,093	76.59%	68.81%	82.05%				8	1
7. 2012	2,596	911	1,685	79.56%	71.34%	84.84%				1	-
8. 2013	3,170	1,119	2,051	77.02%	72.01%	80.05%				11	5
9. 2014	3,736	1,380	2,356	93.31%	90.49%	95.04%				108	14
10. 2015	3,179	1,175	2,004	87.72%	84.72%	89.58%				252	40
11. 2016	2,855	1,051	1,804	93.85%	89.14%	96.83%				685	202
12. Totals	33,494	14,840	18,654				-	-	-	1,069	263

SCHEDULE P - PART 2

SUMMARY INCURRED LOSS & DCC

Years in Which Losses Were Incurred	INCURRED NET LOSSES AND DEFENSE AND COST CONTAINMENT EXPENSES REPORTED AT YEAR END										DEVELOPMENT	
	(\$000 OMITTED)										11	12
	1	2	3	4	5	6	7	8	9	10	One Year	Two Year
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016		
1. Prior	507	567	532	517	503	499	498	498	498	498	-	-
2. 2007	1,516	1,422	1,453	1,432	1,416	1,402	1,401	1,401	1,400	1,401	1	-
3. 2008	XXX	1,120	1,189	1,154	1,168	1,124	1,119	1,118	1,118	1,118	-	-
4. 2009	XXX	XXX	1,087	1,024	930	936	916	915	913	913	-	(2)
5. 2010	XXX	XXX	XXX	1,325	1,270	1,192	1,159	1,150	1,154	1,151	(3)	1
6. 2011	XXX	XXX	XXX	XXX	1,566	1,642	1,599	1,565	1,558	1,555	(3)	(10)
7. 2012	XXX	XXX	XXX	XXX	XXX	1,289	1,212	1,210	1,260	1,228	(32)	18
8. 2013	XXX	XXX	XXX	XXX	XXX	XXX	1,596	1,598	1,575	1,561	(14)	(37)
9. 2014	XXX	XXX	XXX	XXX	XXX	XXX	XXX	1,885	1,834	1,878	44	(7)
10. 2015	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	1,491	1,604	113	XXX
11. 2016	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	1,345	XXX	XXX
										12. Totals	106	(37)

SCHEDULE P - PART 3

SUMMARY PAID NET LOSS & DCC

Years in Which Losses Were Incurred	CUMULATIVE PAID NET LOSSES AND DEFENSE AND 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
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016		
1. Prior	-	268	425	488	495	498	498	498	498	498	1,022	214
2. 2007	689	1,143	1,297	1,375	1,395	1,396	1,396	1,396	1,396	1,397	2,038	642
3. 2008	XXX	523	959	1,030	1,081	1,111	1,118	1,118	1,118	1,118	1,483	424
4. 2009	XXX	XXX	474	787	834	873	913	913	913	913	382	339
5. 2010	XXX	XXX	XXX	590	1,033	1,105	1,131	1,144	1,150	1,151	838	673
6. 2011	XXX	XXX	XXX	XXX	801	1,301	1,486	1,509	1,547	1,548	774	459
7. 2012	XXX	XXX	XXX	XXX	XXX	636	1,043	1,152	1,200	1,226	618	354
8. 2013	XXX	XXX	XXX	XXX	XXX	XXX	778	1,348	1,495	1,548	730	448
9. 2014	XXX	XXX	XXX	XXX	XXX	XXX	XXX	1,003	1,559	1,768	862	465
10. 2015	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	888	1,342	673	366
11. 2016	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	653	334	193

SCHEDULE P - PART 4

SUMMARY NET BULK & IBNR RESERVES

Years in Which Losses Were Incurred	BULK AND IBNR RESERVES ON NET LOSSES AND DEFENSE AND COST CONTAINMENT EXPENSES REPORTED AT YEAR END (\$000 OMITTED)									
	1	2	3	4	5	6	7	8	9	10
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
1. Prior	189	96	35	10	4	1	-	-	-	-
2. 2007	322	107	58	23	99	2	1	-	-	-
3. 2008	XXX	161	84	65	42	6	1	-	-	-
4. 2009	XXX	XXX	150	105	59	20	5	2	1	-
5. 2010	XXX	XXX	XXX	175	99	49	15	5	3	-
6. 2011	XXX	XXX	XXX	XXX	168	66	24	9	4	1
7. 2012	XXX	XXX	XXX	XXX	XXX	82	40	19	8	1
8. 2013	XXX	XXX	XXX	XXX	XXX	XXX	123	67	21	5
9. 2014	XXX	XXX	XXX	XXX	XXX	XXX	XXX	112	59	28
10. 2015	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	120	108
11. 2016	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	182

Claims System Summary Exhibit

Claim Management Group - General Liability (Spring Manufacturing Company) Claims										
Policy Period	Carrier	Valuation Date	Claim Count	Open Claims	Closed Claims	Indemnity Paid	Expense Paid	Indemnity Reserve	Expense Reserve	Total Incurred
2010	Superb	06/30/2017	84	2	82	154,575	861,409	7,500	4,794	1,028,278
2011	Superb	06/30/2017	60	8	51	91,838	596,206	40,667	37,126	765,837
2012	Superb	06/30/2017	66	8	58	103,284	919,091	8,500	30,114	1,060,989
2013	Superb	06/30/2017	71	8	63	113,773	535,995	44,001	36,685	730,454
2014	Superb	06/30/2017	42	9	33	58,457	333,532	69,500	44,578	506,067
2015	Superb	06/30/2017	65	7	57	104,385	649,247	34,034	30,659	818,325
2016	Superb	06/30/2017	52	19	33	100,450	159,442	126,250	46,748	432,890
2017	Superb	06/30/2017	15	3	12	24,017	129,865	14,114	9,439	177,436
Total			454	64	390	750,780	4,184,787	344,566	240,143	5,520,276

Claim Management Group - General Liability (Spring Manufacturing Company) Incidents Only										
Policy Period	Carrier	Valuation Date	Incident Count	Open Incidents	Closed Incidents	Indemnity Paid	Expense Paid	Indemnity Reserve	Expense Reserve	Total Incurred
2010	Superb	06/30/2017	147	-	147	-	139,028	-	-	139,028
2011	Superb	06/30/2017	119	-	118	-	152,498	-	1,011	153,508
2012	Superb	06/30/2017	106	-	106	-	105,394	-	-	105,394
2013	Superb	06/30/2017	141	-	141	-	149,934	-	-	149,934
2014	Superb	06/30/2017	109	1	108	-	202,165	-	3,032	205,197
2015	Superb	06/30/2017	124	0	124	-	149,804	-	809	150,612
2016	Superb	06/30/2017	125	9	116	-	161,254	52,500	8,043	221,797
2017	Superb	06/30/2017	31	1	30	-	38,428	-	594	39,022
Total			902	11	890	-	1,098,504	52,500	13,488	1,164,492

Claims System Detail Report

Detail Loss Report

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

Data Organization: Compilation of Triangle

Accounting Configuration Goal: Calculate Total Paid-to-Date

Years in Which Losses Were Incurred	CUMULATIVE PAID NET LOSSES AND DEFENSE AND COST CONTAINMENT EXPENSES REPORTED AT YEAR-END									
	(\$000 OMITTED)									
	1	2	3	4	5	6	7	8	9	10
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
1. Prior										
2. 2007	689	1,143	1,297	1,375	1,395	1,396	1,396	1,396	1,396	1,397
3. 2008		523	959	1,030	1,081	1,111	1,118	1,118	1,118	1,118
4. 2009			474	787	834	873	913	913	913	913
5. 2010				590	1,033	1,105	1,131	1,144	1,150	1,151
6. 2011					801	1,301	1,486	1,509	1,547	1,548
7. 2012						636	1,043	1,152	1,200	1,226
8. 2013							778	1,348	1,495	1,548
9. 2014								1,003	1,559	1,768
10. 2015									888	1,342
11. 2016										653
Total	689	1,666	2,730	3,782	5,144	6,422	7,865	9,583	11,266	12,664

Data Organization: Compilation of Triangle

Actuarial Configuration

Goal: Estimate Total Ultimately Paid

Years in Which Losses Were Incurred	CUMULATIVE PAID NET LOSSES AND DEFENSE AND COST CONTAINMENT EXPENSES REPORTED AT YEAR-END (\$000 OMITTED)										Ultimate Total Payment	
	1	2	3	4	5	6	7	8	9	10		11
	12	24	36	48	60	72	84	96	108	120		
1. Prior												???
2. 2007	689	1,143	1,297	1,375	1,395	1,396	1,396	1,396	1,396	1,396	1,397	???
3. 2008	523	959	1,030	1,081	1,111	1,118	1,118	1,118	1,118	1,118		???
4. 2009	474	787	834	873	913	913	913	913	913			???
5. 2010	590	1,033	1,105	1,131	1,144	1,150	1,151					???
6. 2011	801	1,301	1,486	1,509	1,547	1,548						???
7. 2012	636	1,043	1,152	1,200	1,226							???
8. 2013	778	1,348	1,495	1,548								???
9. 2014	1,003	1,559	1,768									???
10. 2015	888	1,342										???
11. 2016	653											???

Exercise 2

CLRS Boot Camp Co

Analysis of Loss & DCC Paid as of 12/31/2016

General Liability

Summary of Loss & DCC Paid

		Cumulative Paid Loss & DCC (\$000 Omitted) [Schedule P Presentation]									
Accident Year	Cumulative Accident Year Paid as of Year End										
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	
2007	4,494	6,491	8,543	9,740	10,668	10,853	10,887	10,908	11,023	11,358	
2008		5,381	7,777	9,092	9,279	9,453	9,490	9,528	9,548	9,589	
2009			5,909	9,753	10,453	11,003	11,146	11,185	11,198	11,301	
2010				8,565	11,615	12,942	13,400	14,126	14,339	14,384	
2011					6,717	10,195	11,852	12,662	14,082	14,644	
2012						7,718	10,947	13,650	14,387	14,417	
2013							9,154	11,584	13,446	13,865	
2014								8,900	11,557	13,889	
2015									6,804	10,330	
2016										7,313	

		Cumulative Paid Loss & DCC (\$000 Omitted) [Actuarial Triangle]									
Accident Year	Development Stage in Months										
	12	24	36	48	60	72	84	96	108	120	
2007											
2008											
2009											
2010											
2011											
2012											
2013											
2014											
2015											
2016											

Exercise 2 - Completed

CLRS Boot Camp Co

Analysis of Loss & DCC Paid as of 12/31/2016

General Liability

Summary of Loss & DCC Paid

		Cumulative Paid Loss & DCC (\$000 Omitted) [Schedule P Presentation]									
Accident Year	Cumulative Accident Year Paid as of Year End										
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	
2007	4,494	6,491	8,543	9,740	10,668	10,853	10,887	10,908	11,023	11,358	
2008		5,381	7,777	9,092	9,279	9,453	9,490	9,528	9,548	9,589	
2009			5,909	9,753	10,453	11,003	11,146	11,185	11,198	11,301	
2010				8,565	11,615	12,942	13,400	14,126	14,339	14,384	
2011					6,717	10,195	11,852	12,662	14,082	14,644	
2012						7,718	10,947	13,650	14,387	14,417	
2013							9,154	11,584	13,446	13,865	
2014								8,900	11,557	13,889	
2015									6,804	10,330	
2016										7,313	

		Cumulative Paid Loss & DCC (\$000 Omitted) [Actuarial Triangle]									
Accident Year	Development Stage in Months										
	12	24	36	48	60	72	84	96	108	120	
2007	4,494	6,491	8,543	9,740	10,668	10,853	10,887	10,908	11,023	11,358	
2008	5,381	7,777	9,092	9,279	9,453	9,490	9,528	9,548	9,589		
2009	5,909	9,753	10,453	11,003	11,146	11,185	11,198	11,301			
2010	8,565	11,615	12,942	13,400	14,126	14,339	14,384				
2011	6,717	10,195	11,852	12,662	14,082	14,644					
2012	7,718	10,947	13,650	14,387	14,417						
2013	9,154	11,584	13,446	13,865							
2014	8,900	11,557	13,889								
2015	6,804	10,330									
2016	7,313										

