

---

---

# *Intermediate Track III*

## *GL Case Study*

*September 2009*  
*Chicago, IL*

# *Background Information*

---

---

GL Insurance Company is a small, stock insurance company that has been insuring businesses against General Liability exposures for over 20 years. The company has insured a stable book of business over the years (essentially the same group of insureds). The company has been well managed and has a healthy balance sheet.

# *Background Information*

---

---

- GL Insurance Company has a small actuarial staff headed by an actuarial student.
- The department calculated year-end reserves using both the paid and incurred loss development methods.
- The staff supplements this analysis with the use of expected loss techniques, if needed.

# *Background Information*

---

---

- In previous years, the paid and incurred loss projections were almost identical.
- Recently, differences between the two estimates are emerging.
- GLIC has employed you, a consulting actuary, to complete its current reserve certification and to critique the actuarial work done by GLIC's actuarial department.
- You begin by examining the work done by GLIC's actuarial department.

# Total GL Paid Loss Development

Accident Year	Paid Losses (\$000)										
	Evaluation Age in Months										
	12	24	36	48	60	72	84	96	108	120	132
1998	1,340	3,188	5,072	6,973	8,677	10,008	11,802	12,606	13,174	13,596	14,033
1999	1,857	4,297	6,864	9,438	11,820	13,594	14,783	15,710	16,439	16,972	
2000	2,024	4,891	7,790	10,733	13,792	16,071	17,695	18,886	19,735		
2001	2,781	6,655	10,671	14,738	18,022	20,795	23,179	24,597			
2002	3,439	8,272	13,325	18,551	23,386	26,861	29,409				
2003	3,714	9,039	14,638	20,326	26,117	30,643					
2004	4,652	11,236	18,109	25,239	31,250						
2005	5,292	12,974	21,106	29,611							
2006	6,818	16,984	27,677								
2007	9,337	23,263									
2008	15,073										

# Total GL Paid Loss Development

Accident Year	Paid Loss Development Age-to-Age Factors										
	12-24	24-36	36-48	48-60	60-72	72-84	84-96	96-108	108-120	120-132	132+
1998	2.379	1.591	1.375	1.244	1.153	1.179	1.068	1.045	1.032	1.032	
1999	2.314	1.597	1.375	1.252	1.150	1.087	1.063	1.046	1.032		
2000	2.417	1.593	1.378	1.285	1.165	1.101	1.067	1.045			
2001	2.393	1.603	1.381	1.223	1.154	1.115	1.061				
2002	2.405	1.611	1.392	1.261	1.149	1.095					
2003	2.434	1.619	1.389	1.285	1.173						
2004	2.415	1.612	1.394	1.238							
2005	2.452	1.627	1.403								
2006	2.491	1.630									
2007	2.491										
2008											

3 Yr Avg	2.478	1.623	1.395	1.261	1.159	1.104	1.064	1.045	1.032	1.032
3 Yr Wtd	2.482	1.624	1.396	1.259	1.160	1.103	1.064	1.045	1.032	1.032
5 Yr Avg	2.457	1.620	1.392	1.258	1.158	1.115	1.065	1.045	1.032	1.032
Mid 3 of 5	2.459	1.619	1.391	1.261	1.156	1.104	1.065	1.045		
Wtd Avg	2.443	1.615	1.390	1.255	1.159	1.109	1.064	1.045	1.032	1.032
Selected	2.478	1.623	1.395	1.261	1.159	1.104	1.064	1.045	1.032	1.032

# Total GL Paid Loss Development

Analysis of Development Patterns - Paid  
 Power Model  
 Curve:  $Y = A \cdot (B \cdot X)$

Actual Values (slide 6)		Transformed Values		Fitted Values	
X Var.	Y Variable	X	Y'	X	Y
<u>Age</u>	<u>LDF's</u>	<u>X</u>	<u>ln[ln(Y)]</u>	<u>Age</u>	<u>LDF's</u>
12	2.478	12	(0.10)	12	2.092
24	1.623	24	(0.73)	24	1.651
36	1.395	36	(1.10)	36	1.406
48	1.261	48	(1.46)	48	1.261
60	1.159	60	(1.92)	60	1.171
72	1.104	72	(2.32)	72	1.113
84	1.064	84	(2.78)	84	1.075
96	1.045	96	(3.11)	96	1.051
108	1.032	108	(3.45)	108	1.034
120	1.032	120	(3.45)	120	1.023
				132	1.016
				144	1.011
				156	1.007
				168	1.005
				180	1.003
				192	1.002
				204	1.002
				216	1.001
				228	1.001
				240	1.000
				252	1.000
				264	1.000
				276	1.000
				288	1.000

  

Parameter Estimates	A =	2.962
	B =	0.968

  

Tail Factor from 132-Ultimate	
Fitted Data	1.049
Broader Data Source	1.135
Selected Tail Factor	1.075

Cumulative Factors	
X	Y
<u>Age</u>	<u>CDF's</u>
12	11.522
24	4.650
36	2.865
48	2.054
60	1.628
72	1.406
84	1.274
96	1.197
108	1.145
120	1.110
132	1.075

Tail Factor x Actual LDF's  
 (cumulative)

