Estimation of Adjusting and Other Expense Reserves Utilizing Limited Historical Claim Report, Payment, and Closing Transaction Patterns

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Abstract: The estimation of adjusting and other expense (AOE) reserves can be constrained by the availability of historical AOE payment data, lack of uniformity of data, and lack of consensus of what AOE represents. Adjusting and other expenses are incurred when claims are first reported and opened, throughout the life of the claims when partial payments and revisions are made, and finally when claims are closed and final payments are issued by the insurer. Our paper will present a variation of the count-based methodology whereby we utilize the limited data presented to us by an insurer to estimate AOE reserves. This paper will attempt to describe how one can use historical reporting, payment (including partial payment), and closing patterns to estimate AOE reserves associated with IBNR counts and future payments on open claims. Assumptions are also made with respect to the average cost of each AOE per claim payment throughout the life of a claim using current AOE payment information and the number of claim payment and closing transactions. The cost of each transaction is developed using historical calendar year AOE amounts, and assumptions of the relative cost of each transaction type.

Keywords: Unallocated loss adjustment expense reserves, adjusting and other expense reserves

1. INTRODUCTION

1.1 Research Context

In the annals of reserving literature, the review of adjusting and other expenses (AOE) seems to have become relegated to second-tier status. In the current CAS syllabus only one paper (R. Conger/A. Nolibos) on the reserving exam addresses the topic, and in the 2009 Casualty Loss Reserve Seminar there were no sessions that covered it. Furthermore, there has been a limited number of existing actuarial subject literature on this topic, particularly in recent years.

The limited existing actuarial literature (see Section 5 – References) on this topic either assumes that detailed, historical payment information is readily available or reviews and/or modifies the existing paid to paid methodologies on this topic.

There are a number of reasons why there is such little focus by actuaries on these expenses. Based on year-end 2008 Schedule P data for the U.S. P&C industry, adjusting and other unpaid losses represented only 5.2% of total net unpaid losses and expenses. Generally, there are no specific case reserves set up for AOE reserves as there are for the loss and defense and cost containment (DCC) reserves.

In addition, payment information used to develop estimates of AOE reserves is not generally available in a format that lends itself to a traditional actuarial analysis. This is due to a number of factors discussed below including:

- Inconsistencies in definition of AOE
- Lack of "triangular" data
- Availability of internal studies
- Operational variations among companies

1.2 Objective

The objective of this paper is to describe a methodology we developed in order to estimate AOE reserves for a single line of business based on a unique situation presented to us by an insurer where their historical expense data and detailed expense information (such as payment information) was limited or not available.

Whereas most actuarial literature on this topic assumes that information to estimate AOE reserves is readily available, there are situations where the insurer does not capture certain information, does not capture this information in the requisite detail, or undergoes changes in their claim handling function making it impractical to use historical information. The methodology described in this paper relies on certain assumptions and calculations related to the limited historical information available in this situation, based on discussions with insurance company personnel, particularly around the costs associated with various claim handling transactions, and actuarial judgment.

1.2.1 Lack of clarity in the definition of AOE

According to statement of Statutory Accounting Principles (SSAP) # 55, AOE are those expenses other than DCC that are assigned to the expense group "Loss Adjustment Expense." Whereas DCC are defined in SSAP #55 as defense, litigation, and medical cost containment expenses, AOE include, but are not limited to, the following items:

(a) fees and expenses of adjusters and settling agents;

(b) loss adjustment expenses for participation in voluntary and involuntary market pools if reported by calendar year;

(c) attorney fees incurred in the determination of coverage, including litigation between the reporting entity and the policyholder; and

(d) fees and salaries for appraisers, private investigators, hearing representatives, inspectors and fraud investigators, if working in the capacity of an adjuster.

There are at least two issues associated with this definition that may arise. The first relates to the fact that AOE includes all expenses other than DCC assigned to the expense group "Loss Adjustment Expense." Although four examples are given, it is less clear how specific overhead costs should be included and how they should be reserved for if a company goes into runoff. The second arises when claims handling services are outsourced to a third party and the overall, inseparable fee may include costs for both AOE and DCC services.

1.2.2 Lack of "triangular" data

Since typical triangular data by accident year is not available for AOE, standard actuarial methodologies employing loss triangles (or loss expense triangles in this case) cannot be used. The

actuary is forced to use calendar-year data, and apply various assumptions specific to what that data represents, to both determine the AOE reserve amounts required, and allocate it to accident year.

1.2.3 Availability of internal studies

There is a wide variation among companies related to how they determine the portion of expenses attributable to AOE. Based on some of the detailed methodologies, it would appear that some of the more sophisticated procedures involve internal studies that relate salaries and other costs to time spent on specific activities. This might vary significantly among companies in their frequency (if conducted at all) and methodology. Often it may be a byproduct of other operational efficiency studies conducted by the company when they reorganize to reduce expenses.

1.2.4 Operational variations among companies

Although all companies go through some type of process to open claims, set initial reserves, revise those reserves as needed, make payments and close claims, how they go about doing it may vary considerable. Some have their own claim departments, while others may use third-party administrators (TPAs), or have the insured settle their own claims below a certain dollar amount. Even within a company's claim department, relative costs could vary significantly based on lines of business written, the degree of automation, the use of predictive modeling, and other factors.

Recognizing these limitations, the actuary is often forced to come up with procedures to take advantage of the data provided, and make assumptions as to exactly what AOE is meant to represent, and how it relates to various measurable claim activities. It is clear that, even if the best data were available, the methodologies that would be appropriate to determine the AOE reserves for one company might not be the best for another company with a different book of business, maturity of the book, or corporate structure. Thus it is best for the actuary to develop and consider a menu of various techniques to establish reserves.