Basic Reserving Calculations: Development Factors

Years in Which Losses Were Incurred	CUMULATIVE PAID NET LOSSES AND DEFENSE AND COST CONTAINMENT EXPENSES REPORTED AT YEAR-END									
	AGE-TO-AGE FACTORS									
	1	2	3	4	5	6	7	8	9	10
	12 - 24	24 - 36	36 - 48	48 - 60	60 - 72	72 - 84	84 - 96	96 - 108	108 - 120	
1. Prior										
2. 2007	1.659	1.135	1.060	1.015	1.001	1.000	1.000	1.000	1.001	
3. 2008	1.834	1.074	1.050	1.028	1.006	1.000	1.000	1.000		
4. 2009	1.660	1.060	1.047	1.046	1.000	1.000	1.000			
5. 2010	1.751	1.070	1.024	1.011	1.005	1.001				
6. 2011	1.624	1.142	1.015	1.025	1.001					
7. 2012	1.640	1.105	1.042	1.022						
8. 2013	1.733	1.109	1.038							
9. 2014	1.554	1.134								
10. 2015	1.511									
10. 2016										

Basic Reserving Calculations:

Calculation of Loss Development Factors: 12-24

Years in Which Losses Were Incurred	CUMULATIVE PAID NET LOSSES AND DEFENSE AND COST CONTAINMENT EXPENSES REPORTED AT YEAR-END (\$000 OMITTED)				
	1	2	3	4	5
	12	24	36	48	60
⋮	⋮	⋮	⋮	⋮	⋮
7. 2012	636	1,043	1,152	1,200	1,226
8. 2013	778	1,348	1,495	1,548	
9. 2014	1,003	1,559	1,768		
10. 2015	888	1,342			
11. 2016	653				

Years in Which Losses Were Incurred	CUMULATIVE PAID NET LOSSES AND DEFENSE AND COST CONTAINMENT EXPENSES REPORTED AT YEAR-END AGE-TO-AGE FACTORS			
	1	2	3	4
	12 - 24	24 - 36	36 - 48	48 - 60
⋮	⋮	⋮	⋮	⋮
7. 2012	1.640	1.105	1.042	1.022
8. 2013	1.733	1.109	1.035	
9. 2014	1.554	1.134		
10. 2015	1.511			
11. 2016				

$$1,342 / 888 = 1.511$$

Basic Reserving Calculations:

Calculation of Loss Development Factors: 12-24

Years in Which Losses Were Incurred	CUMULATIVE PAID NET LOSSES AND DEFENSE AND COST CONTAINMENT EXPENSES REPORTED AT YEAR-END (\$000 OMITTED)				
	1	2	3	4	5
	12	24	36	48	60
∴	∴	∴	∴	∴	∴
7. 2012	636	1,043	1,152	1,200	1,226
8. 2013	778	1,348	1,495	1,548	
9. 2014	1,003	1,559	1,768		
10. 2015	888	1,342			
11. 2016	653				

Years in Which Losses Were Incurred	CUMULATIVE PAID NET LOSSES AND DEFENSE AND COST CONTAINMENT EXPENSES REPORTED AT YEAR-END AGE-TO-AGE FACTORS			
	1	2	3	4
	12 - 24	24 - 36	36 - 48	48 - 60
∴	∴	∴	∴	∴
7. 2012	1.640	1.105	1.042	1.022
8. 2013	1.733	1.109	1.035	
9. 2014	1.554	1.134		
10. 2015	1.511			
11. 2016				

$$1,559 / 1,003 = 1.554$$

$$1,342 / 888 = 1.511$$

Basic Reserving Calculations:

Calculation of Loss Development Factors: 12-24

Years in Which Losses Were Incurred	CUMULATIVE PAID NET LOSSES AND DEFENSE AND COST CONTAINMENT EXPENSES REPORTED AT YEAR-END (\$000 OMITTED)				
	1	2	3	4	5
	12	24	36	48	60
∴	∴	∴	∴	∴	∴
7. 2012	636	1,043	1,152	1,200	1,226
8. 2013	778	1,348	1,495	1,548	
9. 2014	1,003	1,559	1,768		
10. 2015	888	1,342			
11. 2016	653				

$$1,348 / 778 = 1.733$$

$$1,559 / 1,003 = 1.554$$

$$1,342 / 888 = 1.511$$

Years in Which Losses Were Incurred	CUMULATIVE PAID NET LOSSES AND DEFENSE AND COST CONTAINMENT EXPENSES REPORTED AT YEAR-END AGE-TO-AGE FACTORS			
	1	2	3	4
	12 - 24	24 - 36	36 - 48	48 - 60
∴	∴	∴	∴	∴
7. 2012	1.640	1.105	1.042	1.022
8. 2013	1.733	1.109	1.035	
9. 2014	1.554	1.134		
10. 2015	1.511			
11. 2016				

Basic Reserving Calculations:

Calculation of Loss Development Factors: 12-24

Years in Which Losses Were Incurred	CUMULATIVE PAID NET LOSSES AND DEFENSE AND COST CONTAINMENT EXPENSES REPORTED AT YEAR-END (\$000 OMITTED)				
	1	2	3	4	5
	12	24	36	48	60
∴	∴	∴	∴	∴	∴
7. 2012	636	1,043	1,152	1,200	1,226
8. 2013	778	1,348	1,495	1,552	
9. 2014	1,003	1,559	1,768		
10. 2015	888	1,342			
11. 2016	653				

Years in Which Losses Were Incurred	CUMULATIVE PAID NET LOSSES AND DEFENSE AND COST CONTAINMENT EXPENSES REPORTED AT YEAR-END AGE-TO-AGE FACTORS			
	1	2	3	4
	12 - 24	24 - 36	36 - 48	48 - 60
∴	∴	∴	∴	∴
7. 2012	1.640	1.105	1.042	1.022
8. 2013	1.733	1.109	1.038	
9. 2014	1.554	1.134		
10. 2015	1.511			
11. 2016				

$$1,348 / 773 = 1.733$$

$$1,559 / 1,003 = 1.554$$

$$1,342 / 888 = 1.511$$

Basic Reserving Calculations:

Calculation of Loss Development Factors: 12-24

Years in Which Losses Were Incurred	CUMULATIVE PAID NET LOSSES AND DEFENSE AND COST CONTAINMENT EXPENSES REPORTED AT YEAR-END (\$000 OMITTED)				
	1	2	3	4	5
	12	24	36	48	60
∴	∴	∴	∴	∴	∴
7. 2012	636	1,043	1,152	1,200	1,226
8. 2013	778	1,348	1,495	1,552	
9. 2014	1,003	1,559	1,768		
10. 2015	888	1,342			
11. 2016	633				

Years in Which Losses Were Incurred	CUMULATIVE PAID NET LOSSES AND DEFENSE AND COST CONTAINMENT EXPENSES REPORTED AT YEAR-END AGE-TO-AGE FACTORS			
	1	2	3	4
	12 - 24	24 - 36	36 - 48	48 - 60
∴	∴	∴	∴	∴
7. 2012	1.640	1.105	1.042	1.022
8. 2013	1.733	1.109	1.038	
9. 2014	1.554	1.134		
10. 2015	1.511			
11. 2016				

$$1,043 / 636 = 1.640$$

$$1,348 / 773 = 1.733$$

$$1,559 / 1,003 = 1.554$$

$$1,342 / 888 = 1.511$$

Basic Reserving Calculations:

Calculation of Loss Development Factors: 24-36

Years in Which Losses Were Incurred	CUMULATIVE PAID NET LOSSES AND DEFENSE AND COST CONTAINMENT EXPENSES REPORTED AT YEAR-END (\$000 OMITTED)				
	1	2	3	4	5
	12	24	36	48	60
∴	∴	∴	∴	∴	∴
7. 2012	636	1,043	1,152	1,200	1,226
8. 2013	778	1,348	1,495	1,548	
9. 2014	1,003	1,559	1,768		
10. 2015	888	1,342			
11. 2016	653				

Years in Which Losses Were Incurred	CUMULATIVE PAID NET LOSSES AND DEFENSE AND COST CONTAINMENT EXPENSES REPORTED AT YEAR-END AGE-TO-AGE FACTORS			
	1	2	3	4
	12 - 24	24 - 36	36 - 48	48 - 60
∴	∴	∴	∴	∴
7. 2012	1.640	1.105	1.042	1.022
8. 2013	1.733	1.109	1.035	
9. 2014	1.554	1.134		
10. 2015	1.511			
11. 2016				

$$1,768 / 1,559 = 1.134$$

Basic Reserving Calculations:

Calculation of Loss Development Factors: 24-36

Years in Which Losses Were Incurred	CUMULATIVE PAID NET LOSSES AND DEFENSE AND COST CONTAINMENT EXPENSES REPORTED AT YEAR-END (\$000 OMITTED)				
	1	2	3	4	5
	12	24	36	48	60
∴	∴	∴	∴	∴	∴
7. 2012	636	1,043	1,152	1,200	1,226
8. 2013	778	1,348	1,495	1,548	
9. 2014	1,003	1,559	1,768		
10. 2015	888	1,342			
11. 2016	653				

Years in Which Losses Were Incurred	CUMULATIVE PAID NET LOSSES AND DEFENSE AND COST CONTAINMENT EXPENSES REPORTED AT YEAR-END AGE-TO-AGE FACTORS			
	1	2	3	4
	12 - 24	24 - 36	36 - 48	48 - 60
∴	∴	∴	∴	∴
7. 2012	1.640	1.105	1.042	1.022
8. 2013	1.733	1.109	1.035	
9. 2014	1.554	1.134		
10. 2015	1.511			
11. 2016				

$$1,495 / 1,348 = 1.109$$

$$1,768 / 1,559 = 1.134$$

Basic Reserving Calculations: Development Factors

Years in Which Losses Were Incurred	CUMULATIVE PAID NET LOSSES AND DEFENSE AND COST CONTAINMENT EXPENSES REPORTED AT YEAR-END									
	AGE-TO-AGE FACTORS									
	1	2	3	4	5	6	7	8	9	10
	12 - 24	24 - 36	36 - 48	48 - 60	60 - 72	72 - 84	84 - 96	96 - 108	108 - 120	
1. Prior										
2. 2007	1.659	1.135	1.060	1.015	1.001	1.000	1.000	1.000	1.001	
3. 2008	1.834	1.074	1.050	1.028	1.006	1.000	1.000	1.000		
4. 2009	1.660	1.060	1.047	1.046	1.000	1.000	1.000			
5. 2010	1.751	1.070	1.024	1.011	1.005	1.001				
6. 2011	1.624	1.142	1.015	1.025	1.001					
7. 2012	1.640	1.105	1.042	1.022						
8. 2013	1.733	1.109	1.035							
9. 2014	1.554	1.134								
10. 2015	1.511									
11. 2016										

Exercise 3

CLRS Boot Camp Co

Analysis of Loss & DCC Incurred as of 12/31/2016

General Liability

Case Incurred Loss & DCC

Accident Year	Evaluation Age (Months)														
	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180
2002	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
2003	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
2004	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	
2005	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		
2006	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				
2007	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					
2008	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						
2009	6,717,086	10,194,738	11,851,717	12,661,864	14,081,734	13,643,777	13,488,408	13,623,292							
2010	7,717,931	10,947,386	13,649,914	14,387,140	14,017,332	15,083,244	15,158,660								
2011	9,153,615	11,583,639	13,445,812	13,865,237	14,717,899	14,363,510									
2012	8,900,329	11,556,692	13,889,442	14,400,566	14,367,616										
2013	6,804,499	10,330,437	11,714,665	13,522,351											
2014	7,312,509	11,373,571	12,915,590												
2015	7,377,474	10,997,744													
2016	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
2002															
2003															
2004															
2005															
2006															
2007															
2008															
2009															
2010															
2011															
2012															
2013															
2014															
2015															
2016															

Exercise 3 – Completed

CLRS Boot Camp Co

Analysis of Loss & DCC Incurred as of 12/31/2016

General Liability

Case Incurred Loss & DCC

Accident Year	Evaluation Age (Months)														
	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180
2002	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
2003	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
2004	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
2005	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
2006	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
2007	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
2008	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
2009	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
2010	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
2011	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
2012	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
2013	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
2014	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
2015	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
2016	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
2002	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
2003	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
2004	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
2005	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
2006	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
2007	1.651	1.072	1.091	0.977	0.995	1.000	1.020	0.982	1.001	1.001	1.001	1.001	1.001	1.001	1.001
2008	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
2009	1.518	1.163	1.068	1.112	0.969	0.989	1.010	1.010	1.010	1.010	1.010	1.010	1.010	1.010	1.010
2010	1.418	1.247	1.054	0.974	1.076	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005
2011	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
2012	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
2013	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
2014	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
2015	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
2016	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