# Total GL Incurred Loss Development

Accident Year	Incurred Losses (\$000)										
	Evaluation Age in Months										
	12	24	36	48	60	72	84	96	108	120	132
1998	5,662	8,879	11,006	12,396	13,067	13,526	13,838	14,075	14,315	14,573	14,778
1999	6,975	10,897	13,556	15,303	16,271	16,861	17,252	17,565	17,883	18,208	
2000	8,345	13,012	16,304	18,417	19,507	20,224	20,677	21,077	21,465		
2001	10,652	17,073	21,391	23,978	25,469	26,443	27,073	27,550			
2002	13,647	21,807	27,086	30,684	32,600	33,807	34,584				
2003	15,549	24,872	31,261	35,432	37,460	38,965					
2004	18,260	29,200	36,605	41,696	44,488						
2005	22,029	35,312	44,500	50,322							
2006	28,730	46,297	58,061								
2007	39,637	64,628									
2008	55,297										



# Total GL Incurred Loss Development

Accident Year	Incurred Loss Development Age-to-Age Factors										
	12-24	24-36	36-48	48-60	60-72	72-84	84-96	96-108	108-120	120-132	132+
1998	1.568	1.240	1.126	1.054	1.035	1.023	1.017	1.017	1.018	1.014	
1999	1.562	1.244	1.129	1.063	1.036	1.023	1.018	1.018	1.018		
2000	1.559	1.253	1.130	1.059	1.037	1.022	1.019	1.018			
2001	1.603	1.253	1.121	1.062	1.038	1.024	1.018				
2002	1.598	1.242	1.133	1.062	1.037	1.023					
2003	1.600	1.257	1.133	1.057	1.040						
2004	1.599	1.254	1.139	1.067							
2005	1.603	1.260	1.131								
2006	1.611	1.254									
2007	1.630										
2008											

3 Yr Avg	1.615	1.256	1.134	1.062	1.038	1.023	1.018	1.018	1.018	1.014
3 Yr Wtd	1.618	1.256	1.134	1.062	1.039	1.023	1.018	1.018	1.018	1.014
5 Yr Avg	1.609	1.253	1.131	1.062	1.038	1.023	1.018	1.018	1.018	1.014
Mid 3 of 5	1.605	1.255	1.132	1.061	1.037	1.023	1.018	1.018		
Wtd Avg	1.605	1.253	1.131	1.062	1.038	1.023	1.018	1.018	1.018	1.014
Selected	1.615	1.256	1.134	1.062	1.038	1.023	1.018	1.018	1.018	1.014

# Total GL Incurred Loss Development

Analysis of Development Patterns - Incurred  
Power Model  
Curve:  $Y = A \wedge (B \wedge X)$

Actual Values (slide 9)		Transformed Values		Fitted Values		Cumulative Factors	
X Var.	Y Variable	X'	Y'	X	Y	X	Y
Age	LDF's	X	ln[ln(Y)]	Age	LDF's	Age	CDF's
12	1.615	12	(0.74)	12	1.308	12	2.848
24	1.256	24	(1.48)	24	1.200	24	1.764
36	1.134	36	(2.07)	36	1.132	36	1.404
48	1.062	48	(2.81)	48	1.088	48	1.238
60	1.038	60	(3.28)	60	1.059	60	1.165
72	1.023	72	(3.78)	72	1.040	72	1.122
84	1.018	84	(4.01)	84	1.027	84	1.097
96	1.018	96	(4.03)	96	1.018	96	1.077
108	1.018	108	(4.02)	108	1.012	108	1.058
120	1.014	120	(4.27)	120	1.008	120	1.039
				132	1.006	132	1.025
				144	1.004		
				156	1.003		
				168	1.002		
				180	1.001		
				192	1.001		
				204	1.001		
				216	1.000		
				228	1.000		
				240	1.000		
				252	1.000		
				264	1.000		
				276	1.000		
				288	1.000		

  

<b>Parameter Estimates</b>	<b>A = 1.484</b>
	<b>B = 0.968</b>

  

<b>Tail Factor from 132-Ultimate</b>	
<b>Fitted Data</b>	<b>1.018</b>
<b>Broader Data Source</b>	<b>1.037</b>
<b>Selected Tail Factor</b>	<b>1.025</b>

  

<b>Tail Factor x Actual LDF's (cumulative)</b>	
12	2.848
24	1.764
36	1.404
48	1.238
60	1.165
72	1.122
84	1.097
96	1.077
108	1.058
120	1.039
132	1.025

# Total GL Loss Development

## Total General Liability Summary of Loss Development Projections

Accident Year	Earned Premium	Actual Losses @ 12/31/08		Cumulative LDF		Estimated Ultimate Losses		Estimate Ultimate Loss Ratio	
		Paid	Incurred	Paid	Incurred	Paid	Incurred	Paid	Incurred
(1)	(2)	(3) slide 5	(4) slide 8	(5) slide 7	(6) slide 10	(7)=(3)x(5)	(8)=(4)x(6)	(9)=(7)/(2)	(10)=(8)/(2)
1998	22,122	14,033	14,778	1.075	1.025	15,085	15,147	68.2%	68.5%
1999	26,474	16,972	18,208	1.110	1.039	18,831	18,926	71.1%	71.5%
2000	30,286	19,735	21,465	1.145	1.058	22,603	22,715	74.6%	75.0%
2001	37,741	24,597	27,550	1.197	1.077	29,452	29,675	78.0%	78.6%
2002	45,691	29,409	34,584	1.274	1.097	37,458	37,936	82.0%	83.0%
2003	50,562	30,643	38,965	1.406	1.122	43,070	43,727	85.2%	86.5%
2004	60,349	31,250	44,488	1.628	1.165	50,889	51,846	84.3%	85.9%
2005	75,972	29,611	50,322	2.054	1.238	60,817	62,294	80.1%	82.0%
2006	97,616	27,677	58,061	2.865	1.404	79,303	81,537	81.2%	83.5%
2007	131,861	23,263	64,628	4.650	1.764	108,162	113,990	82.0%	86.4%
2008	168,391	15,073	55,297	11.522	2.848	173,668	157,512	103.1%	93.5%
Total	747,065	262,263	428,346			639,339	635,305	85.6%	85.0%