The determination of AOE reserves is also different from other reserve reviews in that it often involves both allocation and reserve determination calculations. Initially a portion of the calendar year expense payments needs to be allocated to AOE. It may also need to be allocated to individual lines of business as well. This is then used to develop the overall reserve requirement, and that reserve then needs to be allocated to accident year, line of business (if not done previously), etc. For the methodology described in this paper, we assume there is only one line of business, but it could be expanded to include multiple lines.

For the actuary, the calculation of the AOE reserves often comes down to the information available, knowledge of the claim department structure and how it handles claims, and selected assumptions based on information from management. As a result there may be a wide variation in methodologies used. This paper presents a methodology we deployed faced with one such unique set of constraints.

1.3 Outline

The remainder of the paper proceeds as follows. Section 2 will discuss the background of our methodology, and then go into further details of the calculations and formulas used. A sample calculation is presented to explain the methodology and clarify the discussion. Our methodology will also discuss two different approaches an actuary can take – one without trended AOE costs, and another assuming trended AOE costs. Section 3 includes the results of this methodology using the sample data shown throughout this paper, along with a discussion of additional enhancements that could be made to the methodology. Section 4 presents our conclusions and main findings of this paper. An appendix is included, providing exhibits relating to the sample calculation referred to throughout this paper. Finally, references are provided in Section 5.

2. BACKGROUND AND METHODS

2.1 Information Available

The methodology and approach described below was developed to estimate AOE reserves for a single line of business with a moderate tail based on a unique situation presented to us by an insurer where their historical expense data was limited.

For this situation transaction counts (closings, partial payments, etc.) and AOE payments were only useful for the most recent 1-3 years because of recent changes in the insurer's claim handling operations. Thus the limited information that we did use in our methodology included:

1. Historical accident year claim reporting patterns
2. Open claim counts by accident year for the last three calendar year ends
3. Number of claims closed in the last two calendar years
4. Number of claim payment transactions in the last calendar year
5. Estimated calendar year AOE payments for the last year

In our methodology, we had to make certain assumptions around the costs associated with various claim handling transactions. These assumptions are described throughout the methodology discussion below.

2.2 Methodology Overview

In our methodology, based on our approach and assumptions made, estimates of AOE reserves are determined for expenses associated with:

1. Initial reporting of IBNR claims,
2. Future payments for IBNR claims and claims already reported and currently considered open, and
3. Future closings for IBNR claims and claims already reported and currently considered open.

It should be noted that the closings and interim payments include those on both known and IBNR claims combined, as this process does not allow them to be identified separately.

Our methodology assumes that the insurer does not incur any expenses when claims are reopened. Furthermore, we assume that no expenses are incurred for claim maintenance on outstanding claims for which no payments are issued to the insured during the year.

Utilizing the available information described above, and incorporating assumptions regarding the relative average AOE costs associated with various actions taken on a claim and the impact of inflation on future such costs, various estimates of AOE reserves were made. Based on our understanding of claim handling expenses for this particular insurer, they incur considerably more expenses when a claim is first reported to them as opposed to when payments are made (including interim payments) or when a claim is closed. This is inconsistent with the 50-50 rule actuaries typically use to establish ULAE/AOE reserves, which assumes that 50% of ULAE/AOE is paid when the claim is first opened and the other 50% when it is closed.

In addition to the assumption we made regarding the relative average AOE cost for a given transaction, our methodology calculates the following to develop the indicated AOE reserve:

1. the ultimate claim reporting pattern
2. an estimate of the ratio of number of claims closed to the number of payment and closing transactions

3. percentage of total reported claims that remain open at the end of each calendar year based on the maturity of the accident year

As described in more detail below, the average transaction cost assumptions and the selected AOE trend factor are applied to the various estimated transaction counts. To calculate these counts, the items listed above were used to project:

1. estimated IBNR claim counts,
2. number of payment and closing transactions, for both known and IBNR claims combined, and
3. the timing of the reporting, payment and closing transactions.

2.2.1 Estimate of IBNR Claim Counts

The estimate of IBNR claim counts is determined by using a reported claim count loss development triangle. Age-to-age claim development factors are selected at 12-month intervals, and age-to-ultimate claim development factors are computed, as shown in Appendix Exhibit A.1. Using the selected age-to-age factors, reported claim counts are developed to ultimate, as shown in Appendix Exhibit A.2. Taking the differences in the implied cumulative reported claim counts at future year ends from Appendix Exhibit A.2, the incremental claims to be reported in each future calendar year can be obtained (Appendix Exhibit A.3). The number of reported claim counts, ultimate claim counts, and IBNR counts by accident year are shown in Table 1 below:

Table 1 – Summary of Reported, IBNR, and Ultimate Claim Counts

Accident Year	(1) Reported Claims at 12/31/08	(2) Ultimate Claim Count	(3) IBNR Claims (2)-(1)
1993	995	995	0
1994	979	979	0
1995	816	816	0
1996	1,182	1,182	0
1997	1,376	1,377	1
1998	1,442	1,444	2
1999	1,418	1,421	3
2000	1,534	1,542	8
2001	1,572	1,582	10
2002	1,758	1,772	14
2003	1,999	2,019	20
2004	2,610	2,659	49
2005	2,888	2,970	82
2006	2,684	2,886	202
2007	2,226	2,526	300
2008	1,744	2,670	926
Total	27,223	28,840	1,617

IBNR claim counts are computed by subtracting reported claim counts from the ultimate claim counts estimated. These counts are used to estimate the AOE associated with the first reporting of claims and are combined with current open claim counts to estimate the AOE associated with future claim payments (for both partial payments and payments to close claims).

2.3 Methodology – No Trending

2.3.1 AOE Reserves Associated with the Initial Reporting of Future Claims

A key assumption we used to estimate the AOE reserves is the relative relationship between the average AOE cost when a claim is first reported to an insurer versus when a payment is made or a claim is closed. Using calendar year AOE payments, the number of claims reported in a calendar year, the number of payments and closings made in a calendar year, and the relationship of average costs by type of transaction, we estimated the average AOE per reported claim and per claim payment/closing transaction.