Basic Reserving Calculations: Development Factors – Averages

▶ Simple Averages

- All years
- Recent years
- Excluding high and low value from average

▶ Weighted Averages

- Weighted by data
- All years
- Recent years

NOTE: Observed changes may influence number of years included

Basic Reserving Calculations:

Loss Development Factors – Averages

Years in Which Losses Were Incurred	CUMULATIVE PAID NET LOSSES AND DEFENSE AND COST CONTAINMENT EXPENSES REPORTED AT YEAR-END									
	AGE-TO-AGE FACTORS									
	1	2	3	4	5	6	7	8	9	10
	12 - 24	24 - 36	36 - 48	48 - 60	60 - 72	72 - 84	84 - 96	96 - 108	108 - 120	120 - Ult
1. Prior										
2. 2007	1.659	1.135	1.060	1.015	1.001	1.000	1.000	1.000	1.001	
3. 2008	1.834	1.074	1.050	1.028	1.006	1.000	1.000	1.000		
4. 2009	1.660	1.060	1.047	1.046	1.000	1.000	1.000			
5. 2010	1.751	1.070	1.024	1.011	1.005	1.001				
6. 2011	1.624	1.142	1.015	1.025	1.001					
7. 2012	1.640	1.105	1.042	1.022						
8. 2013	1.733	1.109	1.035							
9. 2014	1.554	1.134								
10. 2015	1.511									
11. 2016										
All Yr Ave	1.663	1.104	1.039	1.024	1.003	1.000	1.000	1.000	1.001	
3 Yr Ave	1.599	1.116	1.031	1.019	1.002	1.000	1.000			
5 Yr Ave	1.612	1.112	1.033	1.026	1.003					
3 Yr Wt Ave	1.592	1.118	1.030	1.020	1.002	1.000	1.000			
5 Yr Hi-Lo	1.606	1.116	1.034	1.025	1.002					

Exercise 4

Calculate Averages

CLRS Boot Camp Co
 Analysis of Loss & DCC Incurred as of 12/31/2016
 General Liability

Case Incurred Loss & DCC

Accident Year	Evaluation Age (Months)														
	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180
2002	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
2003	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
2004	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
2005	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
2006	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
2007	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
2008	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
2009	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
2010	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
2011	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
2012	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
2013	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
2014	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
2015	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
2016	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
2002	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
2003	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
2004	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
2005	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
2006	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
2007	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
2008	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
2009	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
2010	1.418	1.247	1.054	0.974	1.076	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005
2011	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
2012	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
2013	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
2014	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
2015	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
2016	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
Weighted Averages															
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 Wtd				1.022	1.006	1.000	1.005	0.999	1.005	1.000	1.000	1.000	1.000	1.000	1.000

Exercise 4- Completed

Calculate averages

CLRS Boot Camp Co
 Analysis of Loss & DCC Incurred as of 12/31/2016
 General Liability

Case Incurred Loss & DCC

Accident Year	Evaluation Age (Months)														
	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180
2002	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
2003	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
2004	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	
2005	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		
2006	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				
2007	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					
2008	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						
2009	6,717,086	10,194,738	11,851,717	12,661,864	14,081,734	13,643,777	13,488,408	13,623,292							
2010	7,717,931	10,947,386	13,649,914	14,387,140	14,017,332	15,083,244	15,158,660								
2011	9,153,615	11,583,639	13,445,812	13,865,237	14,717,899	14,363,510									
2012	8,900,329	11,556,692	13,889,442	14,400,566	14,367,616										
2013	6,804,499	10,330,437	11,714,665	13,522,351											
2014	7,312,509	11,373,571	12,915,590												
2015	7,377,474	10,997,744													
2016	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
2002	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	
2003	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	
2004	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		
2005	1.444	1.316	1.140	1.095	1.017	1.003	0.990	1.023	1.030	1.000	1.000				
2006	1.445	1.169	1.032	0.997	0.988	1.010	1.013	1.000	0.996	1.000					
2007	1.651	1.072	1.091	0.977	0.995	1.000	1.020	0.982	1.001						
2008	1.356	1.114	1.114	0.999	0.996	1.003	1.007	1.000							
2009	1.518	1.163	1.068	1.112	0.969	0.989	1.010								
2010	1.418	1.247	1.054	0.974	1.076	1.005									
2011	1.265	1.161	1.031	1.061	0.976										
2012	1.298	1.202	1.037	0.998											
2013	1.518	1.134	1.154												
2014	1.555	1.136													
2015	1.491														
2016															

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			
5 Year	1.425	1.176	1.069	1.029	1.002	1.001	1.008	1.000	1.005	1.000					
5 Yr x 15%	1.436	1.166	1.053	1.019	0.989	1.003	1.010	0.998	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	

Weighted Averages

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			
5 Yr Wtd	1.412	1.176	1.066	1.027	1.002	1.001	1.008	1.000	1.006	1.000					
All Year Wtd	1.425	1.171	1.083	1.022	1.005	1.000	1.005	0.999	1.005	1.000	1.000	1.000	1.000	1.000	

Selecting Factors

Years in Which Losses Were Incurred	CUMULATIVE PAID NET LOSSES AND DEFENSE AND COST CONTAINMENT EXPENSES REPORTED AT YEAR-END									
	AGE-TO-AGE FACTORS									
	1	2	3	4	5	6	7	8	9	10
	12 - 24	24 - 36	36 - 48	48 - 60	60 - 72	72 - 84	84 - 96	96 - 108	108 - 120	120 - Ult
1. Prior										
2. 2007	1.659	1.135	1.060	1.015	1.001	1.000	1.000	1.000	1.001	
3. 2008	1.834	1.074	1.050	1.028	1.006	1.000	1.000	1.000		
4. 2009	1.660	1.060	1.047	1.046	1.000	1.000	1.000			
5. 2010	1.751	1.070	1.024	1.011	1.005	1.001				
6. 2011	1.624	1.142	1.015	1.025	1.001					
7. 2012	1.640	1.105	1.042	1.022						
8. 2013	1.733	1.109	1.035							
9. 2014	1.554	1.134								
10. 2015	1.511									
11. 2016										
All Yr Ave	1.663	1.104	1.039	1.024	1.003	1.000	1.000	1.000	1.001	
3 Yr Ave	1.599	1.116	1.031	1.019	1.002	1.000	1.000			
5 Yr Ave	1.612	1.112	1.033	1.026	1.003					
3 Yr Wt Ave	1.592	1.118	1.030	1.020	1.002	1.000	1.000			
5 Yr Hi-Lo	1.606	1.116	1.034	1.025	1.002					
Selected LDF	1.612	1.112	1.033	1.026	1.003	1.000	1.000	1.000	1.001	

Exercise 5

Select Development Factors

CLRS Boot Camp Co
 Analysis of Loss & DCC Incurred as of 12/31/2016
 General Liability

Case Incurred Loss & DCC

Accident Year	Evaluation Age (Months)														
	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180
2002	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
2003	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
2004	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
2005	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
2006	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
2007	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
2008	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
2009	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
2010	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
2011	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
2012	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
2013	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
2014	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
2015	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
2016	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
2002	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
2003	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
2004	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
2005	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
2006	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
2007	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
2008	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
2009	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
2010	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
2011	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
2012	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
2013	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
2014	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
2015	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
2016	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	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	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

Weighted Averages

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	1.425	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 Wtd	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

Selection															
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Exercise 5 - Completed

Select Development Factors

CLRS Boot Camp Co
 Analysis of Loss & DCC Incurred as of 12/31/2016
 General Liability

Case Incurred Loss & DCC

Accident Year	Evaluation Age (Months)														
	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180
2002	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
2003	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
2004	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
2005	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
2006	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
2007	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
2008	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
2009	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
2010	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
2011	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
2012	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
2013	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
2014	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
2015	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
2016	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
2002	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
2003	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
2004	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
2005	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
2006	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
2007	1.651	1.072	1.091	0.977	0.995	1.000	1.020	0.982	1.001	1.001	1.001	1.001	1.001	1.001	1.001
2008	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
2009	1.518	1.163	1.068	1.112	0.969	0.989	1.010	1.010	1.010	1.010	1.010	1.010	1.010	1.010	1.010
2010	1.418	1.247	1.054	0.974	1.076	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005
2011	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
2012	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
2013	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
2014	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
2015	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
2016	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	1.521	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	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
Weighted Averages															
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	1.425	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 Wtd	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
Selection	1.436	1.166	1.070	1.029	1.010	1.004	1.005	1.001	1.001	1.000	1.000	1.000	1.000	1.000	1.000

Basic Reserving Techniques: Squaring the Triangle

Years in Which Losses Were Incurred	CUMULATIVE PAID NET LOSSES AND DEFENSE AND COST CONTAINMENT EXPENSES REPORTED AT YEAR-END									
	AGE-TO-AGE FACTORS									
	1	2	3	4	5	6	7	8	9	10
	12 - 24	24 - 36	36 - 48	48 - 60	60 - 72	72 - 84	84 - 96	96 - 108	108 - 120	120 - Ult
1. Prior										
2. 2007	1.659	1.135	1.060	1.015	1.001	1.000	1.000	1.000	1.001	
3. 2008	1.834	1.074	1.050	1.028	1.006	1.000	1.000	1.000	1.001	
4. 2009	1.660	1.060	1.047	1.046	1.000	1.000	1.000	1.000	1.001	
5. 2010	1.751	1.070	1.024	1.011	1.005	1.001	1.000	1.000	1.001	
6. 2011	1.624	1.142	1.015	1.025	1.001	1.000	1.000	1.000	1.001	
7. 2012	1.640	1.105	1.042	1.022	1.003	1.000	1.000	1.000	1.001	
8. 2013	1.733	1.109	1.035	1.026	1.003	1.000	1.000	1.000	1.001	
9. 2014	1.554	1.134	1.033	1.026	1.003	1.000	1.000	1.000	1.001	
10. 2015	1.511	1.112	1.033	1.026	1.003	1.000	1.000	1.000	1.001	
11. 2016	1.612	1.112	1.033	1.026	1.003	1.000	1.000	1.000	1.001	
Selected LDF	1.612	1.112	1.033	1.026	1.003	1.000	1.000	1.000	1.001	

Basic Reserving Techniques:

What the LDF represents

CUMULATIVE PAID NET LOSSES AND DEFENSE AND COST CONTAINMENT EXPENSES REPORTED AT YEAR-END									
AGE-TO-AGE FACTORS									
	12 - 24	24 - 36	36 - 48	48 - 60	60 - 72	72 - 84	84 - 96	96 - 108	108 - 120
Selected LDF	1.612	1.112	1.033	1.026	1.003	1.000	1.000	1.000	1.001

Years in Which Losses Were Incurred	CUMULATIVE PAID NET LOSSES AND DEFENSE AND COST CONTAINMENT EXPENSES REPORTED AT YEAR-END (\$'000 OMITTED)									
	1	2	3	4	5	6	7	8	9	10
	12	24	36	48	60	72	84	96	108	120
1. Prior										
2. 2007	689	1,143	1,297	1,375	1,395	1,396	1,396	1,396	1,396	1,397
3. 2008	523	959	1,030	1,081	1,111	1,118	1,118	1,118	1,118	1,119
4. 2009	474	787	834	873	913	913	913	913	913	914
5. 2010	590	1,033	1,105	1,131	1,144	1,150	1,151	1,151	1,151	1,152
6. 2011	801	1,301	1,486	1,509	1,547	1,548	1,548	1,548	1,548	1,550
7. 2012	636	1,043	1,152	1,200	1,226	1,229	1,230	1,230	1,230	1,230
8. 2013	778	1,348	1,495	1,548	1,589	1,593	1,593	1,593	1,593	1,595
9. 2014	1,003	1,559	1,768	1,826	1,874	1,879	1,879	1,879	1,879	1,881
10. 2015	888	1,342	1,492	1,541	1,581	1,586	1,586	1,586	1,586	1,587
11. 2016	653	1,053	1,171	1,209	1,241	1,244	1,244	1,244	1,244	1,245