# Total GL Expected Loss Techniques

## Total General Liability Bornhuetter-Ferguson Method

	AY 2007		AY 2008	
	Paid Estimate	Incurred Estimate	Paid Estimate	Incurred Estimate
(1) Earned Premium	131,861	131,861	168,391	168,391
(2) Expected Loss Ratio	86%	86%	90%	90%
(3) Expected Losses [ (1) x (2) ]	113,400	113,400	151,552	151,552
(4) Cumulative Loss Development Factor (slide 11)	4.650	1.764	11.522	2.848
(5) % of Losses Unpaid/Unreported [ $1 - 1 / (4)$ ]	78.5%	43.3%	91.3%	64.9%
(6) \$ of Losses Unpaid/Unreported [ (3) x (5) ]	89,011	49,107	138,398	98,347
(7) Actual Losses @ 12/31/08 (slide 11)	23,263	64,628	15,073	55,297
(8) Revised Ultimate Losses [ (6) + (7) ]	112,274	113,735	153,471	153,644

# Total GL Loss Development

## Total General Liability Revised Ultimate Losses

Accident Year	Earned Premium	Actual Losses @ 12/31/08		Estimated Ultimate Losses		Estimated Required IBNR		Estimate Ultimate Loss Ratio	
		Paid	Incurred	Paid	Incurred	Paid	Incurred	Paid	Incurred
(1)	(2)	(3) slide 5	(4) slide 8	(5) slide 11 (latest 2 AY from slide 12)	(6) slide 11	(7)=(5)-(4)	(8)=(6)-(4)	(9)=(7)/(2)	(10)=(8)/(2)
1998	22,122	14,033	14,778	15,085	15,147	307	369	68.2%	68.5%
1999	26,474	16,972	18,208	18,831	18,926	623	718	71.1%	71.5%
2000	30,286	19,735	21,465	22,603	22,715	1,138	1,250	74.6%	75.0%
2001	37,741	24,597	27,550	29,452	29,675	1,902	2,125	78.0%	78.6%
2002	45,691	29,409	34,584	37,458	37,936	2,874	3,352	82.0%	83.0%
2003	50,562	30,643	38,965	43,070	43,727	4,105	4,762	85.2%	86.5%
2004	60,349	31,250	44,488	50,889	51,846	6,401	7,358	84.3%	85.9%
2005	75,972	29,611	50,322	60,817	62,294	10,495	11,972	80.1%	82.0%
2006	97,616	27,677	58,061	79,303	81,537	21,242	23,476	81.2%	83.5%
2007	131,861	23,263	64,628	112,274	113,735	47,646	49,107	85.1%	86.3%
2008	168,391	15,073	55,297	153,471	153,644	98,174	98,347	91.1%	91.2%
Total	747,065	262,263	428,346	623,255	631,182	194,909	202,836	83.4%	84.5%

# *Total GL Loss Development*

---

---

## Summary of IBNR Estimates

Total General Liability Paid Estimate (slide 13)	194,909
Total General Liability Incurred Estimate (slide 13)	202,836
GLIC Actuary Selection (average)	198,872
GLIC Carried IBNR Reserves	198,304
Indicated Redundancy/(Deficiency)	-568

---

# *Additional Research*

---

---

Next you interview the vice president of each of the following departments:

- Claims
- Marketing
- Underwriting

# *Vice President of Claims*

---

---

- Staff and procedures have remained the same for as long as anyone can remember.
- Systems have not changed, and there have been no accounting or other changes that would have impacted year-end processing.



# *Vice President of Marketing*

---

---

- The client base is extremely stable.
- Growth has come primarily from increase in business from existing clients, as opposed to new clients.
- GLIC's clients represent almost all US distributors of Widgets.
- These clients are expanding into other areas, generating the growth in premium.
- Given the company's understanding of the product and their sensible approach to pricing (small annual increases), they have captured and retained their niche market.

# *Vice President of Underwriting*

---

---

- The VP is concerned about the 10% loss ratio (including DCC) deterioration over the last four accident years.
- They attribute at least part of the problem to the heavier GL exposures being accepted from their long-term clients.

# Distribution of Earned Premium

Accident	Earned Premium (\$000)			
Year	Total	Heavy	Light	% Heavy
(1)	(2)	(3)	(4)	(5)
1998	22,122	192	21,930	0.9%
1999	26,474	822	25,652	3.1%
2000	30,286	2,499	27,787	8.3%
2001	37,741	5,101	32,640	13.5%
2002	45,691	9,987	35,704	21.9%
2003	50,562	12,065	38,497	23.9%
2004	60,349	15,174	45,175	25.1%
2005	75,972	22,537	53,435	29.7%
2006	97,616	35,455	62,161	36.3%
2007	131,861	59,999	71,862	45.5%
2008	168,391	86,337	82,054	51.3%
Total	747,065	250,168	496,897	33.5%

# *Vice President of Underwriting*

---

---

- The underwriting department, with the help of the actuarial staff, will be conducting separate rate analyses for Heavy GL versus Light GL later in the year.
- Although the analysis has not yet been completed, the underwriting department suspects that Heavy GL rates need to increase by more than the traditional 5% annual increase taken in previous years for Total GL.
- Loss development triangles by class of business have just been provided via an ad hoc request to the data processing department.

