Aggregate Loss Reserve Analysis by Accounting Date

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Abstract

This paper introduces new systematic procedures to estimate aggregate unpaid claims as of the current accounting date. Through the use of examples that introduce concepts in a natural progression, emphasis is placed on the reasonability and practicality of an accounting date reserving framework and its appeal to loss reserving practitioners. The accounting date framework provides a fresh perspective which differs from traditional actuarial reserving methods that typically derive unpaid claim estimates using individual accident year experience. Current accounting date aggregate unpaid claims are directly estimated from the emergence of aggregate claim experience which had been unpaid as of prior accounting dates. Exploration of this accounting date framework leads to techniques that may be understood as accounting date analogues of commonly used accident year reserving methods including the incurred development and Bornhuetter-Ferguson methods.

In addition to revealing visibly apparent aggregate unpaid claim estimates, the structure of appropriate accounting date reserving applications suggests improved accuracy over corresponding accident year development methods.

Keywords: loss reserve; reserving; unpaid claim estimate; IBNR; Bornhuetter-Ferguson; accounting date

1. INTRODUCTION

Basic loss reserving methods typically begin with individual accident year claim[1] experience and develop each accident year to an estimated ultimate value. These estimated ultimate values are reduced by cumulative claim payments as of the current accounting date resulting in an unpaid claim estimate for each accident year as of that date. In applying this procedure, the sum of the individual accident year unpaid claim estimates is understood to be an aggregate unpaid claim estimate as of the current accounting date.

Traditional accident year development methods have several important potential drawbacks:

- They are indirect. Indirectly solving for unpaid claims by estimating ultimate costs and then reducing this estimate by cumulative claim payments to date provides no immediate visible sense of the order-of-magnitude of a reasonable aggregate unpaid claim estimate.
- The aggregate unpaid claim estimate may be unduly volatile. The focus is to obtain unpaid claim estimates by individual accident year rather than directly target an aggregate unpaid claim estimate.

[1] Accident year claim (or loss) is used throughout this paper since it is the most common organization of historical data. Techniques described in this paper are also applicable to data organized in other time intervals including policy year, underwriting year, report year and fiscal year. Similarly, the techniques are applicable to monthly, quarterly and biannual data. Finally, the techniques presented are applicable to dollars, claim counts, ALAE (DCCE), and loss & ALAE combined.

- They are often highly leveraged, especially for long-tailed lines of business. Small changes in historical experience or development factor selection may lead to large changes in unpaid claim estimates. Even when exposures are directly incorporated into accident year development methods (e.g., Cape Cod), the focus remains on estimating individual accident year unpaid claims rather than an aggregate unpaid claim estimate.

This paper approaches reserving techniques from a different perspective by asking the direct question:

How might we estimate aggregate unpaid claims as of the current accounting date from the historical aggregate emergence of claims that were unpaid as of prior accounting dates?

This is addressed by examining properties of the emergence of aggregate unpaid claims under certain common and reasonable actuarial assumptions. We then endeavor to capitalize on these properties to derive estimates of aggregate unpaid claims as of the current accounting date. Exploration of the accounting date framework leads to techniques that may be understood as accounting date analogues of commonly used accident year reserving methods including the incurred development and Bornhuetter-Ferguson methods.

The accounting date techniques presented are relatively easy to apply and allow for direct estimation of aggregate unpaid claims. Since historical loss data is recast such that certain experience for all accident years is combined and the aggregate unpaid claims are estimated from this combined data, statistical volatility is expected to decrease while credibility is expected to increase as compared with traditional accident year development methods. The accounting date representation further provides an observable order-of-magnitude indication of reasonable unpaid claim estimates. Recent research suggests that certain accounting date reserving techniques are particularly consistent with the type of actuarial methodologies that tend to produce relatively accurate unpaid claim estimates in comparison with reserving methods in common use. Section 11 discusses these concepts further.