Sample Calculations for 2016

At 24 Months Using LDFs	1,053	= 653 * 1.612	
At 36 Months Using LDFs	1,171	= 1,053 * 1.112	= 653 * 1.612 * 1.112
At 48 Months Using LDFs	1,209	= 1,171 * 1.033	= 653 * 1.612 * 1.112 * 1.033

Basic Reserving Techniques: Cumulative development factor (CDF)

CUMULATIVE PAID NET LOSSES AND DEFENSE AND COST CONTAINMENT EXPENSES REPORTED AT YEAR-END									
AGE-TO-AGE FACTORS AND CUMULATIVE DEVELOPMENT FACTORS									
	12 - 24	24 - 36	36 - 48	48 - 60	60 - 72	72 - 84	84 - 96	96 - 108	108 - 120
Selected LDF	1.612	1.112	1.033	1.026	1.003	1.000	1.000	1.000	1.001
CDF	1.907	1.183	1.064	1.030	1.004	1.001	1.001	1.001	1.001

Years in Which Losses Were Incurred	CUMULATIVE PAID NET LOSSES AND DEFENSE AND COST CONTAINMENT EXPENSES REPORTED AT YEAR-END (\$000 OMITTED)										
	1	2	3	4	5	6	7	8	9	10	11
	12	24	36	48	60	72	84	96	108	120	Ultimate
1. Prior											
2. 2007	689	1,143	1,297	1,375	1,395	1,396	1,396	1,396	1,396	1,397	1,398
3. 2008	523	959	1,030	1,081	1,111	1,118	1,118	1,118	1,118		1,119
4. 2009	474	787	834	873	913	913	913	913			914
5. 2010	590	1,033	1,105	1,131	1,144	1,150	1,151				1,152
6. 2011	801	1,301	1,486	1,509	1,547	1,548					1,550
7. 2012	636	1,043	1,152	1,200	1,226						1,230
8. 2013	778	1,348	1,495	1,548							1,595
9. 2014	1,003	1,559	1,768								1,881
10. 2015	888	1,342									1,587
11. 2016	653										1,245

Sample Calculations for 2016 Using CDF

$$2016 \text{ Using CDFs} \quad 1,245 = 653 * 1.907 = 653 * 1.612 * 1.112 * 1.033 * 1.026 * 1.003 * 1.000 * 1.000 * 1.000 * 1.001$$

Basic Reserving Techniques: Cumulative development factor (CDF)

Years in Which Losses Were Incurred	CUMULATIVE PAID NET LOSSES AND DEFENSE AND COST CONTAINMENT EXPENSES REPORTED AT YEAR-END									
	AGE-TO-AGE FACTORS									
	1	2	3	4	5	6	7	8	9	10
	12 - 24	24 - 36	36 - 48	48 - 60	60 - 72	72 - 84	84 - 96	96 - 108	108 - 120	
1. Prior										
2. 2007	1.659	1.135	1.060	1.015	1.001	1.000	1.000	1.000	1.001	
3. 2008	1.834	1.074	1.050	1.028	1.006	1.000	1.000	1.000		
4. 2009	1.660	1.060	1.047	1.046	1.000	1.000	1.000			
5. 2010	1.751	1.070	1.024	1.011	1.005	1.001				
6. 2011	1.624	1.142	1.015	1.025	1.001					
7. 2012	1.640	1.105	1.042	1.022						
8. 2013	1.733	1.109	1.035							
9. 2014	1.554	1.134								
10. 2015	1.511									
10. 2016										
All Yr Ave	1.663	1.104	1.039	1.024	1.003	1.000	1.000	1.000	1.001	
3 Yr Ave	1.599	1.116	1.031	1.019	1.002	1.000	1.000			
5 Yr Ave	1.612	1.112	1.033	1.026	1.003					
3 Yr Wt Ave	1.592	1.118	1.030	1.020	1.002	1.000	1.000			
5 Yr Hi-Lo	1.606	1.116	1.034	1.025	1.002					
Selected LDF	1.612	1.112	1.033	1.026	1.003	1.000	1.000	1.000	1.001	
CDF	1.907	1.183	1.064	1.030	1.004	1.001	1.001	1.001	1.001	

Exercise 6

Select Development Factors

CLRS Boot Camp Co
 Analysis of Loss & DCC Incurred as of 12/31/2016
 General Liability

Case Incurred Loss & DCC

Accident Year	Evaluation Age (Months)														
	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180
2002	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
2003	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
2004	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
2005	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
2006	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
2007	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
2008	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
2009	6,717,086	10,194,738	11,851,717	12,661,864	14,081,734	13,643,777	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
2010	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
2011	9,153,615	11,583,639	13,445,812	13,865,237	14,717,899	14,717,899	14,717,899	14,717,899	14,717,899	14,717,899	14,717,899	14,717,899	14,717,899	14,717,899	14,717,899
2012	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
2013	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
2014	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
2015	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
2016	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
2002	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
2003	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
2004	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
2005	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
2006	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
2007	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
2008	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
2009	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
2010	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
2011	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
2012	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
2013	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
2014	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
2015	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
2016	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	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

Weighted Averages

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 Wtd	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															

Exercise 6 - Completed

Select Development Factors

CLRS Boot Camp Co
 Analysis of Loss & DCC Incurred as of 12/31/2016
 General Liability

Case Incurred Loss & DCC

Accident Year	Evaluation Age (Months)														
	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180
2002	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
2003	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	8,584,298	8,584,298	8,584,298	8,584,298	8,584,298	8,584,298
2004	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
2005	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
2006	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
2007	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
2008	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
2009	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
2010	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
2011	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
2012	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
2013	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
2014	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
2015	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
2016	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
2002	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
2003	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
2004	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
2005	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
2006	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
2007	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
2008	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
2009	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
2010	1.418	1.247	1.054	0.974	1.076	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005
2011	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
2012	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
2013	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
2014	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
2015	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
2016	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	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	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
Weighted Averages															
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 Wtd	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	1.411	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															
Selection	1.436	1.166	1.070	1.029	1.010	1.004	1.005	1.001	1.001	1.001	1.000	1.000	1.000	1.000	1.000
Cumulative LDF															
Cumulative LDF	1.883	1.311	1.124	1.051	1.021	1.011	1.007	1.002	1.001	1.001	1.000	1.000	1.000	1.000	1.000

Loss Development Methods

- ▶ Development Methods
 - Paid Losses
 - Incurred Losses
 - LAE
 - Counts – Closed, Reported, Closed with Payment, etc.
- ▶ Expected Ratio Method
- ▶ Bornhuetter–Ferguson Method
- ▶ Paid to Paid Method
- ▶ And Many, Many, Many More.... which are outside of the scope of this session

Development Methods:

Paid LDM

**CUMULATIVE PAID NET LOSSES AND DEFENSE
AND COST CONTAINMENT EXPENSES REPORTED
AT YEAR-END
(\$000 OMITTED)**

Accident Year (1)	Actual Paid Losses as of 12/31/2016 (2)	Cumulative Development Factors to Ultimate (3)	Estimated Ultimate Loss & DCC [(2) x (3)] (4)
2007	1,397	1.001	1,398
2008	1,118	1.001	1,119
2009	913	1.001	914
2010	1,151	1.001	1,152
2011	1,548	1.001	1,550
2012	1,226	1.004	1,230
2013	1,548	1.030	1,595
2014	1,768	1.064	1,881
2015	1,342	1.183	1,587
2016	653	1.907	1,245
Total	12,664		13,670

Case Reserves = 767

Exercise 7

Boot Camp Insurance Company

Analysis of Loss & DCC Reserves as of 12/31/2016

Liability

Paid Loss Development Method

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Accident Year	Age	Earned Premium	Paid Loss	Paid CDF	Estimated Ultimate Paid Loss Development Method	Estimated Reserves PLDM	Estimated Ultimate Loss Ratio
2002		6,953,372					
2003		6,567,116					
2004		6,690,146					
2005		7,103,262					
2006		7,959,030					
2007		9,363,418					
2008		10,597,562					
2009		11,036,360					
2010		11,402,928					
2011		11,099,580					
2012		10,683,363					
2013		10,430,225					
2014		10,106,327					
2015		9,889,744					
2016		9,998,036					
Total		139,880,469	-	-	-	-	0.00%

Exercise 7- Completed

Boot Camp Insurance Company

Analysis of Loss & DCC Reserves as of 12/31/2016

Liability

Paid Loss Development Method

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Accident Year	Age	Earned Premium	Paid Loss	Paid CDF	Estimated Ultimate Paid Loss Development Method	Estimated Reserves PLDM	Estimated Ultimate Loss Ratio
2002	180	6,953,372	4,066,336	1.000	4,066,336	-	58.48%
2003	168	6,567,116	3,271,028	1.000	3,271,028	-	49.81%
2004	156	6,690,146	4,586,913	1.000	4,586,913	-	68.56%
2005	144	7,103,262	4,556,737	1.000	4,556,737	-	64.15%
2006	132	7,959,030	4,357,830	1.000	4,357,830	-	54.75%
2007	120	9,363,418	3,174,353	1.100	3,491,788	317,435	37.29%
2008	108	10,597,562	2,329,891	1.133	2,639,767	309,876	24.91%
2009	96	11,036,360	2,463,992	1.168	2,878,246	414,254	26.08%
2010	84	11,402,928	3,156,139	1.224	3,863,724	707,584	33.88%
2011	72	11,099,580	6,907,218	1.325	9,149,140	2,241,922	82.43%
2012	60	10,683,363	4,132,680	1.474	6,092,620	1,959,940	57.03%
2013	48	10,430,225	1,766,813	1.794	3,169,957	1,403,144	30.39%
2014	36	10,106,327	1,655,619	2.422	4,010,117	2,354,498	39.68%
2015	24	9,889,744	629,188	3.839	2,415,496	1,786,308	24.42%
2016	12	9,998,036	383,397	7.621	2,921,697	2,538,300	29.22%
Total		139,880,469	47,438,135		61,471,396	14,033,260	43.95%

Development Methods:

Paid LDM

CUMULATIVE PAID NET LOSSES AND DEFENSE AND COST
CONTAINMENT EXPENSES REPORTED AT YEAR-END
(\$000 OMITTED)

Accident Year (1)	Actual Paid Losses as of 12/31/2016 (2)	Cumulative Development Factors to Ultimate (3)	Estimated Ultimate Loss & DCC [(2) x (3)] (4)	Estimated Loss & DCC Reserves [(4) - (2)] (5)
2007	1,397	1.001	1,398	1
2008	1,118	1.001	1,119	1
2009	913	1.001	914	1
2010	1,151	1.001	1,152	1
2011	1,548	1.001	1,550	2
2012	1,226	1.004	1,230	4
2013	1,548	1.030	1,595	47
2014	1,768	1.064	1,881	113
2015	1,342	1.183	1,587	245
2016	653	1.907	1,245	592
Total	12,664		13,670	1,006
	Case Reserves =		767	
	IBNR Reserves =		239	

Exercise 8

Boot Camp Insurance Company

Analysis of Loss & DCC Reserves as of 12/31/2016

Liability

Incurred Loss Development Method

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Accident Year	Age	Earned Premium	Incurred Loss	Incurred CDF	Estimated Ultimate Incurred Loss Development Method	Estimated Reserves ILDM	Estimated Ultimate Loss Ratio
2002		6,953,372					
2003		6,567,116					
2004		6,690,146					
2005		7,103,262					
2006		7,959,030					
2007		9,363,418					
2008		10,597,562					
2009		11,036,360					
2010		11,402,928					
2011		11,099,580					
2012		10,683,363					
2013		10,430,225					
2014		10,106,327					
2015		9,889,744					
2016		9,998,036					
Total		139,880,469	-	-	-	-	0.00%

Exercise 8 – Completed

Boot Camp Insurance Company

Analysis of Loss & DCC Reserves as of 12/31/2016

Liability

Incurred Loss Development Method

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Accident Year	Age	Earned Premium	Incurred Loss	Incurred CDF	Incurred Loss Development Method	Estimated Reserves ILDM	Estimated Ultimate Loss Ratio
2002	180	6,953,372	4,230,708	1.000	4,230,708	164,372	60.84%
2003	168	6,567,116	3,320,551	1.000	3,320,551	49,523	50.56%
2004	156	6,690,146	4,622,140	1.005	4,646,722	59,809	69.46%
2005	144	7,103,262	4,629,844	1.012	4,683,359	126,621	65.93%
2006	132	7,959,030	4,721,272	1.029	4,858,839	501,008	61.05%
2007	120	9,363,418	3,244,357	1.092	3,541,614	367,261	37.82%
2008	108	10,597,562	2,329,891	1.174	2,734,739	404,848	25.81%
2009	96	11,036,360	2,674,745	1.185	3,170,800	706,808	28.73%
2010	84	11,402,928	3,631,863	1.179	4,280,388	1,124,249	37.54%
2011	72	11,099,580	7,442,768	1.198	8,914,050	2,006,832	80.31%
2012	60	10,683,363	5,448,294	1.224	6,671,330	2,538,650	62.45%
2013	48	10,430,225	2,911,031	1.302	3,789,306	2,022,493	36.33%
2014	36	10,106,327	3,045,525	1.478	4,502,480	2,846,861	44.55%
2015	24	9,889,744	2,397,947	1.803	4,323,484	3,694,296	43.72%
2016	12	9,998,036	2,365,070	2.670	6,315,902	5,932,505	63.17%
Total		139,880,469	57,016,006		69,984,272	22,546,136	50.03%

“Tail” Development Factor

- ▶ “Tail” refers to the length of time it takes for all claims in a given cohort to close.
- ▶ “Tail” Development Factors recognize development beyond the last data point in a development triangle.
- ▶ Selected based on judgment, curve fitting, external benchmarks
- ▶ *“Estimating Tail Development Factors: What to do When the Triangle Runs Out”*, J. Boor, CAS Forum, Winter 2006.