---

---

# *Light GL*

# Light GL Paid Loss Development

Accident Year	Paid Losses (\$000)										
	Evaluation Age in Months										
	12	24	36	48	60	72	84	96	108	120	132
1998	1,329	3,159	5,023	6,902	8,586	9,900	11,682	12,476	13,037	13,454	13,885
1999	1,812	4,177	6,654	9,129	11,420	13,122	14,250	15,134	15,830	16,337	
2000	1,886	4,517	7,150	9,838	12,543	14,575	16,018	17,075	17,826		
2001	2,463	5,810	9,220	12,631	15,359	17,647	19,606	20,763			
2002	2,795	6,565	10,399	14,288	17,831	20,345	22,176				
2003	2,956	7,012	11,149	15,263	19,384	22,563					
2004	3,643	8,561	13,535	18,584	22,765						
2005	3,932	9,331	14,836	20,444							
2006	4,661	11,154	17,679								
2007	5,544	13,128									
2008	10,484										

# Light GL Paid Loss Development

Accident Year	Paid Loss Development Age-to-Age Factors										
	12-24	24-36	36-48	48-60	60-72	72-84	84-96	96-108	108-120	120-132	132+
1998	2.377	1.590	1.374	1.244	1.153	1.180	1.068	1.045	1.032	1.032	
1999	2.305	1.593	1.372	1.251	1.149	1.086	1.062	1.046	1.032		
2000	2.395	1.583	1.376	1.275	1.162	1.099	1.066	1.044			
2001	2.359	1.587	1.370	1.216	1.149	1.111	1.059				
2002	2.349	1.584	1.374	1.248	1.141	1.090					
2003	2.372	1.590	1.369	1.270	1.164						
2004	2.350	1.581	1.373	1.225							
2005	2.373	1.590	1.378								
2006	2.393	1.585									
2007	2.368										
2008											

3 Yr Avg	2.378	1.585	1.373	1.248	1.151	1.100	1.062	1.045	1.032	1.032
3 Yr Wtd	2.378	1.585	1.374	1.246	1.152	1.100	1.062	1.045	1.032	1.032
5 Yr Avg	2.371	1.586	1.373	1.247	1.153	1.113	1.064	1.045	1.032	1.032
Mid 3 of 5	2.371	1.586	1.372	1.248	1.153	1.100	1.064	1.045		
Wtd Avg	2.367	1.587	1.373	1.245	1.153	1.108	1.063	1.045	1.032	1.032
Selected	2.378	1.585	1.373	1.248	1.151	1.100	1.062	1.045	1.032	1.032

# Light GL Paid Loss Development

Analysis of Development Patterns - Paid  
Power Model  
Curve:  $Y = A \wedge (B \wedge X)$

Actual Values (slide 23)		Transformed Values		Fitted Values		Cumulative Factors	
X Var.	Y Variable	X'	Y'	X	Y	X	Y
<u>Age</u>	<u>LDF's</u>	<u>X</u>	<u>ln[ln(Y)]</u>	<u>Age</u>	<u>LDF's</u>	<u>Age</u>	<u>CDF's</u>
12	2.378	12	(0.14)	12	2.007	12	10.398
24	1.585	24	(0.77)	24	1.610	24	4.373
36	1.373	36	(1.15)	36	1.385	36	2.758
48	1.248	48	(1.51)	48	1.249	48	2.008
60	1.151	60	(1.96)	60	1.164	60	1.610
72	1.100	72	(2.35)	72	1.110	72	1.398
84	1.062	84	(2.81)	84	1.074	84	1.271
96	1.045	96	(3.12)	96	1.050	96	1.196
108	1.032	108	(3.46)	108	1.034	108	1.145
120	1.032	120	(3.46)	120	1.023	120	1.109
				132	1.016	132	1.075
				144	1.011	Tail Factor x Actual LDF's (cumulative)	
				156	1.007		
				168	1.005		
				180	1.003		
				192	1.002		
				204	1.002		
				216	1.001		
				228	1.001		
				240	1.001		
				252	1.000		
				264	1.000		
				276	1.000		
				288	1.000		

  

<b>Parameter Estimates</b>	<b>A = 2.771</b>
	<b>B = 0.969</b>

  

<b>Tail Factor from 132-Ultimate</b>	
<b>Fitted Data</b>	<b>1.050</b>
<b>Broader Data Source</b>	<b>1.135</b>
<b>Selected Tail Factor</b>	<b>1.075</b>



# Light GL Incurred Loss Development

Accident Year	Incurred Losses (\$000)										
	Evaluation Age in Months										
	12	24	36	48	60	72	84	96	108	120	132
1998	5,612	8,794	10,896	12,269	12,932	13,385	13,693	13,926	14,163	14,418	14,620
1999	6,752	10,520	13,066	14,738	15,666	16,230	16,603	16,902	17,206	17,516	
2000	7,642	11,837	14,773	16,649	17,615	18,249	18,650	19,004	19,346		
2001	9,187	14,561	18,128	20,249	21,464	22,258	22,770	23,157			
2002	10,611	16,569	20,491	23,073	24,434	25,289	25,845				
2003	11,775	18,475	22,964	25,857	27,253	28,289					
2004	13,600	21,311	26,404	29,863	31,744						
2005	15,388	24,082	29,934	33,586							
2006	18,143	28,394	35,038								
2007	21,383	33,614									
2008	29,195										