The average AOE incurred based on the type of transaction (when a claim is first reported or a payment or closing is made) is not readily available to most insurers. The average costs by transaction type can be approximated based on an understanding of the claim handling function of

an insurance company and interviews with those involved in the process. This would allow one to better discern the AOE costs incurred when a claim is first reported to an insurer relative to the costs incurred when a claim payment or closing is made. As a result of these considerations we utilized a ratio of five to one (5:1). In other words, for every $5 spent on AOE when a claim is first reported, $1 is spent on AOE every time a claim payment is made or a claim is closed.

Using this relationship, along with the amount of paid AOE and the number of claim payments and closings in a calendar year, we can estimate the average AOE to open a claim, as shown in Table 2. When utilizing calendar year data, information from the most recent calendar year or an average from a number of calendar years can be used based on the availability of data.

Table 2 – Average AOE Cost to Open a Claim

	5:1 Ratio
(1) CY AOE Payments	$6,105,000
(2) Number of Claims Reported	2,594
(3) Number of Payments & Closings Made	3,339
(4) Average AOE to Open a Claim	$1,871.67

Row (4), the average AOE cost to open a claim, is calculated as follows: 5 x Row (1) ÷ [Row (2) x 5 + Row (3)] ***or*** (5 x $6,105,000 / [2,594 x 5 + 3,339] = $1,871.67.

In order to estimate the AOE reserves associated with opening of the IBNR claims, we multiply the average AOE per claim reported in Row (4) of Table 2 by the IBNR counts in Column (3) of Table 1 ($1,871.67 x 1,617 = $3,026,484). This produces an estimate of the AOE reserves associated with opening of IBNR claims based on the five to one cost relativity and assuming no increase in future costs to set a claim in the future (i.e. no trend).

2.3.2 Projection of Claim Settlement and Payment Pattern

The claim settlement pattern can be projected in a similar manner to the claim reporting pattern as discussed above by utilizing closed claim development triangles. Unfortunately, for our situation, we were limited to two years of calendar year closed claim count data. Thus, using this limited data, we devised a method to estimate the claim settlement pattern using only recent claim reporting and open claim count information as described in the following paragraphs.

Table 3 displays the open claim count and reported claim count information for the last three years with evaluation dates as of December 31.

Table 3 – Open Claim and Reported Claim Count

Accident Year	(1) Open Claim Counts As of YE08	(2) Open Claim Counts As of YE07	(3) Open Claim Counts As of YE06	(4) Reported Claim Counts As of YE08	(5) Reported Claim Counts As of YE07	(6) Reported Claim Counts As of YE06
1993	3	4	4	995	995	995
1994	4	8	12	979	979	979
1995	7	13	14	816	816	816
1996	5	9	11	1,182	1,181	1,172
1997	17	22	28	1,376	1,376	1,376
1998	13	20	25	1,442	1,442	1,442
1999	19	28	38	1,418	1,418	1,418
2000	23	34	49	1,534	1,534	1,532
2001	47	64	99	1,572	1,569	1,568
2002	74	129	255	1,758	1,757	1,752
2003	197	285	440	1,999	1,981	1,962
2004	405	601	876	2,610	2,579	2,456
2005	875	1,134	1,459	2,888	2,678	2,477
2006	987	1,222	1,553	2,684	2,622	1,982
2007	1,455	1,612		2,226	1,702	
2008	1,350			1,744		
Total	**5,481**	**5,185**	**4,863**	**27,223**	**24,629**	**21,927**

Using the claim count information summarized in Table 3, we calculate the percentage of reported claims that were still open as of the three most recent evaluation dates (December 31, 2006, 2007, and 2008) by dividing Columns (1) through (3) by Columns (4) through (6) respectively. The results are displayed in Table 4, Columns (1) through (3) below. Next, based on this three-year history, we select the percentage of reported claims that we would expect to be open at different evaluation periods (12 months, 24 months, etc.) as shown in Column (4).

Table 4 – Claim Settlement Pattern

Maturity (months)	(1) Percentage of Reported Claims That are Open in 2008	(2) Percentage of Reported Claims That are Open in 2007	(3) Percentage of Reported Claims That are Open in 2006	(4) % of Claims Open Selection
192	0.3%			**0.5%**
180	0.4%	0.4%		**0.7%**
168	0.9%	0.8%	0.4%	**1.0%**
156	0.4%	1.6%	1.2%	**1.5%**
144	1.2%	0.8%	1.7%	**2.0%**
132	0.9%	1.6%	0.9%	**2.2%**
120	1.3%	1.4%	2.0%	**2.5%**
108	1.5%	2.0%	1.7%	**3.0%**
96	3.0%	2.2%	2.7%	**3.5%**
84	4.2%	4.1%	3.2%	**4.2%**
72	9.9%	7.3%	6.3%	**8.5%**
60	15.5%	14.4%	14.6%	**15.0%**
48	30.3%	23.3%	22.4%	**25.0%**
36	36.8%	42.3%	35.7%	**35.0%**
24	65.4%	46.6%	58.9%	**55.0%**
12	77.4%	94.7%	78.4%	**85.0%**

Using the selected percentages of reported claims that are open in Column (4), adjusting it for the actual percentage at the latest point in time (Column (1)) and utilizing the actual number of claims reported and open as of year-end 2008 (from Table 3) and estimated to be reported in calendar year 2009 (from Appendix Exhibit A.3), we are able to project the number of claims that will close in calendar year 2009. Thus, for example, the number of claim closings in calendar year 2009 for accident year 2008 is calculated as follows:

Reported Claims in CY 2009 – [Estimated Reported Claims at YE 2009 x Column (1) {12 Months} x Column (4) {24 Months] / Column (4) {12 Months}] + Open Claims at YE 2008, ***or***

610 – [2,354 x 0.774 x 0.55 / 0.85] + 1,350 = 781, where:

- 610 is the number of AY 2008 claims expected to be reported in calendar year 2009
- 2,354 is the number of AY 2008 total reported claims expected through 12/31/09
- 1,350 is the number of open claims as of 12/31/2008
- 77.4% is the actual percentage of AY 2008 reported claims that are open as of 12/31/08
- 55% is the selected percentage of reported claims that are open for a typical AY at 24 months based on historical data

- 85% is the selected percentage of reported claims that are open for a typical AY at 12 months based on historical data

The calculations used to project the number of claims to be closed in calendar year 2010 and subsequent are made in conjunction with the estimation of the number of open claims at the beginning of each calendar year along with the number of claims that are expected to be reported during the calendar year. The number of new claims reported in future calendar years (from Appendix Exhibit A.3) is reduced by these closings (as shown in Table 5 below), and is then added to the open claim counts from the beginning of the year to determine the open claim counts for the beginning of the following year (as shown in Table 6 below). Thus, for accident year 2008, in our example we estimate that there will be 1,179 open claims as of 12/31/09 (as shown in Table 6), which is equal to:

$$1{,}350 + 610 - 781 = 1{,}179, \text{ where:}$$

- 1,350 claims that are open as of 12/31/08 (from Table 3),
- 610 claims that are projected to be reported in calendar year 2009 (as shown in Appendix Exhibit A.3),
- 781 claims that are estimated to be closed in calendar year 2009 (as calculated previously and shown in Table 5 below).

Using this estimate of open claims for AY 2008 as of 12/31/09 and a new ratio of open to reported claims (50.1%) is calculated for AY 2008 at 24 months. This is shown in Appendix Exhibit A.4. The same calculation of calendar year closings and the resulting number of open claims at the end of the year (and the resulting new ratio of open to reported claims) is repeated for each subsequent calendar year until all claims reported have been closed.

For AY 2008, in calendar year 2010, we expect 517 claims to close based on the following calculation:

$$129 - [2{,}483 \times 0.501 \times 0.35 / 0.55] + 1{,}179 = 517, \text{ where:}$$

- 129 is the number of AY 2008 claims expected to be reported in calendar year 2010
- 2,483 is the number of AY 2008 total reported claims expected through 12/31/10
- 1,179 is the previously calculated number of open claims as of 12/31/2009
- 50.1% is the calculated percentage of AY 2008 reported claims that are open as of 12/31/09

- 35% is the selected percentage of reported claims that are open for a typical AY at 36 months based on historical data
- 55% is the selected percentage of reported claims that are open for a typical AY at 24 months based on historical data

The same calculation is also made for each of the accident years prior to 2008.

Thus, Tables 5 and 6, which display the projected closed and open claim patterns by accident year and calendar year, respectively, can be built up as a result of this calculation using the reported claim pattern in Appendix Exhibit A.2, and the selected percentages of claims open from Table 4, Column (4).

Table 5 – Projected Future Closed Claim Counts

AY	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
1993	3															
1994	1	3														
1995	2	1	4													
1996	2	1	1	2												
1997	5	4	3	2	4											
1998	2	4	3	2	1	3										
1999	3	3	5	4	2	2	4									
2000	6	4	4	6	4	2	2	4								
2001	9	9	6	5	9	7	4	3	7							
2002	16	11	11	7	6	11	9	5	4	9						
2003	105	20	14	14	9	7	14	12	7	5	12					
2004	195	125	24	17	17	11	8	17	14	8	6	14				
2005	374	250	162	31	21	21	14	10	21	18	11	7	18			
2006	371	318	214	138	27	18	18	12	9	18	15	9	6	15		
2007	600	354	312	209	134	26	18	18	12	9	18	15	9	6	15	
2008	781	517	313	259	175	111	22	15	15	10	8	15	12	7	5	12

Table 6 – Projected Open Claim Counts

Number of Claims at Open Year-End

AY	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1994	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1995	5	4	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	3	2	2	-	-	-	-	-	-	-	-	-	-	-	-
1997	13	9	6	4	-	-	-	-	-	-	-	-	-	-	-
1998	12	9	6	4	3	-	-	-	-	-	-	-	-	-	-
1999	17	15	11	8	5	4	-	-	-	-	-	-	-	-	-
2000	19	17	15	12	8	5	4	-	-	-	-	-	-	-	-
2001	40	34	30	27	20	14	9	7	-	-	-	-	-	-	-
2002	62	53	44	39	35	27	18	12	9	-	-	-	-	-	-
2003	98	82	70	58	51	47	35	23	16	12	-	-	-	-	-
2004	231	115	96	82	69	60	55	41	28	19	14	-	-	-	-
2005	530	303	150	125	108	90	79	72	54	36	25	18	-	-	-
2006	737	446	255	126	106	91	76	67	61	45	30	21	15	-	-
2007	977	729	442	252	125	104	90	75	66	60	45	30	21	15	-
2008	1,179	791	591	358	205	101	85	73	61	53	49	36	24	17	12

The next step is to determine the total number of claim payment and closing transactions by accident year and calendar year using the calculated closed counts. Again, we had limited information to work with, since only the 2008 interim claim payment counts were available. Using this information, we examined the ratio of closings to total claim payment and closing transactions. This is shown on Table 7 below.

Table 7 – Claim Payments and Closed Claim Patterns

Accident Year	(1) Claims Closed in 2008	(2) 2008 Claim Payment & Closing Counts	(3) Percentage of Closings to Total Payments & Closings (1)/(2)	(4) Selected Percentage of Closings to Total Payments & Closings
1993	1	1	100%	**100%**
1994	4	4	100%	**100%**
1995	6	6	100%	**100%**
1996	5	6	83%	**100%**
1997	5	7	71%	**98%**
1998	7	7	100%	**95%**
1999	9	10	90%	**93%**
2000	11	13	85%	**92%**
2001	20	27	74%	**90%**
2002	56	66	85%	**90%**
2003	106	122	87%	**87%**
2004	227	259	88%	**85%**
2005	469	586	80%	**75%**
2006	297	540	55%	**60%**
2007	681	1,012	67%	**50%**
2008	394	673	59%	**40%**
Total	**2,298**	**3,339**		

As shown above in Table 7, the percentage of closings to total payments and closings during the year increases as the accident year matures. Using the selected percentages in Column (4), we then project the pattern of claim payments and closings to be made by accident year and calendar year as shown in Table 8 below.