Tail Factors: Impact of Selection

CUMULATIVE PAID NET LOSSES AND DEFENSE AND COST CONTAINMENT EXPENSES REPORTED AT YEAR-END (\$000 OMITTED)

Accident Year (1)	Actual Paid Losses as of 12/31/2016 (2)	Age-to-Age Development Factors (3)	Cumulative Development Factors to Ultimate (4)	Estimated Ultimate Loss & DCC [(2) x (4)] (5)	Earned Premium (6)	Estimated Ultimate Loss & DCC Ratio [(5) / (6)] (7)	Estimated Loss & DCC Reserves [(4) - (2)] (8)
2007	1,397	1.001	1.001	1,398	2,284	61.21%	1
2008	1,118	1.000	1.001	1,119	2,092	53.48%	1
2009	913	1.000	1.001	914	1,833	49.84%	1
2010	1,151	1.000	1.001	1,152	2,136	53.92%	1
2011	1,548	1.000	1.001	1,550	2,551	60.74%	2
2012	1,226	1.003	1.004	1,230	1,986	61.96%	4
2013	1,548	1.026	1.030	1,595	2,561	62.26%	47
2014	1,768	1.033	1.064	1,881	2,479	75.86%	113
2015	1,342	1.112	1.183	1,587	2,237	70.95%	245
2016	653	1.612	1.907	1,245	1,862	66.88%	592
Total	12,664			13,670	22,021	62.08%	1,006
	Case Reserves =		767				
	IBNR Reserves =		239				

Tail Factors: Impact of Selection

CUMULATIVE PAID NET LOSSES AND DEFENSE AND COST CONTAINMENT EXPENSES REPORTED AT YEAR-END (\$000 OMITTED)

Accident Year (1)	Actual Paid Losses as of 12/31/2016 (2)	Age-to-Age Development Factors (3)	Cumulative Development Factors to Ultimate (4)	Estimated Ultimate Loss & DCC [(2) x (4)] (5)	Earned Premium (6)	Estimated Ultimate Loss & DCC Ratio [(5) / (6)] (7)	Estimated Loss & DCC Reserves [(4) - (2)] (8)
2007	1,397	1.021	1.021	1,426	2,284	62.45%	29
2008	1,118	1.000	1.021	1,142	2,092	54.57%	24
2009	913	1.000	1.021	932	1,833	50.86%	19
2010	1,151	1.000	1.021	1,175	2,136	55.02%	24
2011	1,548	1.000	1.021	1,581	2,551	61.98%	33
2012	1,226	1.003	1.024	1,255	1,986	63.21%	29
2013	1,548	1.026	1.051	1,627	2,561	63.53%	79
2014	1,768	1.033	1.085	1,919	2,479	77.40%	151
2015	1,342	1.112	1.207	1,619	2,237	72.39%	277
2016	653	1.612	1.946	1,271	1,862	68.24%	618
Total	12,664			13,947	22,021	63.34%	1,283
	Case Reserves =		767				
	IBNR Reserves =		516				

Selection of Tail Factors

- ▶ Tail factors increased by 2.00%
- ▶ Ultimate losses increased by:
 - \$277 thousand on \$13,670 thousand
 - 2.03% increase in ultimate losses
- ▶ Loss reserves also increased by:
 - \$277 thousand on \$1,006 thousand
 - 27.57% increase in overall reserve levels!
- ▶ IBNR reserves increased by:
 - \$277 thousand on \$239 thousand
 - **116.10% in overall IBNR levels!!!!**
- ▶ Biggest impacts are in the most recent year.

Exercise 9

Boot Camp Insurance Company

Analysis of Loss & DCC Reserves as of 12/31/2016

Liability

Paid Loss

Accident Year	Evaluation Age (Months)														
	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180
2002	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
2003	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	
2004	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		
2005	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			
2006	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				
2007	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					
2008	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						
2009	501,760	1,005,937	1,340,913	1,545,589	2,213,662	2,370,115	2,452,890	2,463,992							
2010	301,145	658,664	1,212,189	2,430,778	2,881,963	3,049,911	3,156,139								
2011	266,685	1,109,352	1,959,118	3,213,095	6,149,641	6,907,218									
2012	912,098	1,686,868	1,917,266	2,745,786	4,132,680										
2013	338,919	901,700	1,345,545	1,766,813											
2014	338,929	801,962	1,655,619												
2015	345,581	629,188													
2016	383,397														

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
2002	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	
2003	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		
2004	2.813	2.131	1.258	1.278	1.019	1.005	1.000	1.000	1.000	1.018	1.163	1.003			
2005	2.533	1.374	1.544	1.364	1.127	1.076	1.025	1.047	1.047	1.320	0.989				
2006	1.773	2.249	1.681	1.163	1.154	1.047	1.043	1.067	1.022	1.108					
2007	2.041	1.828	1.390	1.320	1.102	1.043	1.095	1.147	0.982						
2008	2.321	1.694	1.271	1.075	1.063	1.098	1.178	1.038							
2009	2.005	1.333	1.153	1.432	1.071	1.035	1.005								
2010	2.187	1.840	2.005	1.186	1.058	1.035									
2011	4.160	1.766	1.640	1.914	1.123										
2012	1.849	1.137	1.432	1.505											
2013	2.661	1.492	1.313												
2014	2.366	2.064													
2015	1.821														
2016															

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 Wtd	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 Wtd	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		
Selection	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	1.000
Cumulative LDF	7.621	3.839	2.422	1.794	1.474	1.325	1.224	1.168	1.133	1.100	1.000	1.000	1.000	1.000	1.000	1.000

Exercise 9 – Completed

Boot Camp Insurance Company

Analysis of Loss & DCC Reserves as of 12/31/2016

Liability

Paid Loss

Accident Year	Evaluation Age (Months)														
	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180
2002	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
2003	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	
2004	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		
2005	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			
2006	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				
2007	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					
2008	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						
2009	501,760	1,005,937	1,340,913	1,545,589	2,213,662	2,370,115	2,452,890	2,463,992							
2010	301,145	658,664	1,212,189	2,430,778	2,881,963	3,049,911	3,156,139								
2011	266,685	1,109,352	1,959,118	3,213,095	6,149,641	6,907,218									
2012	912,098	1,686,868	1,917,266	2,745,786	4,132,680										
2013	338,919	901,700	1,345,545	1,766,813											
2014	338,929	801,962	1,655,619												
2015	345,581	629,188													
2016	383,397														

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
2002	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	
2003	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		
2004	2.813	2.131	1.258	1.278	1.019	1.005	1.000	1.000	1.000	1.018	1.163	1.003			
2005	2.533	1.374	1.544	1.364	1.127	1.076	1.025	1.047	1.047	1.320	0.989				
2006	1.773	2.249	1.681	1.163	1.154	1.047	1.043	1.067	1.022	1.108					
2007	2.041	1.828	1.390	1.320	1.102	1.043	1.095	1.147	0.982						
2008	2.321	1.694	1.271	1.075	1.063	1.098	1.178	1.038							
2009	2.005	1.333	1.153	1.432	1.071	1.035	1.005								
2010	2.187	1.840	2.005	1.186	1.058	1.035									
2011	4.160	1.766	1.640	1.914	1.123										
2012	1.849	1.137	1.432	1.505											
2013	2.661	1.492	1.313												
2014	2.366	2.064													
2015	1.821														
2016															

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 Wtd	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 Wtd	2.329	1.568	1.505	1.485	1.094	1.048	1.061	1.057	1.011	1.117	1.056				
All Year	2.412	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	
Selection	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	1.029
Cumulative LDF	7.843	3.951	2.493	1.846	1.517	1.363	1.260	1.202	1.166	1.132	1.029	1.029	1.029	1.029	1.029

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

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

Expected Ratio Method Historical Data– Schedule P

	Total Loss and Loss Expense Incurred			Loss and Loss Expense Percentage (Incurred / Premiums Earned)			Nontabular Discount		34	Net Balance Sheet Reserves After Discount	
	26 Direct and Assumed	27 Ceded	28 Net	29 Direct and Assumed	30 Ceded	31 Net	32 Loss	33 Loss Expense	Inter- Company Pooling Participation Percentage	35 Losses Unpaid	36 Loss Expenses Unpaid
1. Prior	(1)	(1)	-							-	-
2. 2007	4,474	2,547	1,927	76.79%	71.95%	84.30%				4	1
3. 2008	3,433	1,831	1,602	70.36%	65.70%	76.58%				-	-
4. 2009	3,057	1,722	1,335	67.51%	63.90%	72.83%				-	-
5. 2010	3,670	1,873	1,797	73.96%	66.28%	84.13%				-	-
6. 2011	3,324	1,231	2,093	76.59%	68.81%	82.05%				8	1
7. 2012	2,596	911	1,685	79.56%	71.34%	84.84%				1	-
8. 2013	3,170	1,119	2,051	77.02%	72.01%	80.05%				11	5
9. 2014	3,736	1,380	2,356	93.31%	90.49%	95.04%				108	14
10. 2015	3,179	1,175	2,004	87.72%	84.72%	89.58%				252	40
11. 2016	2,855	1,051	1,804	93.85%	89.14%	96.83%				685	202
12. Totals	33,494	14,840	18,654				-	-	-	1,069	263

Total Net Unpaid (Matches Slide 30) = \$1,332

Expected Ratio Method

▶ Estimating Reserves Based on ELR

- $\text{Earned Premium} \times \text{ELR} = \text{Expected Ultimate Losses}$
- $\text{Ultimate Losses} - \text{Paid Losses} = \text{Total Reserve}$
- $\text{Total Reserves} - \text{Case Reserve} = \text{IBNR Reserve}$

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

(Note: Some exceptions if large amounts of
Salvage and Subrogation expected)

Exercise 10

Boot Camp Insurance Company

Analysis of Loss & DCC Reserves as of 12/31/2016

Liability

Expected Loss Ratio Method

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Accident Year	Earned Premium	Paid LDM	Inc LDM	Loss Ratio Paid LDM	Loss Ratio Inc LDM	Selected Expected Loss Ratio	ELM Estimated Ultimate
2002	6,953,372			0.00%	0.00%		-
2003	6,567,116			0.00%	0.00%		-
2004	6,690,146			0.00%	0.00%		-
2005	7,103,262			0.00%	0.00%		-
2006	7,959,030			0.00%	0.00%		-
2007	9,363,418			0.00%	0.00%		-
2008	10,597,562			0.00%	0.00%		-
2009	11,036,360			0.00%	0.00%		-
2010	11,402,928			0.00%	0.00%		-
2011	11,099,580			0.00%	0.00%		-
2012	10,683,363			0.00%	0.00%		-
2013	10,430,225			0.00%	0.00%		-
2014	10,106,327			0.00%	0.00%		-
2015	9,889,744			0.00%	0.00%		-
2016	9,998,036			0.00%	0.00%		-
Total	108,880,469	-	-	0.00%	0.00%	N/A	-