# Light GL Incurred Loss Development

Accident Year	Incurred Loss Development Age-to-Age Factors										
	12-24	24-36	36-48	48-60	60-72	72-84	84-96	96-108	108-120	120-132	132+
1998	1.567	1.239	1.126	1.054	1.035	1.023	1.017	1.017	1.018	1.014	
1999	1.558	1.242	1.128	1.063	1.036	1.023	1.018	1.018	1.018		
2000	1.549	1.248	1.127	1.058	1.036	1.022	1.019	1.018			
2001	1.585	1.245	1.117	1.060	1.037	1.023	1.017				
2002	1.561	1.237	1.126	1.059	1.035	1.022					
2003	1.569	1.243	1.126	1.054	1.038						
2004	1.567	1.239	1.131	1.063							
2005	1.565	1.243	1.122								
2006	1.565	1.234									
2007	1.572										
2008											

3 Yr Avg	1.567	1.239	1.126	1.059	1.037	1.022	1.018	1.018	1.018	1.014
3 Yr Wtd	1.568	1.238	1.126	1.059	1.037	1.022	1.018	1.018	1.018	1.014
5 Yr Avg	1.568	1.239	1.124	1.059	1.036	1.023	1.018	1.018	1.018	1.014
Mid 3 of 5	1.567	1.240	1.125	1.059	1.036	1.023	1.018	1.018		
Wtd Avg	1.567	1.240	1.125	1.059	1.036	1.023	1.018	1.018	1.018	1.014
Selected	1.567	1.239	1.126	1.059	1.037	1.022	1.018	1.018	1.018	1.014

# Light GL Incurred Loss Development

Analysis of Development Patterns - Incurred  
 Power Model  
 Curve:  $Y = A \wedge (B \wedge X)$

Actual Values (slide 26)		Transformed Values		Fitted Values		Cumulative Factors	
X Var.	Y Variable	X'	Y'	X	Y	X	Y
<u>Age</u>	<u>LDF's</u>	<u>X</u>	<u>ln[ln(Y)]</u>	<u>Age</u>	<u>LDF's</u>	<u>Age</u>	<u>CDF's</u>
12	1.567	12	(0.80)	12	1.284	12	2.689
24	1.239	24	(1.54)	24	1.187	24	1.716
36	1.126	36	(2.13)	36	1.125	36	1.385
48	1.059	48	(2.86)	48	1.084	48	1.230
60	1.037	60	(3.32)	60	1.057	60	1.162
72	1.022	72	(3.81)	72	1.039	72	1.121
84	1.018	84	(4.03)	84	1.026	84	1.096
96	1.018	96	(4.04)	96	1.018	96	1.077
108	1.018	108	(4.03)	108	1.012	108	1.058
120	1.014	120	(4.27)	120	1.008	120	1.039
				132	1.006	132	1.025
				144	1.004	Tail Factor x Actual LDF's (cumulative)	
				156	1.003		
				168	1.002		
				180	1.001		
				192	1.001		
				204	1.001		
				216	1.000		
				228	1.000		
				240	1.000		
				252	1.000		
				264	1.000		
				276	1.000		
				288	1.000		

  

Parameter Estimates	
A =	1.439
B =	0.969

  

Tail Factor from 132-Ultimate	
Fitted Data	1.018
Broader Data Source	1.037
Selected Tail Factor	1.025

# Light GL Loss Development

## Summary of Loss Development Projections

Accident Year	Earned Premium	Actual Losses @ 12/31/08		Cumulative LDF		Estimated Ultimate Losses		Estimate Ultimate Loss Ratio	
		Paid	Incurred	Paid	Incurred	Paid	Incurred	Paid	Incurred
(1)	(2)	(3) slide 22	(4) slide 25	(5) slide 24	(6) slide 27	(7)=(3)x(5)	(8)=(4)x(6)	(9)=(7)/(2)	(10)=(8)/(2)
1998	21,930	13,885	14,620	1.075	1.025	14,926	14,986	68.1%	68.3%
1999	25,652	16,337	17,516	1.109	1.039	18,125	18,205	70.7%	71.0%
2000	27,787	17,826	19,346	1.145	1.058	20,410	20,470	73.5%	73.7%
2001	32,640	20,763	23,157	1.196	1.077	24,842	24,935	76.1%	76.4%
2002	35,704	22,176	25,845	1.271	1.096	28,187	28,330	78.9%	79.3%
2003	38,497	22,563	28,289	1.398	1.121	31,546	31,701	81.9%	82.3%
2004	45,175	22,765	31,744	1.610	1.162	36,645	36,877	81.1%	81.6%
2005	53,435	20,444	33,586	2.008	1.230	41,059	41,306	76.8%	77.3%
2006	62,161	17,679	35,038	2.758	1.385	48,762	48,535	78.4%	78.1%
2007	71,862	13,128	33,614	4.373	1.716	57,403	57,675	79.9%	80.3%
2008	82,054	10,484	29,195	10.398	2.689	109,015	78,512	132.9%	95.7%
Total	496,897	198,050	291,950			430,920	401,531	86.7%	80.8%