Table 8 – Projected Number of Claim Payments and Closings to be Made

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
AY																	
1993	3																3
1994	1	3															4
1995	2	1	4														7
1996	2	1	1	2													5
1997	5	4	3	2	4												18
1998	2	4	3	2	1	3											15
1999	3	3	5	4	2	2	4										22
2000	6	5	4	6	4	2	2	4									32
2001	9	9	6	5	9	7	4	3	7								59
2002	18	12	12	8	6	11	9	5	4	9							92
2003	117	22	15	15	9	7	14	12	7	5	12						234
2004	224	139	27	18	18	12	9	17	14	8	6	14					503
2005	440	288	180	34	23	22	14	10	21	18	11	7	18				1,086
2006	495	374	246	153	30	20	19	13	9	18	15	9	6	15			1,423
2007	1,001	471	367	241	149	28	19	19	13	9	18	15	9	6	15		2,381
2008	1,562	861	417	304	201	124	24	16	16	11	8	15	12	7	5	12	3,595
Total (G)	3,890	2,197	1,288	792	456	237	118	99	90	78	69	60	45	28	20	12	9,479

The projected number of combined claim payments and closings to be made in Table 8 is determined by dividing the projected number of claims closed by accident year and calendar year in Table 5 by the selected ratio of payments and closings made to closed claims from Table 7, Column (4). Thus, for accident year 2008, we project 1,562 claim payments and closings to be made in 2009, by dividing the 781 claims we expect to close in the year by 50%, which is the percentage of claims that we expect to close from 12 to 24 months after policy inception.

Thus, the projected total number of payment and closing transactions is the sum of all the future calendar year claim payment and closing counts in Table 8, or 9,479. Using the average AOE to open a claim as estimated in Table 2, and the five to one relationship, the implied cost of each payment and closing transaction is $374.33 ($1,871.67 ÷ 5). We can then estimate the AOE reserves associated with the future claim payment and closing transactions in Table 8 (9,479 x $374.33, or $3,548,248). It should be noted that the closings and interim payments include those on both known and IBNR claims combined, as this process does not allow them to be identified separately.

By combining the estimates of AOE reserves associated with the cost of opening future IBNR claims from Section 2.3.1 ($3,026,484) with the estimates of AOE reserves in Table 8 associated

with the projected claim payments and closings ($3,548,248), we obtain an estimate of AOE reserves ($6,574,732) that does not reflect the impact of inflation.

2.4 Methodology – Reflecting Trend

Realistically, AOE costs increase over time as a result of inflationary pressures. Using the timing of the claim reporting and closing patterns as outlined in Appendix Exhibit A.2 and Table 8, respectively, along with the average AOE per transaction type, we are able to apply a trending procedure to develop additional estimates for AOE reserves. The following calculations and tables assume that the average AOE cost to open a claim is five times higher than the AOE cost associated with each subsequent payment or claim closing. First, we apply the average AOE cost related to opening a claim of $1,871.67 (from Table 2, Row (4)) trended by 4.0% annually, to the incremental claim counts to be reported in each future calendar-year diagonal shown in Appendix Exhibit A.3. This provides an estimate of the AOE reserves associated with the opening of the IBNR claims assuming trended AOE costs, which are shown in Appendix Exhibit A.5.

For example, for accident year 2008, the 610 incremental claim counts expected to be reported in 2009 are multiplied by the expected cost to open a claim in 2009 ($1,946.53 or $1,871.67 x 1.04), to produce $1,187,385 in required AOE reserves. Summing all the values in Appendix Exhibit A.5 gives the total AOE reserve required for the opening of future IBNR claims of $3,287,931. (Note: differences may exist due to rounding)

Next, the estimate of AOE reserves associated with the future claim payments and closures is made using the projected pattern of claim payment and closing transactions from Table 8. The same procedure used for the newly reported claims is used here, except that the underlying starting cost that is used is $374.33 rather than $1,871.67 (assuming an AOE cost relativity of five times). The resulting estimate of the AOE reserves for all future payments (partial and closing) is shown in Appendix Exhibit A.6.

For example, for accident year 2008, the 1,562 claim payments to be made in 2009 are multiplied by the expected cost to pay a claim in 2009 ($389.30 or $374.33 x 1.04), to produce $608,047 in required AOE reserves. Summing all the values in Appendix Exhibit A.6 gives the total AOE reserve required for the future claim payments of $3,956,876.

By combining the total estimates of AOE reserves in Appendix Exhibits A.5 and A.6 we get the total AOE reserves estimate of $7,244,807, which assumes an annual trend of 4.0%.

3. RESULTS AND DISCUSSION

The methodology described above provides us with an estimate of AOE reserves using a specific set of assumptions made by the actuary. To test the sensitivity of the results, we ran the model changing one of our assumptions (the relativity of the cost of paying/settling a claim and opening it) from a 5:1 ratio to a 3:1 ratio. The results from each of these are summarized in Table 9 below.

Table 9 – Summary of AOE Reserves

		AOE Relativity	
		5X	**3X**
No Trend	Reporting of IBNR Claims	3,026,484	2,663,012
	Future Payments and Closings on Open & IBNR Claims	3,548,248	5,203,522
	Total	**6,574,732**	**7,866,534**
Trend	Reporting of IBNR Claims	3,287,931	2,893,060
	Future Payments and Closings on Open & IBNR Claims	3,956,876	5,802,778
	Total	**7,244,807**	**8,695,838**

The results from Table 9 demonstrate the sensitivity of estimates of AOE reserves to the AOE relativity and application of a trend factor. As the ratio of AOE incurred when a claim is first reported versus when a payment is made or claim is settled decreases (from 5:1 to 3:1) the estimate of the AOE reserves will increase because the average AOE cost associated with claim payment and closing transactions is higher, and the number of claim payment and closing transactions estimated are greater than the number of IBNR claims. Likewise, the methodology assuming an annual trend of 4.0% produces estimates of AOE reserves that are approximately 10% higher than the estimates without annual trend.