Bornhuetter–Ferguson Method – Paid Method

Calculating the Percent of Unpaid Loss:

Paid Loss_i X CLDF_{Paid i} = Estimated Ultimate Loss

$$\frac{\text{Paid Loss}_i}{\text{Estimated Ultimate Loss}} = \frac{1.000}{\text{CLDF}_{\text{Paid } i}} = \text{Percent of Ultimate Loss Paid at } i \text{ Months}$$

$$\begin{aligned} \text{Percent of Ultimate Loss Unpaid} &= 1.000 - \text{Percent of Ultimate Loss Paid at } i \text{ Months} \\ &= 1.000 - \frac{1.000}{\text{CLDF}_{\text{Paid } i}} \end{aligned}$$

Bornhuetter–Ferguson Method

Paid Method

Years in Which Losses Were Incurred	CUMULATIVE PAID NET LOSSES AND DEFENSE AND COST CONTAINMENT EXPENSES REPORTED AT YEAR-END									
	AGE-TO-AGE FACTORS									
	1	2	3	4	5	6	7	8	9	10
	12 - 24	24 - 36	36 - 48	48 - 60	60 - 72	72 - 84	84 - 96	96 - 108	108 - 120	
1. Prior										
2. 2007	1.659	1.135	1.060	1.015	1.001	1.000	1.000	1.000	1.001	
3. 2008	1.834	1.074	1.050	1.028	1.006	1.000	1.000	1.000		
4. 2009	1.660	1.060	1.047	1.046	1.000	1.000	1.000			
5. 2010	1.751	1.070	1.024	1.011	1.005	1.001				
6. 2011	1.624	1.142	1.015	1.025	1.001					
7. 2012	1.640	1.105	1.042	1.022						
8. 2013	1.733	1.109	1.035							
9. 2014	1.554	1.134								
10. 2015	1.511									
10. 2016										
All Yr Ave	1.663	1.104	1.039	1.024	1.003	1.000	1.000	1.000	1.001	
3 Yr Ave	1.599	1.116	1.031	1.019	1.002	1.000	1.000			
5 Yr Ave	1.612	1.112	1.033	1.026	1.003					
3 Yr Wt Ave	1.592	1.118	1.030	1.020	1.002	1.000	1.000			
5 Yr Hi-Lo	1.606	1.116	1.034	1.025	1.002					
Selected LDF	1.612	1.112	1.033	1.026	1.003	1.000	1.000	1.000	1.001	
CDF	1.907	1.183	1.064	1.030	1.004	1.001	1.001	1.001	1.001	
Unpaid Factor = 1.00 - 1.00 / CDF										
	= 1 - 1 / 1.907		= 1 - 1 / 1.064							
Unpaid Factor	0.476	0.154	0.060	0.029	0.004	0.001	0.001	0.001	0.001	

Bornhuetter–Ferguson Method – Paid Method

**Reserves Based on ELR, Unpaid Factor, and Actual
Paid Loss**

$(EP \times ELR) \times (\text{Unpaid Factor}) = \text{Unpaid (i.e. Reserves)}$

Where $\text{Unpaid Factor} = (1.000 - 1.000 / \text{CLDF}_{\text{Paid}})$

$\text{Actual Paid} + \text{Unpaid Reserve} = \text{Ultimate Losses}$

Bornhuetter–Ferguson Method – Paid Method

BORNHUETTER- FERGUSON PAID METHOD (\$000 OMITTED)

Accident Year (1)	Earned Premium (2)	Assumed Expected Loss & DCC Ratio (3)	Assumed Expected Loss & DCC (2) x (3) (4)	Unpaid Factor (5)	Estimated Unpaid (6)	Actual Paid Loss & DCC (7)	Estimated Ultimate Loss & DCC (8)
2007	2,284	62.0%	1,416	-	-	1,397	1,397
2008	2,092	62.0%	1,297	0.001	1	1,118	1,119
2009	1,833	62.0%	1,136	0.001	1	913	914
2010	2,136	62.0%	1,324	0.001	1	1,151	1,152
2011	2,551	62.0%	1,582	0.001	1	1,548	1,549
2012	1,986	62.0%	1,231	0.004	4	1,226	1,230
2013	2,561	62.0%	1,588	0.029	46	1,548	1,594
2014	2,479	62.0%	1,537	0.060	92	1,768	1,860
2015	2,237	62.0%	1,387	0.154	214	1,342	1,556
2016	1,862	62.0%	1,154	0.476	549	653	1,202
Total	22,021				910	12,664	13,574
	Case Reserves =		767				
	IBNR Reserves =		143				

Bornhuetter–Ferguson Method – Case Incurred Method

Reserves Based on ELR, IBNR Factor, and Case Incurred Loss

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

$$\text{Where IBNR Factor} = (1.000 - 1.000 / \text{CLDF}_{\text{Incurred}})$$

$$\text{Case Incurred} + \text{IBNR Reserve} = \text{Ultimate Losses}$$

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

The IBNR Factor is the percent of expected losses unreported.

Bornhuetter–Ferguson Method – Incurred Method

BORNHUETTER- FERGUSON INCURRED METHOD (\$000 OMITTED)

Accident Year (1)	Earned Premium (2)	Assumed Expected Loss & DCC Ratio (3)	Assumed Expected Loss & DCC (2) x (3) (4)	Unreported (IBNR) Factor (5)	Estimated Unreported (IBNR) (6)	Case Incurred Loss & DCC (7)	Estimated Ultimate Loss & DCC (8)
2007	2,284	62.0%	1,416	-	-	1,401	1,401
2008	2,092	62.0%	1,297	0.001	1	1,118	1,119
2009	1,833	62.0%	1,136	0.000	0	913	913
2010	2,136	62.0%	1,324	0.000	0	1,151	1,151
2011	2,551	62.0%	1,582	0.000	1	1,555	1,556
2012	1,986	62.0%	1,231	0.001	1	1,226	1,227
2013	2,561	62.0%	1,588	0.001	1	1,556	1,557
2014	2,479	62.0%	1,537	0.004	6	1,851	1,857
2015	2,237	62.0%	1,387	0.007	9	1,497	1,506
2016	1,862	62.0%	1,154	0.023	27	1,163	1,190
Total	22,021				46	13,431	13,477
	Case Reserves =		767				
	IBNR Reserves =		46				

Exercise 11

Boot Camp Insurance Company

Analysis of Loss & DCC Reserves as of 12/31/2016

Liability

Paid Bornhuetter-Ferguson Method

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Accident Year	Age	Earned Premium	ELM Ultimate	Unpaid Factor	Estimated Unpaid	Actual Paid Loss	Paid BF Method Ultimate	Estimated Reserves PBFM	Estimated IBNR PBFM
2002	180	6,953,372				4,066,336			
2003	168	6,567,116				3,271,028			
2004	156	6,690,146				4,586,913			
2005	144	7,103,262				4,556,737			
2006	132	7,959,030				4,357,830			
2007	120	9,363,418				3,174,353			
2008	108	10,597,562				2,329,891			
2009	96	11,036,360				2,463,992			
2010	84	11,402,928				3,156,139			
2011	72	11,099,580				6,907,218			
2012	60	10,683,363				4,132,680			
2013	48	10,430,225				1,766,813			
2014	36	10,106,327				1,655,619			
2015	24	9,889,744				629,188			
2016	12	9,998,036				383,397			
Total		108,890,469	-		-	47,438,135	-	-	-

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

EZ INSURANCE COMPANY AUTOMOBILE LIABILITY Cumulative Paid DCC to Cumulative Paid Losses (\$000)

Accident Year	CUMULATIVE PAID DCC						
	12	24	36	48	60	72	84
2010	71	166	286	416	527	611	677
2011	83	189	313	458	584	672	
2012	93	213	361	523	657		
2013	103	226	394	581			
2014	108	245	437				
2015	128	280					
2016	132						

Accident Year	CUMULATIVE PAID LOSS						
	12	24	36	48	60	72	84
2010	3,361	5,991	7,341	8,259	8,916	9,408	9,759
2011	3,780	6,671	8,156	9,205	9,990	10,508	
2012	4,212	7,541	9,351	10,639	11,536		
2013	4,901	8,864	10,987	12,458			
2014	5,708	10,268	12,699				
2015	6,093	11,172					
2016	6,962						

Paid to Paid Method

EZ INSURANCE COMPANY AUTOMOBILE LIABILITY Cumulative Paid DCC to Cumulative Paid Losses (\$000)

Accident Year	RATIO CUMULATIVE PAID DCC TO CUMULATIVE PAID LOSS						
	12	24	36	48	60	72	84
2010	0.021	0.028	0.039	0.050	0.059	0.065	0.069
2011	0.022	0.028	0.038	0.050	0.058	0.064	
2012	0.022	0.028	0.039	0.049	0.057		
2013	0.021	0.025	0.036	0.047			
2014	0.019	0.024	0.034				
2015	0.021	0.025					
2016	0.019						

0.025 = 280 Paid DCC / 11,172 Paid Loss

Paid to Paid Method

EZ INSURANCE COMPANY AUTOMOBILE LIABILITY Cumulative Paid DCC to Cumulative Paid Losses (\$000)

Accident Year	RATIO CUMULATIVE PAID DCC TO CUMULATIVE PAID LOSS AGE-TO-AGE FACTORS						
	12 - 24	24 - 36	36 - 48	48 - 60	60 - 72	72 - 84	
2010	1.312	1.406	1.293	1.173	1.099	1.068	
2011	1.290	1.355	1.297	1.175	1.094		
2012	1.279	1.367	1.273	1.159			
2013	1.213	1.406	1.301				
2014	1.261	1.442					
2015	1.193						
2016							
Average	1.258	1.395	1.291	1.169	1.096	1.068	
4 Point Ave	1.237	1.393	1.291				
Ave x Hi / Lo	1.261	1.393	1.295	1.173			
Selected LDF	1.237	1.393	1.291	1.169	1.096	1.068	1.068
CDF	3.250	2.628	1.888	1.462	1.251	1.141	1.068

Exercise 12

Boot Camp Insurance Company
Analysis of Loss & DCC Reserves as of 12/31/2016
Liability

Paid DCC / Paid Loss

Accident Year	Evaluation Age (Months)														
	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180
2002	5.30%	7.21%	14.03%	20.81%	21.39%	21.00%	20.95%	21.02%	20.87%	20.74%	18.72%	17.86%	17.86%	17.69%	17.69%
2003	6.54%	7.53%	12.68%	25.86%	28.22%	28.29%	29.00%	29.24%	29.47%	29.78%	29.77%	29.30%	25.97%	26.24%	
2004	8.06%	7.33%	13.20%	19.37%	20.39%	20.90%	21.30%	21.72%	21.98%	22.18%	21.90%	18.99%	18.98%		
2005	6.85%	9.38%	26.90%	38.55%	35.47%	32.26%	30.75%	30.44%	29.33%	28.16%	21.42%	21.87%			
2006	6.26%	14.65%	20.28%	26.25%	30.78%	27.24%	26.46%	26.12%	24.67%	24.27%	22.03%				
2007	10.30%	27.32%	44.45%	57.28%	49.68%	46.58%	46.31%	42.29%	37.23%	38.31%					
2008	13.56%	24.77%	43.03%	55.55%	72.04%	69.42%	66.05%	56.63%	55.40%						
2009	2.78%	5.71%	20.04%	44.81%	48.29%	46.39%	45.38%	45.72%							
2010	7.55%	13.52%	28.25%	27.89%	34.45%	33.70%	33.40%								
2011	11.01%	10.10%	25.50%	26.91%	17.46%	16.00%									
2012	3.28%	6.27%	20.11%	32.95%	25.28%										
2013	4.93%	8.55%	21.47%	41.64%											
2014	13.30%	21.52%	33.51%												
2015	21.62%	18.57%													
2016	11.87%														