# Light GL Expected Loss Techniques

## Bornhuetter-Ferguson Method

	AY 2008	
	Paid Estimate	Incurred Estimate
(1) Earned Premium (slide 28)	82,054	82,054
(2) Expected Loss Ratio	83.5%	83.5%
(3) Expected Losses [ (1) x (2) ]	68,515	68,515
(4) Cumulative Loss Development Factor (slide 28)	10.398	2.689
(5) % of Losses Unpaid/Unreported [ $1 - 1 / (4)$ ]	90.4%	62.8%
(6) \$ of Losses Unpaid/Unreported [ (3) x (5) ]	61,926	43,038
(7) Actual Losses @ 12/31/08 (slide 28)	10,484	29,195
(8) Revised Ultimate Losses [ (6) + (7) ]	72,410	72,233

# Light GL Loss Development

## Light General Liability Revised Ultimate Losses

Accident Year	Earned Premium	Actual Losses @ 12/31/08		Estimated Ultimate Losses		Estimated Required IBNR		Estimate Ultimate Loss Ratio	
		Paid	Incurred	Paid	Incurred	Paid	Incurred	Paid	Incurred
(1)	(2)	(3) slide 22	(4) slide 25	(5) slide 28 (latest AY from slide 29)	(6) slide 28	(7)=(5)-(4)	(8)=(6)-(4)	(9)=(7)/(2)	(10)=(8)/(2)
1998	21,930	13,885	14,620	14,926	14,986	306	365	68.1%	68.3%
1999	25,652	16,337	17,516	18,125	18,205	609	689	70.7%	71.0%
2000	27,787	17,826	19,346	20,410	20,470	1,064	1,124	73.5%	73.7%
2001	32,640	20,763	23,157	24,842	24,935	1,685	1,778	76.1%	76.4%
2002	35,704	22,176	25,845	28,187	28,330	2,342	2,485	78.9%	79.3%
2003	38,497	22,563	28,289	31,546	31,701	3,257	3,412	81.9%	82.3%
2004	45,175	22,765	31,744	36,645	36,877	4,901	5,133	81.1%	81.6%
2005	53,435	20,444	33,586	41,059	41,306	7,473	7,720	76.8%	77.3%
2006	62,161	17,679	35,038	48,762	48,535	13,724	13,497	78.4%	78.1%
2007	71,862	13,128	33,614	57,403	57,675	23,789	24,061	79.9%	80.3%
2008	82,054	10,484	29,195	72,410	72,233	43,215	43,038	88.2%	88.0%
Total	496,897	198,050	291,950	394,315	395,252	102,365	103,302	79.4%	79.5%

---

---

# *Heavy GL*

# Heavy GL Paid Loss Development

Accident Year	Paid Losses (\$000)										
	Evaluation Age in Months										
	12	24	36	48	60	72	84	96	108	120	132
1998	11	29	49	71	91	108	120	130	137	142	148
1999	45	120	210	309	400	472	533	576	609	635	
2000	138	374	640	895	1,249	1,496	1,677	1,811	1,909		
2001	318	845	1,451	2,107	2,663	3,148	3,573	3,834			
2002	644	1,707	2,926	4,263	5,555	6,516	7,233				
2003	758	2,027	3,489	5,063	6,733	8,080					
2004	1,009	2,675	4,574	6,655	8,485						
2005	1,360	3,643	6,270	9,167							
2006	2,157	5,830	9,998								
2007	3,793	10,135									
2008	4,589										



# Heavy GL Paid Loss Development

Accident Year	Paid Loss Development Age-to-Age Factors										
	12-24	24-36	36-48	48-60	60-72	72-84	84-96	96-108	108-120	120-132	132+
1998	2.636	1.690	1.449	1.282	1.187	1.111	1.083	1.054	1.036	1.042	
1999	2.667	1.750	1.471	1.294	1.180	1.129	1.081	1.057	1.043		
2000	2.710	1.711	1.398	1.396	1.198	1.121	1.080	1.054			
2001	2.657	1.717	1.452	1.264	1.182	1.135	1.073				
2002	2.651	1.714	1.457	1.303	1.173	1.110					
2003	2.674	1.721	1.451	1.330	1.200						
2004	2.651	1.710	1.455	1.275							
2005	2.679	1.721	1.462								
2006	2.703	1.715									
2007	2.672										
2008											

3 Yr Avg	2.685	1.715	1.456	1.303	1.185	1.122	1.078	1.055	1.040	1.042
3 Yr Wtd	2.682	1.716	1.457	1.300	1.187	1.119	1.076	1.055	1.042	1.042
5 Yr Avg	2.676	1.716	1.455	1.313	1.187	1.121	1.079	1.055	1.040	1.042
Mid 3 of 5	2.675	1.717	1.455	1.303	1.187	1.120	1.080	1.054		
Wtd Avg	2.676	1.716	1.455	1.300	1.187	1.119	1.076	1.055	1.042	1.042
Selected	2.685	1.715	1.456	1.303	1.185	1.122	1.078	1.055	1.040	1.042

# Heavy GL Paid Loss Development

Analysis of Development Patterns - Paid  
 Power Model  
 Curve:  $Y = A \wedge (B \wedge X)$