One consideration for modifying this methodology is to also reflect the average AOE cost related to maintaining a claim that remains open during a calendar year regardless of whether there were payments or revisions made to that claim. This could be reflected in the model by assuming a fixed cost to maintain any claim that is open during the year. A relativity could be established

between this fixed cost per open claim and the cost to open or make payments on a claim. Similarly, the AOE cost of revising a claim estimate could be included provided the appropriate transaction information is available. Consideration can also be given to different costs associated with the reopening of claims previously closed.

This methodology could also be modified to reflect different assumptions associated with the relativity of AOE costs for claim payment and closing transactions, and also to reflect partial accident years (i.e., for a quarterly evaluation). In order to reflect partial accident years for the most recent 12-month period, we would have to apply several changes to the calculations in our methodology, particularly around those calculations working off of the ultimate claim counts for the most recent accident year, 2008.

4. CONCLUSIONS

For the actuary, the calculation of the AOE reserves often comes down to the information available, knowledge of the claim department structure and how it handles claims, and selected assumptions based on information from management. As a result there may be a wide variation in methodologies and assumptions used by the actuary. An actuary needs to recognize the limitations to him or her and work with the information that is available to come up with a reasonable methodology, which was the primary reason for us developing the methodology described in this paper.

As noted throughout the paper, considerable uncertainty may be due to assumptions made because certain information is not available to the actuary. Resulting estimates of AOE reserves may vary based on differing assumptions of:

- Annual trend percentage
- Relationship between AOE costs by transaction type
- Claim reporting age to age development factors
- Selected claim payment pattern
- Selected percentage of claims that will close during a calendar year

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Appendix Exhibit A.1

Reported Claim Development Triangle

Accident Year	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192
1993	406	767	901	945	965	975	975	980	980	980	990	995	995	995	995	995
1994	390	755	881	940	945	964	964	964	969	969	979	979	979	979	979	
1995	408	618	738	774	798	804	804	804	804	810	810	816	816	816		
1996	581	882	945	980	1,043	1,099	1,132	1,144	1,157	1,170	1,172	1,181	1,182			
1997	737	1,231	1,300	1,360	1,368	1,368	1,368	1,376	1,376	1,376	1,376	1,376				
1998	865	1,264	1,341	1,379	1,386	1,411	1,442	1,442	1,442	1,442	1,442					
1999	847	1,282	1,322	1,370	1,378	1,418	1,418	1,418	1,418	1,418						
2000	936	1,388	1,482	1,496	1,526	1,532	1,532	1,534	1,534							
2001	1,005	1,485	1,518	1,560	1,566	1,568	1,569	1,572								
2002	1,201	1,553	1,722	1,748	1,752	1,757	1,758									
2003	1,498	1,769	1,866	1,962	1,981	1,999										
2004	1,749	2,367	2,456	2,579	2,610											
2005	1,847	2,477	2,678	2,888												
2006	1,982	2,622	2,684													
2007	1,702	2,226														
2008	1,744															

Link Ratios	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192
1993	1.889	1.175	1.049	1.021	1.010	1.000	1.005	1.000	1.000	1.010	1.005	1.000	1.000	1.000	1.000	
1994	1.936	1.167	1.067	1.005	1.020	1.000	1.000	1.005	1.000	1.010	1.000	1.000	1.000	1.000		
1995	1.515	1.194	1.049	1.031	1.008	1.000	1.000	1.000	1.007	1.000	1.007	1.000	1.000			
1996	1.518	1.071	1.037	1.064	1.054	1.030	1.011	1.011	1.011	1.002	1.008	1.001				
1997	1.670	1.056	1.046	1.006	1.000	1.000	1.006	1.000	1.000	1.000	1.000					
1998	1.461	1.061	1.028	1.005	1.018	1.022	1.000	1.000	1.000	1.000						
1999	1.514	1.031	1.036	1.006	1.029	1.000	1.000	1.000	1.000							
2000	1.483	1.068	1.009	1.020	1.004	1.000	1.001	1.000								
2001	1.478	1.022	1.028	1.004	1.001	1.001	1.002									
2002	1.293	1.109	1.015	1.002	1.003	1.001										
2003	1.181	1.055	1.051	1.010	1.009											
2004	1.353	1.038	1.050	1.012												
2005	1.341	1.081	1.078													
2006	1.323	1.024														
2007	1.308															
2008																
All Per Avg	1.484	1.082	1.042	1.016	1.014	1.005	1.003	1.002	1.003	1.004	1.004	1.000	1.000	1.000	1.000	
All Per Wtd Avg	1.404	1.067	1.043	1.013	1.013	1.005	1.003	1.002	1.002	1.003	1.004	1.000	1.000	1.000	1.000	
5 Yr Avg	1.301	1.061	1.045	1.010	1.009	1.005	1.002	1.002	1.004	1.002	1.004					
5 Yr Wtd Avg	1.306	1.057	1.049	1.010	1.009	1.004	1.002	1.002	1.003	1.002	1.004					
3 Yr Avg	1.324	1.047	1.060	1.008	1.004	1.000	1.001	1.000	1.000	1.001	1.005	1.000	1.000			
3 Yr Wtd Avg	1.324	1.047	1.061	1.009	1.005	1.000	1.001	1.000	1.000	1.001	1.004	1.000	1.000			
Selected A-A	**1.350**	**1.055**	**1.045**	**1.010**	**1.008**	**1.003**	**1.002**	**1.001**	**1.001**	**1.001**	**1.001**	**1.001**	**1.000**	**1.000**	**1.000**	
Selected A-U	1.530	1.134	1.075	1.028	1.018	1.010	1.007	1.005	1.004	1.003	1.002	1.001	1.000	1.000	1.000	**1.000**