Hint: Do Not Round

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
2003	1.361	1.946	1.483	1.028	0.982	0.997	1.003	0.993	0.994	0.902	0.954	1.000	0.990	1.000	
2004	1.150	1.684	2.040	1.091	1.003	1.025	1.008	1.008	1.010	1.000	0.984	0.886	1.011		
2005	0.910	1.800	1.468	1.053	1.025	1.019	1.020	1.012	1.009	0.987	0.867	0.999			
2006	1.368	2.869	1.433	0.920	0.910	0.953	0.990	0.963	0.960	0.761	1.021				
2007	2.339	1.385	1.294	1.173	0.885	0.971	0.987	0.945	0.984	0.907					
2008	2.653	1.627	1.289	0.867	0.938	0.994	0.913	0.881	1.029						
2009	1.827	1.737	1.291	1.297	0.964	0.951	0.857	0.978							
2010	2.052	3.509	2.236	1.078	0.961	0.978	1.007								
2011	1.790	2.090	0.987	1.235	0.978	0.991									
2012	0.917	2.525	1.055	0.649	0.917										
2013	1.910	3.208	1.638	0.767											
2014	1.734	2.511	1.939												
2015	1.619	1.557													
2016	0.859														

Hint: Round to three places

Numeric Averages

3 Year				0.884	0.952	0.973	0.926	0.935	0.991	0.885	0.957	0.962			
5 Year				1.005	0.952	0.977	0.951	0.956	0.998	0.911					
5 Yr x H/L				1.027	0.954	0.980	0.963	0.962	1.001	0.932					
All Year				1.014	0.956	0.987	0.973	0.969	0.998	0.911	0.957	0.962	1.001	1.000	
3 Yr Wtd				0.880	0.959	0.969	0.917	0.938	0.995	0.876	0.960	0.949			
5 Yr Wtd				1.050	0.956	0.974	0.936	0.952	1.000	0.910					
All Year				1.019	0.954	0.981	0.954	0.963	0.999	0.910	0.959	0.949	1.002	1.000	

Paid to Paid Method

EZ INSURANCE COMPANY AUTOMOBILE LIABILITY Cumulative Paid DCC to Cumulative Paid Losses (\$000)

Accident Year (1)	Ratio to Date (2)	CDF (3)	Developed Paid / Paid Ratio (4)	Estimated Ultimate Losses (5)	Estimated Ultimate DCC (6)	Paid DCC to Date (7)	Indicated DCC Reserves (8)
2010	0.069	1.068	0.074	10,292	763	677	86
2011	0.064	1.141	0.073	11,261	822	672	150
2012	0.057	1.251	0.071	12,751	908	657	251
2013	0.047	1.462	0.068	14,500	989	581	408
2014	0.034	1.888	0.065	16,326	1,060	437	623
2015	0.025	2.628	0.066	17,641	1,162	280	882
2016	0.019	3.250	0.062	20,716	1,277	132	1,145
Total				103,487	6,981	3,436	3,545

Exercise 13

Boot Camp Insurance Company

Analysis of Loss & DCC Reserves as of 12/31/2016

Liability

Paid to Paid DCC Development Method

	(1)	(2)	(3)	(4)	(5)
Accident Year	Age	Paid DCC To Paid Loss Ratio	Paid DCC To Paid Loss CDF	Paid DCC To Paid Loss Development Method	Paid DCC To Paid Loss Development Method
2002	180	17.7%		0.0%	-17.7%
2003	168	26.2%		0.0%	-26.2%
2004	156	19.0%		0.0%	-19.0%
2005	144	21.9%		0.0%	-21.9%
2006	132	22.0%		0.0%	-22.0%
2007	120	38.3%		0.0%	-38.3%
2008	108	55.4%		0.0%	-55.4%
2009	96	45.7%		0.0%	-45.7%
2010	84	33.4%		0.0%	-33.4%
2011	72	16.0%		0.0%	-16.0%
2012	60	25.3%		0.0%	-25.3%
2013	48	41.6%		0.0%	-41.6%
2014	36	33.5%		0.0%	-33.5%
2015	24	18.6%		0.0%	-18.6%
2016	12	11.9%		0.0%	-11.9%
Total					

Diagnostics

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

Ratios – Paid to Case Incurred

Accident Year	Cumulative Paid Losses (\$000 Omitted)		
	Development Stage in Months		
	12	24	36
2014	3,780	6,671	8,156
2015	4,212	7,541	
2016	4,901		

Accident Year	Cumulative Case Incurred Losses (\$000 Omitted)		
	Development Stage in Months		
	12	24	36
2014	9,337	10,847	11,092
2015	10,540	12,205	
2016	11,875		

Accident Year	Ratio Paid to Case Incurred (\$000 Omitted)		
	Development Stage in Months		
	12	24	36
2014	+3,780 / 9,337	+6,671 / 10,847	
2015	+4,212 / 10,540	+7,541 / 12,205	
2016	+4,901 / 11,875		

Ratios – Paid to Case Incurred

Accident Year	Cumulative Paid Losses (\$000 Omitted)		
	Development Stage in Months		
	12	24	36
2014	3,780	6,671	8,156
2015	4,212	7,541	
2016	4,901		

Accident Year	Cumulative Case Incurred Losses (\$000 Omitted)		
	Development Stage in Months		
	12	24	36
2014	9,337	10,847	11,092
2015	10,540	12,205	
2016	11,875		

Accident Year	Ratio Paid to Case Incurred		
	Development Stage in Months		
	12	24	36
2014	0.405	0.615	0.735
2015	0.400	0.618	
2016	0.413		

Ratios – Paid to Case Incurred

Accident Year	Ratio Paid to Case Incurred Development Stage in Months						
	12	24	36	48	60	72	
2011	0.405	0.615	0.735	0.822	0.889	0.934	
2012	0.400	0.618	0.745	0.838	0.907		
2013	0.413	0.641	0.772	0.864			
2014	0.428	0.661	0.790				
2015	0.421	0.666					
2016	0.420						

Ratios – Closed to Reported Claims

Accident Year	Ratio Closed to Reported Claim Count Development Stage in Months						
	12	24	36	48	60	72	
2011	0.740	0.950	0.990	1.000	1.000	1.000	
2012	0.760	0.956	0.980	1.000	1.000		
2013	0.820	0.972	1.000	1.000			
2014	0.800	0.982	1.000				
2015	0.830	0.974					
2016	0.810						

Sensitivity Analysis: Average Incurred (or Paid)

Accident Year	Average Case Incurred Development Stage in Months						
	12	24	36	48	60	72	
2011	6,539	3,913	3,892	3,905	3,915	3,895	
2012	6,164	4,025	4,067	4,101	4,092		
2013	8,744	4,976	4,762	4,804			
2014	8,836	6,005	6,049				
2015	9,724	6,442					
2016	10,325						

Sensitivity Analysis: Average Outstanding

Accident Year	Average Case Reserve Development Stage in Months						
	12	24	36	48	60	72	
2011	4,839	5,464	8,413	-	-	-	
2012	4,684	6,452	6,941	-	-		
2013	7,170	6,941	9,488	-			
2014	7,069	8,155	-				
2015	8,071	9,145					
2016	8,363						

Exercise 14

Boot Camp Insurance Company

Analysis of Loss & DCC Reserves as of 12/31/2016

Liability

Ratio Paid Loss to Incurred Loss

Accident Year	Evaluation Age (Months)														
	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180
2002	15.7%	32.5%	56.4%	72.4%	84.2%	90.6%	94.2%	95.8%	95.7%	87.9%	92.5%	96.0%	96.0%	96.1%	96.1%
2003	15.9%	37.6%	67.0%	85.4%	87.9%	93.7%	94.3%	93.9%	94.1%	93.5%	92.2%	87.6%	99.1%	98.5%	
2004	11.6%	25.1%	57.4%	73.6%	92.6%	97.0%	98.1%	98.9%	98.9%	94.1%	85.6%	99.6%	99.2%		
2005	25.8%	40.3%	43.2%	58.7%	71.4%	81.0%	89.8%	93.9%	93.4%	78.5%	99.5%	98.4%			
2006	18.8%	22.7%	39.4%	53.4%	69.3%	72.1%	75.8%	83.6%	89.5%	87.4%	92.3%				
2007	34.2%	40.8%	56.7%	70.5%	89.4%	97.4%	87.4%	83.2%	98.1%	97.8%					
2008	22.5%	32.6%	52.3%	80.3%	83.1%	71.5%	73.4%	100.0%	100.0%						
2009	35.7%	50.7%	68.1%	60.8%	85.3%	90.1%	94.2%	92.1%							
2010	21.0%	39.4%	42.4%	76.9%	84.5%	86.6%	86.9%								
2011	15.1%	43.2%	44.0%	48.1%	82.9%	92.8%									
2012	40.7%	59.4%	50.5%	63.8%	75.9%										
2013	32.0%	48.5%	55.6%	60.7%											
2014	26.0%	30.8%	54.4%												
2015	20.7%	26.2%													
2016	16.2%														

Comparison of Methods

Accident Year	Earned Premium	Paid Loss & DCC	Case Loss & DCC Reserve	Case Incurred Loss & DCC	Indicated Ultimate Loss & DCC					
					Paid LDF Development Method	Incurred LDF Development Method	Expected Loss Ratio Method	Paid Bornhuetter-Ferguson Method	Incurred Bornhuetter-Ferguson Method	Average of Methods
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
2007	2,284	1,397	4	1,401	1,398	1,401	1,416	1,397	1,401	1,403
2008	2,092	1,118	-	1,118	1,119	1,117	1,297	1,119	1,119	1,154
2009	1,833	913	-	913	914	913	1,136	914	913	958
2010	2,136	1,151	-	1,151	1,152	1,151	1,324	1,152	1,151	1,186
2011	2,551	1,548	7	1,555	1,550	1,554	1,582	1,549	1,556	1,558
2012	1,986	1,226	-	1,226	1,230	1,227	1,231	1,230	1,227	1,229
2013	2,561	1,548	8	1,556	1,595	1,590	1,588	1,594	1,557	1,585
2014	2,479	1,768	83	1,851	1,881	1,869	1,537	1,860	1,857	1,801
2015	2,237	1,342	155	1,497	1,587	1,555	1,387	1,556	1,506	1,518
2016	1,862	653	510	1,163	1,245	1,300	1,154	1,202	1,190	1,218
Total	22,021	12,664	767	13,431	13,670	13,677	13,653	13,574	13,477	13,610
Case Reserves =			767		767	767	767	767	767	767
IBNR Reserves =					239	246	222	143	46	179