Actual Values (slide 33)		Transformed Values		Fitted Values		Cumulative Factors	
X Var.	Y Variable	X	Y'	X	Y	X	Y
Age	LDF's	X	ln[ln(Y)]	Age	LDF's	Age	CDF's
12	2.685	12	(0.01)	12	2.227	12	15.741
24	1.715	24	(0.62)	24	1.740	24	5.864
36	1.456	36	(0.98)	36	1.467	36	3.418
48	1.303	48	(1.33)	48	1.303	48	2.348
60	1.185	60	(1.77)	60	1.201	60	1.802
72	1.122	72	(2.16)	72	1.135	72	1.521
84	1.078	84	(2.59)	84	1.091	84	1.355
96	1.055	96	(2.93)	96	1.062	96	1.258
108	1.040	108	(3.25)	108	1.043	108	1.192
120	1.042	120	(3.18)	120	1.029	120	1.146
				132	1.020	132	1.100
				144	1.014		
				156	1.010		
				168	1.007		
				180	1.005		
				192	1.003		
				204	1.002		
				216	1.002		
				228	1.001		
				240	1.001		
				252	1.001		
				264	1.000		
				276	1.000		
				288	1.000		

  

<b>Parameter Estimates</b>	<b>A = 3.184</b>
	<b>B = 0.970</b>

  

<b>Tail Factor from 132-Ultimate</b>	
Fitted Data	1.067
Broader Data Source	1.135
Selected Tail Factor	1.100

  

<b>Tail Factor x Actual LDF's (cumulative)</b>	
12	15.741
24	5.864
36	3.418
48	2.348
60	1.802
72	1.521
84	1.355
96	1.258
108	1.192
120	1.146
132	1.100

# Heavy GL Incurred Loss Development

Accident Year	Incurred Losses (\$000)										
	Evaluation Age in Months										
	12	24	36	48	60	72	84	96	108	120	132
1998	50	85	110	127	135	141	145	149	152	155	158
1999	223	377	490	565	605	631	649	663	677	692	
2000	703	1,175	1,531	1,768	1,892	1,975	2,027	2,073	2,119		
2001	1,465	2,512	3,263	3,729	4,005	4,185	4,303	4,393			
2002	3,036	5,238	6,595	7,611	8,166	8,518	8,739				
2003	3,774	6,397	8,297	9,575	10,207	10,676					
2004	4,660	7,889	10,201	11,833	12,744						
2005	6,641	11,230	14,566	16,736							
2006	10,587	17,903	23,023								
2007	18,254	31,014									
2008	26,102										

# Heavy GL Incurred Loss Development

Accident Year	Incurred Loss Development Age-to-Age Factors										
	12-24	24-36	36-48	48-60	60-72	72-84	84-96	96-108	108-120	120-132	132+
1998	1.700	1.294	1.155	1.063	1.044	1.028	1.028	1.020	1.020	1.019	
1999	1.691	1.300	1.153	1.071	1.043	1.029	1.022	1.021	1.022		
2000	1.671	1.303	1.155	1.070	1.044	1.026	1.023	1.022			
2001	1.715	1.299	1.143	1.074	1.045	1.028	1.021				
2002	1.725	1.259	1.154	1.073	1.043	1.026					
2003	1.695	1.297	1.154	1.066	1.046						
2004	1.693	1.293	1.160	1.077							
2005	1.691	1.297	1.149								
2006	1.691	1.286									
2007	1.699										
2008											

3 Yr Avg	1.694	1.292	1.154	1.072	1.045	1.027	1.022	1.021	1.021	1.019
3 Yr Wtd	1.695	1.291	1.154	1.072	1.045	1.027	1.021	1.022	1.022	1.019
5 Yr Avg	1.694	1.286	1.152	1.072	1.044	1.027	1.023	1.021	1.021	1.019
Mid 3 of 5	1.693	1.292	1.152	1.072	1.044	1.028	1.022	1.021		
Wtd Avg	1.697	1.289	1.153	1.072	1.045	1.027	1.022	1.022	1.022	1.019
Selected	1.694	1.292	1.154	1.072	1.045	1.027	1.022	1.021	1.021	1.019

# Heavy GL Incurred Loss Development

Analysis of Development Patterns - Incurred  
Power Model  
Curve:  $Y = A \wedge (B \wedge X)$

Actual Values (slide 36)		Transformed Values		Fitted Values		Cumulative Factors	
X Var.	Y Variable	X'	Y'	X	Y	X	Y
Age	LDF's	X	ln[ln(Y)]	Age	LDF's	Age	CDF's
12	1.694	12	(0.64)	12	1.341	12	3.249
24	1.292	24	(1.36)	24	1.225	24	1.918
36	1.154	36	(1.94)	36	1.150	36	1.484
48	1.072	48	(2.67)	48	1.102	48	1.286
60	1.045	60	(3.13)	60	1.069	60	1.200
72	1.027	72	(3.63)	72	1.047	72	1.148
84	1.022	84	(3.84)	84	1.032	84	1.118
96	1.021	96	(3.87)	96	1.022	96	1.095
108	1.021	108	(3.88)	108	1.015	108	1.072
120	1.019	120	(3.95)	120	1.011	120	1.050
				132	1.007	132	1.030
				144	1.005		
				156	1.003		
				168	1.002		
				180	1.002		
				192	1.001		
				204	1.001		
				216	1.001		
				228	1.000		
				240	1.000		
				252	1.000		
				264	1.000		
				276	1.000		
				288	1.000		

  

<b>Parameter Estimates</b>	<b>A = 1.530</b>
	<b>B = 0.970</b>

  