Appendix Exhibit A.2

Developed Reported Claim Counts to Ultimate

AY	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	Ult
1993	406	767	901	945	965	975	975	980	980	980	990	995	995	995	995	995	**995**
1994	390	755	881	940	945	964	964	964	969	969	979	979	979	979	979	*979*	**979**
1995	408	618	738	774	798	804	804	804	804	810	810	816	816	816	*816*	*816*	**816**
1996	581	882	945	980	1,043	1,099	1,132	1,144	1,157	1,170	1,172	1,181	1,182	*1,182*	*1,182*	*1,182*	**1,182**
1997	737	1,231	1,300	1,360	1,368	1,368	1,368	1,376	1,376	1,376	1,376	1,376	*1,377*	*1,377*	*1,377*	*1,377*	**1,377**
1998	865	1,264	1,341	1,379	1,386	1,411	1,442	1,442	1,442	1,442	1,442	*1,443*	*1,444*	*1,444*	*1,444*	*1,444*	**1,444**
1999	847	1,282	1,322	1,370	1,378	1,418	1,418	1,418	1,418	1,418	*1,419*	*1,420*	*1,421*	*1,421*	*1,421*	*1,421*	**1,421**
2000	936	1,388	1,482	1,496	1,526	1,532	1,532	1,534	1,534	*1,536*	*1,538*	*1,540*	*1,542*	*1,542*	*1,542*	*1,542*	**1,542**
2001	1,005	1,485	1,518	1,560	1,566	1,568	1,569	1,572	*1,574*	*1,576*	*1,578*	*1,580*	*1,582*	*1,582*	*1,582*	*1,582*	**1,582**
2002	1,201	1,553	1,722	1,748	1,752	1,757	1,758	*1,762*	*1,764*	*1,766*	*1,768*	*1,770*	*1,772*	*1,772*	*1,772*	*1,772*	**1,772**
2003	1,498	1,769	1,866	1,962	1,981	1,999	*2,005*	*2,009*	*2,011*	*2,013*	*2,015*	*2,017*	*2,019*	*2,019*	*2,019*	*2,019*	**2,019**
2004	1,749	2,367	2,456	2,579	2,610	*2,631*	*2,639*	*2,644*	*2,647*	*2,650*	*2,653*	*2,656*	*2,659*	*2,659*	*2,659*	*2,659*	**2,659**
2005	1,847	2,477	2,678	2,888	*2,917*	*2,940*	*2,949*	*2,955*	*2,958*	*2,961*	*2,964*	*2,967*	*2,970*	*2,970*	*2,970*	*2,970*	**2,970**
2006	1,982	2,622	2,684	*2,805*	*2,833*	*2,856*	*2,865*	*2,871*	*2,874*	*2,877*	*2,880*	*2,883*	*2,886*	*2,886*	*2,886*	*2,886*	**2,886**
2007	1,702	2,226	*2,348*	*2,454*	*2,479*	*2,499*	*2,506*	*2,511*	*2,514*	*2,517*	*2,520*	*2,523*	*2,526*	*2,526*	*2,526*	*2,526*	**2,526**
2008	1,744	*2,354*	*2,483*	*2,595*	*2,621*	*2,642*	*2,650*	*2,655*	*2,658*	*2,661*	*2,664*	*2,667*	*2,670*	*2,670*	*2,670*	*2,670*	**2,670**

* Reported Claim Counts in italics are projected.

Appendix Exhibit A.3

Incremental Future Reported Claim Counts by Accident Year and Calendar Year

AY	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192
1993	406	361	134	44	20	10	0	5	0	0	10	5	0	0	0	0
1994	390	365	126	59	5	19	0	0	5	0	10	0	0	0	0	*0*
1995	408	210	120	36	24	6	0	0	0	6	0	6	0	0	*0*	*0*
1996	581	301	63	35	63	56	33	12	13	13	2	9	1	*0*	*0*	*0*
1997	737	494	69	60	8	0	0	8	0	0	0	0	*1*	*0*	*0*	*0*
1998	865	399	77	38	7	25	31	0	0	0	0	*1*	*1*	*0*	*0*	*0*
1999	847	435	40	48	8	40	0	0	0	0	*1*	*1*	*1*	*0*	*0*	*0*
2000	936	452	94	14	30	6	0	2	0	*2*	*2*	*2*	*2*	*0*	*0*	*0*
2001	1,005	480	33	42	6	2	1	3	*2*	*2*	*2*	*2*	*2*	*0*	*0*	*0*
2002	1,201	352	169	26	4	5	1	*4*	*2*	*2*	*2*	*2*	*2*	*0*	*0*	*0*
2003	1,498	271	97	96	19	18	*6*	*4*	*2*	*2*	*2*	*2*	*2*	*0*	*0*	*0*
2004	1,749	618	89	123	31	*21*	*8*	*5*	*3*	*3*	*3*	*3*	*3*	*0*	*0*	*0*
2005	1,847	630	201	210	*29*	*23*	*9*	*6*	*3*	*3*	*3*	*3*	*3*	*0*	*0*	*0*
2006	1,982	640	62	*121*	*28*	*23*	*9*	*6*	*3*	*3*	*3*	*3*	*3*	*0*	*0*	*0*
2007	1,702	524	*122*	*106*	*25*	*20*	*7*	*5*	*3*	*3*	*3*	*3*	*3*	*0*	*0*	*0*
2008	1,744	*610*	*129*	*112*	*26*	*21*	*8*	*5*	*3*	*3*	*3*	*3*	*3*	*0*	*0*	*0*

* Incremental reported claim counts in italics are projected.