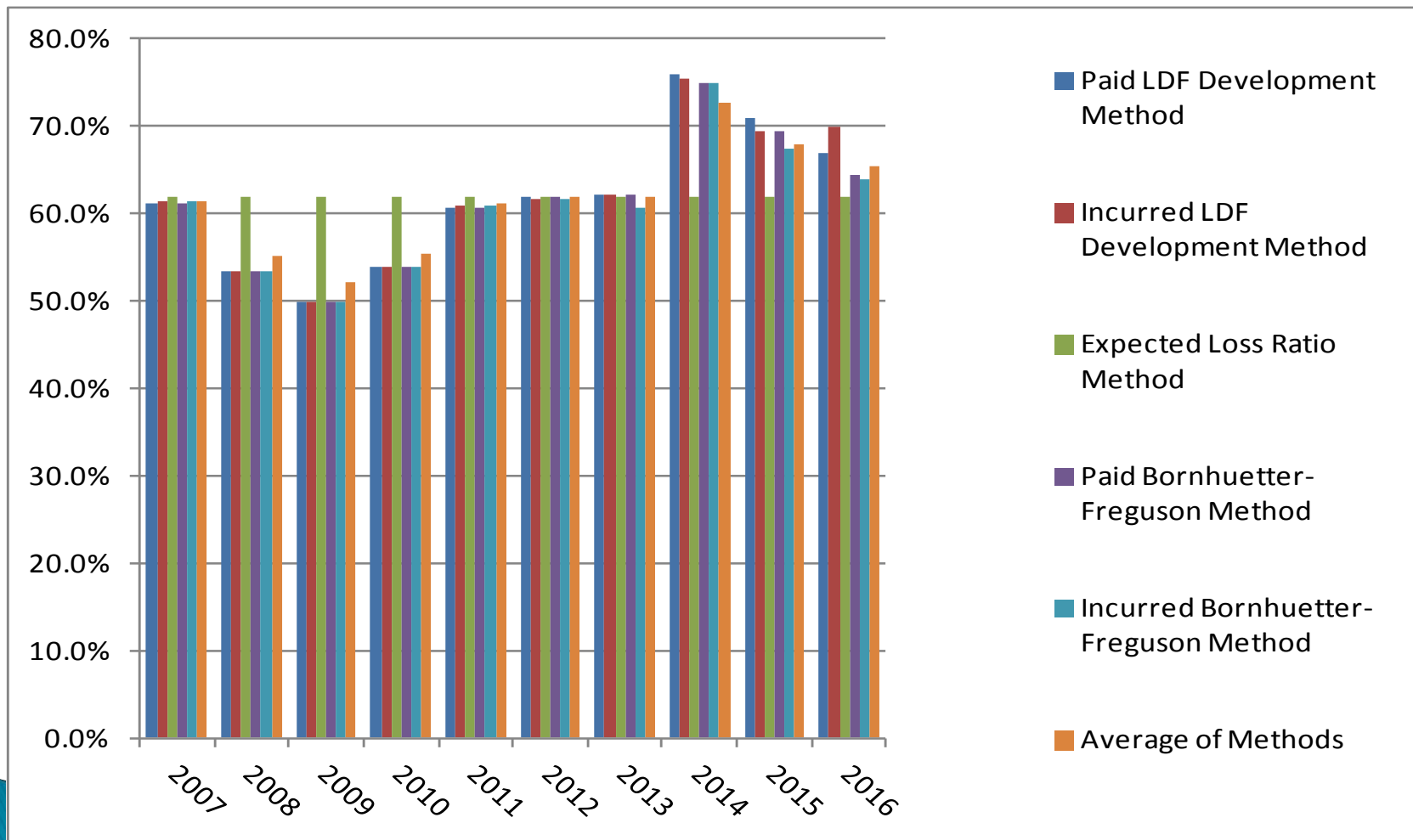
Reasonableness

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

Comparison of Methods – Loss Ratios

Accident Year	Earned Premium	Paid Loss & DCC	Case Loss & DCC Reserve	Case Incurred Loss & DCC	Indicated Ultimate Loss & DCC						Average of Methods
					Paid LDF Development Method	Incurred LDF Development Method	Expected Loss Ratio Method	Bornhuetter-Ferguson Method	Incurred Bornhuetter-Ferguson Method		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	
2007	2,284	61.2%	0.2%	61.3%	61.2%	61.3%	62.0%	61.2%	61.3%	61.4%	
2008	2,092	53.4%	0.0%	53.4%	53.5%	53.4%	62.0%	53.5%	53.5%	55.2%	
2009	1,833	49.8%	0.0%	49.8%	49.8%	49.8%	62.0%	49.9%	49.8%	52.3%	
2010	2,136	53.9%	0.0%	53.9%	53.9%	53.9%	62.0%	53.9%	53.9%	55.5%	
2011	2,551	60.7%	0.3%	61.0%	60.7%	60.9%	62.0%	60.7%	61.0%	61.1%	
2012	1,986	61.7%	0.0%	61.7%	62.0%	61.8%	62.0%	61.9%	61.8%	61.9%	
2013	2,561	60.4%	0.3%	60.8%	62.3%	62.1%	62.0%	62.3%	60.8%	61.9%	
2014	2,479	71.3%	3.3%	74.7%	75.9%	75.4%	62.0%	75.0%	74.9%	72.6%	
2015	2,237	60.0%	6.9%	66.9%	71.0%	69.5%	62.0%	69.6%	67.3%	67.9%	
2016	1,862	35.1%	27.4%	62.5%	66.9%	69.8%	62.0%	64.6%	63.9%	65.4%	
Total	22,021	57.5%		61.0%	62.1%	62.1%	62.0%	61.6%	61.2%	61.8%	
Case Reserves =			767		767	767	767	767	767	767	
IBNR Reserves =					239	246	222	143	46	179	

Comparison of Methods – Loss Ratios



Exercise 15 – Ultimate Selections

Accident Year	(1)	(2)	(3)	(4)	(8)	(9)	Indicated Ultimate Loss			(13)	(14)
	Earned Premium	Paid Loss	Case Reserves	Incurred Loss	Paid Loss	Incurred Loss	Expected Loss Ratio	Paid	Incurred	Average of	Ultimate Loss Selection
					Development Method	Development Method		Bornhuetter Ferguson Method	Bornhuetter Ferguson Method		
2002	6,953,372	4,066,336	164,372	4,230,708	-	4,230,708	-	-	4,230,708	1,692,283	4,230,708
2003	6,567,116	3,271,028	49,523	3,320,551	-	3,320,551	-	-	3,320,551	1,328,220	3,320,551
2004	6,690,146	4,586,913	35,227	4,622,140	-	4,646,722	-	-	4,622,140	1,853,772	4,622,140
2005	7,103,262	4,556,737	73,107	4,629,844	-	4,683,359	-	-	4,629,844	1,862,641	4,629,844
2006	7,959,030	4,357,830	363,442	4,721,272	-	4,858,839	-	-	4,721,272	1,916,022	4,721,272
2007	9,363,418	3,174,353	70,004	3,244,357	-	3,541,614	-	-	3,244,357	1,357,194	3,244,357
2008	10,597,562	2,329,891	-	2,329,891	-	2,734,739	-	-	2,329,891	1,012,926	2,329,891
2009	11,036,360	2,463,992	210,753	2,674,745	-	3,170,800	-	-	2,674,745	1,169,109	2,674,745
2010	11,402,928	3,156,139	475,724	3,631,863	-	4,280,388	-	-	3,631,863	1,582,450	3,631,863
2011	11,099,580	6,907,218	535,550	7,442,768	-	8,914,050	-	-	7,442,768	3,271,364	7,442,768
2012	10,683,363	4,132,680	1,315,614	5,448,294	-	6,671,330	-	-	5,448,294	2,423,925	5,448,294
2013	10,430,225	1,766,813	1,144,218	2,911,031	-	3,789,306	-	-	2,911,031	1,340,067	2,911,031
2014	10,106,327	1,655,619	1,389,906	3,045,525	-	4,502,480	-	-	3,045,525	1,509,601	3,045,525
2015	9,889,744	629,188	1,768,759	2,397,947	-	4,323,484	-	-	2,397,947	1,344,286	2,397,947
2016	9,998,036	383,397	1,981,673	2,365,070	-	6,315,902	-	-	2,365,070	1,736,194	2,365,070
Total	139,880,469	47,438,135	9,577,871	57,016,006	-	69,984,272	-	-	57,016,006	25,400,056	57,016,006

Accident Year	(15)	(16)	(17)	(18)	(19)	(20)	(21)
	Indicated Ultimate Loss Ratio						Ultimate Loss Ratio Selection
	Paid Loss Development Method	Incurred Loss Development Method	Expected Loss Ratio Method	Paid Bornhuetter Ferguson Method	Incurred Bornhuetter Ferguson Method	Average of Methods	
2002	0.00%	60.84%	0.00%	0.00%	60.84%	24.34%	60.84%
2003	0.00%	50.56%	0.00%	0.00%	50.56%	20.23%	50.56%
2004	0.00%	69.46%	0.00%	0.00%	69.09%	27.71%	69.09%
2005	0.00%	65.93%	0.00%	0.00%	65.18%	26.22%	65.18%
2006	0.00%	61.05%	0.00%	0.00%	59.32%	24.07%	59.32%
2007	0.00%	37.82%	0.00%	0.00%	34.65%	14.49%	34.65%
2008	0.00%	25.81%	0.00%	0.00%	21.99%	9.56%	21.99%
2009	0.00%	28.73%	0.00%	0.00%	24.24%	10.59%	24.24%
2010	0.00%	37.54%	0.00%	0.00%	31.85%	13.88%	31.85%
2011	0.00%	80.31%	0.00%	0.00%	67.05%	29.47%	67.05%
2012	0.00%	62.45%	0.00%	0.00%	51.00%	22.69%	51.00%
2013	0.00%	36.33%	0.00%	0.00%	27.91%	12.85%	27.91%
2014	0.00%	44.55%	0.00%	0.00%	30.13%	14.94%	30.13%
2015	0.00%	43.72%	0.00%	0.00%	24.25%	13.59%	24.25%
2016	0.00%	63.17%	0.00%	0.00%	23.66%	17.37%	23.66%
Total							

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

Boot Camp Insurance Company

Analysis of Loss & DCC Reserves as of 12/31/2016

Liability

Summary of Reserves - Loss Only

Accident Year	(1)	(2)	(3)	(2)+(3)	(5)	(6)	(7)
	Earned Premium	Paid Loss	Case Reserves	Incurred Loss			
2002	6,953,372	4,066,336	164,372	4,230,708	4,230,708	-	164,372
2003	6,567,116	3,271,028	49,523	3,320,551	3,320,551	-	49,523
2004	6,690,146	4,586,913	35,227	4,622,140	4,622,140	-	35,227
2005	7,103,262	4,556,737	73,107	4,629,844	4,629,844	-	73,107
2006	7,959,030	4,357,830	363,442	4,721,272	4,721,272	-	363,442
2007	9,363,418	3,174,353	70,004	3,244,357	3,244,357	-	70,004
2008	10,597,562	2,329,891	-	2,329,891	2,329,891	-	-
2009	11,036,360	2,463,992	210,753	2,674,745	2,674,745	-	210,753
2010	11,402,928	3,156,139	475,724	3,631,863	3,631,863	-	475,724
2011	11,099,580	6,907,218	535,550	7,442,768	7,442,768	-	535,550
2012	10,683,363	4,132,680	1,315,614	5,448,294	5,448,294	-	1,315,614
2013	10,430,225	1,766,813	1,144,218	2,911,031	2,911,031	-	1,144,218
2014	10,106,327	1,655,619	1,389,906	3,045,525	3,045,525	-	1,389,906
2015	9,889,744	629,188	1,768,759	2,397,947	2,397,947	-	1,768,759
2016	9,998,036	383,397	1,981,673	2,365,070	2,365,070	-	1,981,673
Total	139,880,469	47,438,135	9,577,871	57,016,006	57,016,006	-	9,577,871

Exercise 16 – Metrics

Boot Camp Insurance Company

Analysis of Loss & DCC Reserves as of 12/31/2016

Liability

Analysis Metrics - Loss Only

	(1)	(2)	(3)	= (2) / (3)	(5)	= (5) / (1)	(7)	= (7) / [(1) / 100,000]	= (5) / (7)
				(4)		(6)		(8)	(9)
Accident Year	Earned Premium	Case Reserves	IBNR Reserves	IBNR to Case	Ultimate Loss	Ultimate Loss Ratio	Ultimate Counts	Ultimate Frequency	Ultimate Severity
2002	6,953,372	164,372	-	0.0%	4,230,708	60.8%	522	7.51	8,105
2003	6,567,116	49,523	-	0.0%	3,320,551	50.6%	528	8.04	6,289
2004	6,690,146	35,227	-	0.0%	4,622,140	69.1%	514	7.68	8,992
2005	7,103,262	73,107	-	0.0%	4,629,844	65.2%	530	7.47	8,730
2006	7,959,030	363,442	-	0.0%	4,721,272	59.3%	562	7.07	8,395
2007	9,363,418	70,004	-	0.0%	3,244,357	34.6%	434	4.64	7,468
2008	10,597,562	-	-	0.0%	2,329,891	22.0%	474	4.47	4,916
2009	11,036,360	210,753	-	0.0%	2,674,745	24.2%	503	4.55	5,322
2010	11,402,928	475,724	-	0.0%	3,631,863	31.9%	509	4.47	7,131
2011	11,099,580	535,550	-	0.0%	7,442,768	67.1%	455	4.10	16,346
2012	10,683,363	1,315,614	-	0.0%	5,448,294	51.0%	498	4.66	10,938
2013	10,430,225	1,144,218	-	0.0%	2,911,031	27.9%	477	4.58	6,097
2014	10,106,327	1,389,906	-	0.0%	3,045,525	30.1%	459	4.54	6,636
2015	9,889,744	1,768,759	-	0.0%	2,397,947	24.2%	412	4.17	5,816
2016	9,998,036	1,981,673	-	0.0%	2,365,070	23.7%	392	3.92	6,039
Total	100,880,469	9,577,871	-	0.0%	57,016,006	40.8%	7,271	5.20	7,842