<b>Tail Factor from 132-Ultimate</b>	
<b>Fitted Data</b>	<b>1.024</b>
<b>Broader Data Source</b>	<b>1.037</b>
<b>Selected Tail Factor</b>	<b>1.030</b>

  

<b>Tail Factor x Actual LDF's (cumulative)</b>	
12	3.249
24	1.918
36	1.484
48	1.286
60	1.200
72	1.148
84	1.118
96	1.095
108	1.072
120	1.050
132	1.030

# Heavy GL Loss Development

## Summary of Loss Development Projections

Accident Year	Earned Premium	Actual Losses @ 12/31/08		Cumulative LDF		Estimated Ultimate Losses		Estimate Ultimate Loss Ratio	
		Paid	Incurred	Paid	Incurred	Paid	Incurred	Paid	Incurred
(1)	(2)	(3) slide 32	(4) slide 35	(5) slide 34	(6) slide 37	(7)=(3)x(5)	(8)=(4)x(6)	(9)=(7)/(2)	(10)=(8)/(2)
1998	192	148	158	1.100	1.030	163	163	84.8%	84.8%
1999	822	635	692	1.146	1.050	728	727	88.6%	88.4%
2000	2,499	1,909	2,119	1.192	1.072	2,275	2,271	91.0%	90.9%
2001	5,101	3,834	4,393	1.258	1.095	4,821	4,809	94.5%	94.3%
2002	9,987	7,233	8,739	1.355	1.118	9,804	9,774	98.2%	97.9%
2003	12,065	8,080	10,676	1.521	1.148	12,288	12,260	101.9%	101.6%
2004	15,174	8,485	12,744	1.802	1.200	15,292	15,289	100.8%	100.8%
2005	22,537	9,167	16,736	2.348	1.286	21,522	21,523	95.5%	95.5%
2006	35,455	9,998	23,023	3.418	1.484	34,177	34,177	96.4%	96.4%
2007	59,999	10,135	31,014	5.864	1.918	59,428	59,485	99.0%	99.1%
2008	86,337	4,589	26,102	15.741	3.249	72,235	84,793	83.7%	98.2%
Total	250,168	64,213	136,396			232,733	245,269	93.0%	98.0%

# Heavy GL Expected Loss Techniques

## Bornhuetter-Ferguson Method

	AY 2008	
	Paid Estimate	Incurred Estimate
(1) Earned Premium (slide 38)	86,337	86,337
(2) Expected Loss Ratio	102.0%	102.0%
(3) Expected Losses [ (1) x (2) ]	88,064	88,064
(4) Cumulative Loss Development Factor (slide 38)	15.741	3.249
(5) % of Losses Unpaid/Unreported [ $1 - 1 / (4)$ ]	93.6%	69.2%
(6) \$ of Losses Unpaid/Unreported [ (3) x (5) ]	82,469	60,955
(7) Actual Losses @ 12/31/08 (slide 38)	4,589	26,102
(8) Revised Ultimate Losses [ (6) + (7) ]	87,058	87,057

# Heavy GL Loss Development

## Heavy General Liability Revised Ultimate Losses

Accident Year	Earned Premium	Actual Losses @ 12/31/08		Estimated Ultimate Losses		Estimated Required IBNR		Estimate Ultimate Loss Ratio	
		Paid	Incurred	Paid	Incurred	Paid	Incurred	Paid	Incurred
(1)	(2)	(3) slide 32	(4) slide 35	(5) slide 38 (latest AY from slide 39)	(6) slide 38	(7)=(5)-(4)	(8)=(6)-(4)	(9)=(7)/(2)	(10)=(8)/(2)
1998	192	148	158	163	163	5	5	84.8%	84.8%
1999	822	635	692	728	727	36	35	88.6%	88.4%
2000	2,499	1,909	2,119	2,275	2,271	156	152	91.0%	90.9%
2001	5,101	3,834	4,393	4,821	4,809	428	416	94.5%	94.3%
2002	9,987	7,233	8,739	9,804	9,774	1,065	1,035	98.2%	97.9%
2003	12,065	8,080	10,676	12,288	12,260	1,612	1,584	101.9%	101.6%
2004	15,174	8,485	12,744	15,292	15,289	2,548	2,545	100.8%	100.8%
2005	22,537	9,167	16,736	21,522	21,523	4,786	4,787	95.5%	95.5%
2006	35,455	9,998	23,023	34,177	34,177	11,154	11,154	96.4%	96.4%
2007	59,999	10,135	31,014	59,428	59,485	28,414	28,471	99.0%	99.1%
2008	86,337	4,589	26,102	87,058	87,057	60,956	60,955	100.8%	100.8%
Total	250,168	64,213	136,396	247,556	247,533	111,160	111,137	99.0%	98.9%



---

---

# *Summary*

# Summary of IBNR Estimates

## Summary of IBNR Estimates

	<u>Paid</u> <u>Estimates</u>	<u>Incurred</u> <u>Estimates</u>
Total General Liability (slide 14)	194,909	202,836
GLIC Actuary Selection (average)	198,872	
Sum of Components		
Light GL (slide 30)	102,365	103,302
<u>Heavy GL (slide 40)</u>	<u>111,160</u>	<u>111,137</u>
Total GL	213,525	214,439
Selected by Consulting Actuary (average)	213,982	
GLIC Carried IBNR Reserves	198,304	
Indicated Redundancy/(Deficiency)	<b>(15,678)</b>	