Appendix Exhibit A.4

Projected Percentages of Reported Claims that will be Open at Subsequent Calendar Year Ends

AY	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
1993	*0.3%*	0.0%															
1994	*0.4%*	0.3%	0.0%														
1995	*0.9%*	0.6%	0.4%	0.0%													
1996	*0.4%*	0.3%	0.2%	0.1%	0.0%												
1997	*1.2%*	0.9%	0.6%	0.4%	0.3%	0.0%											
1998	*0.9%*	0.8%	0.6%	0.4%	0.3%	0.2%	0.0%										
1999	*1.3%*	1.2%	1.1%	0.8%	0.5%	0.4%	0.3%	0.0%									
2000	*1.5%*	1.2%	1.1%	1.0%	0.7%	0.5%	0.3%	0.2%	0.0%								
2001	*3.0%*	2.6%	2.1%	1.9%	1.7%	1.3%	0.9%	0.6%	0.4%	0.0%							
2002	*4.2%*	3.5%	3.0%	2.5%	2.2%	2.0%	1.5%	1.0%	0.7%	0.5%	0.0%						
2003	*9.9%*	4.9%	4.1%	3.5%	2.9%	2.6%	2.3%	1.7%	1.2%	0.8%	0.6%	0.0%					
2004	*15.5%*	8.8%	4.3%	3.6%	3.1%	2.6%	2.3%	2.1%	1.6%	1.0%	0.7%	0.5%	0.0%				
2005	*30.3%*	18.2%	10.3%	5.1%	4.2%	3.6%	3.0%	2.7%	2.4%	1.8%	1.2%	0.8%	0.6%	0.0%			
2006	*36.8%*	26.3%	15.8%	8.9%	4.4%	3.7%	3.2%	2.6%	2.3%	2.1%	1.6%	1.1%	0.7%	0.5%	0.0%		
2007	*65.4%*	41.6%	29.7%	17.8%	10.1%	5.0%	4.2%	3.6%	3.0%	2.6%	2.4%	1.8%	1.2%	0.8%	0.6%	0.0%	
2008	*77.4%*	50.1%	31.9%	22.8%	13.7%	7.7%	3.8%	3.2%	2.7%	2.3%	2.0%	1.8%	1.4%	0.9%	0.6%	0.5%	0.0%

* Calendar Year-End 2008 percentages in italics are actual

Appendix Exhibit A.5

Estimates of AOE Reserves Associated with the Opening of IBNR Claims Assuming Trended AOE

AY	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	Ult
1993																	**0**
1994																0	**0**
1995															0	0	**0**
1996														0	0	0	**0**
1997													1,947	0	0	0	**1,947**
1998												1,947	2,024	0	0	0	**3,971**
1999											1,947	2,024	2,105	0	0	0	**6,076**
2000										3,893	4,049	4,211	4,379	0	0	0	**16,532**
2001									3,893	4,049	4,211	4,379	4,554	0	0	0	**21,086**
2002								7,786	4,049	4,211	4,379	4,554	4,737	0	0	0	**29,716**
2003							11,679	8,098	4,211	4,379	4,554	4,737	4,926	0	0	0	**42,583**
2004						40,877	16,195	10,527	6,569	6,832	7,105	7,389	7,685	0	0	0	**103,178**
2005					56,449	46,561	18,948	13,138	6,832	7,105	7,389	7,685	7,992	0	0	0	**172,098**
2006				235,530	56,683	48,424	19,706	13,663	7,105	7,389	7,685	7,992	8,312	0	0	0	**412,488**
2007			237,477	214,586	52,634	43,792	15,940	11,841	7,389	7,685	7,992	8,312	8,644	0	0	0	**616,291**
2008		1,187,385	261,147	235,801	56,929	47,821	18,946	12,315	7,685	7,992	8,312	8,644	8,990	0	0	0	**1,861,966**
																Total	**3,287,931**

Appendix Exhibit A.6

Estimates of AOE Reserves Associated with Claim Closings and Payments, Assuming AOE Trend

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
1993	1,168																**1,168**
1994	445	1,157															**1,602**
1995	818	567	1,474														**2,858**
1996	649	405	281	730													**2,064**
1997	2,040	1,722	1,075	745	1,937												**7,519**
1998	863	1,599	1,246	777	539	1,401											**6,426**
1999	1,339	1,037	2,020	1,668	1,041	721	1,876										**9,702**
2000	2,431	1,825	1,511	2,555	1,755	1,095	759	1,974									**13,905**
2001	3,666	3,779	2,660	2,083	3,973	3,200	1,997	1,385	3,600								**26,343**
2002	7,004	4,739	4,885	3,349	2,558	5,134	4,374	2,729	1,892	4,920							**41,586**
2003	45,578	9,047	6,214	6,404	4,291	3,202	6,728	5,996	3,742	2,594	6,745						**100,540**
2004	87,103	56,092	11,195	7,893	8,136	5,562	4,236	8,551	7,328	4,573	3,170	8,243					**212,082**
2005	171,170	116,538	75,677	14,968	10,295	10,610	7,096	5,286	11,148	9,972	6,223	4,314	11,217				**454,516**
2006	192,690	151,615	103,779	66,969	13,587	9,261	9,544	6,471	4,887	10,028	8,737	5,452	3,780	9,828			**596,628**
2007	389,530	190,860	154,651	105,441	67,989	13,494	9,538	9,833	6,671	5,043	10,337	8,996	5,613	3,892	10,119		**992,007**
2008	608,047	348,623	175,517	133,318	91,361	58,498	11,896	8,357	8,613	5,955	4,585	9,052	7,578	4,729	3,278	8,524	**1,487,929**
																Total	**3,956,876**

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Abbreviations and Notations

AOE, Adjusting and Other Expenses
DCC, Defense and Cost Containment
IBNR, Incurred but Not Reported
SSAP, Statement of Statutory Accounting Principles
ULAE, Unallocated Loss Adjustment Expenses

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