1.1 Research Context

Other than by separating historical experience into individual accident year components, surprisingly little actuarial literature exists on the subject of directly estimating aggregate unpaid claims as of an accounting date. Saltzmann [16] sought to find an appropriate "yardstick" to measure aggregate loss reserve adequacy. Khury [12] introduces the idea of using "reserve ratios" (i.e., IBNR to premium, IBNR to reported loss, IBNR to paid loss, total reserve to premium, and total reserve to paid loss) as tools for testing the reasonableness of loss reserves. The current NAIC IRIS Ratio 13 Estimated Current Reserve Deficiency to Policyholder's Surplus [15 p. 204] includes an estimate of current accounting date aggregate unpaid loss & DCCE based upon the average of developed loss & DCCE reserves to earned premium for the two prior accounting years which is then applied to current accounting date earned premium. However, all these measures are only benchmark tests and are not intended for use in actually setting loss reserves.

1.2 Objective

The purpose of this paper is to set forth a framework and systematic procedures to estimate aggregate unpaid claims as of the current accounting date. Through the use of examples that introduce concepts in a natural progression, emphasis is placed on the reasonability and practicality of this accounting date reserving paradigm and its appeal to loss reserving practitioners. Appropriate use of these accounting date concepts may increase the accuracy of aggregate unpaid claim estimates as well as bring visual clarity to the unpaid claim estimation process.

1.3 Outline

The remainder of this paper presents a framework and describes techniques by which aggregate unpaid claims may be estimated as of the current accounting date:

- Section 2 discusses actuarial assumptions relied upon to apply accounting date techniques.
- Section 3 introduces payment development by accounting date.
- Section 4 discusses incurred development by accounting date.
- Section 5 describes expected unpaid losses.
- Section 6 presents a Bornhuetter-Ferguson method by accounting date.
- Section 7 describes a Cape Cod method by accounting date.
- Section 8 explores the use of alternative exposure measures.
- Section 9 explains the broad applicability of the accounting date framework.
- Section 10 addresses certain implementation challenges.
- Section 11 discusses the major results of this paper.
- Section 12 summarizes the main conclusions of the paper.

2. ACTUARIAL ASSUMPTIONS

A loss reserve analysis usually commences with information gathering and exploration of any trends and changes that may affect the historical database. This guides the loss reserve practitioner in: consideration of the predictive power of applicable actuarial methods; choice of appropriate loss reserving techniques, and; interpretation of results.

As indicated by Berquist and Sherman [2], [10 p. 81], unpaid claim estimation cannot be reduced to a "cookbook" of rules and methods; actuarial judgment is required at many critical junctures to assure that unpaid claim estimates are neither distorted nor biased. Berquist and Sherman identify certain areas where actuarial judgment is required:

- Determining the optimal combination of the kinds of claims data to be used in the estimation of unpaid claims
- Assessing the effect of changes in an insurer's operations on the claims data that is used in estimating unpaid claims
- Adjusting the claims data for the influences of known and quantifiable events
- Evaluating the strengths and weaknesses of various estimation techniques
- Making the final selection of the unpaid claim estimate(s)

Mindful of the above, accounting date reserving techniques rely upon the following actuarial assumptions:

A1: The **requisite claim and exposure experience is available**. Techniques presented herein reorganize traditional accident year loss reserving claim and exposure experience into a new framework. Under certain conditions, less common exposure measures may be incorporated into the accounting date reserving paradigm.

A2: Except for noise (i.e., randomness in historical experience), **accident year payments subsequent to the first year of development follow the same payment pattern**.

A3: When case reserves are used as loss experience then, except for noise, **there has been no change in the adequacy of case reserves**.

A4: **The exposure metric as of each stage of development provides a reasonable measure of the relative accident year exposure to remaining development**. The exposure metric should reflect exposure volume including trend. Measurement of absolute exposure is not necessary.

A5: The **historical experience is statistically credible**.

A6: The **historical experience is homogeneous**.

A7: The **presence or absence of large claims does not distort the historical experience**.

While the valuation date and accounting date may not necessarily be equal, the current valuation date is assumed to equal the current accounting date for the purposes of this paper. Actuarial assumptions are denoted throughout this text by the shorthand references (e.g., A4) above.

When actual historical experience does not substantially satisfy certain actuarial assumptions relied upon by a particular technique (e.g., there has been a change in the claims environment), it is often possible to: restate historical experience on another basis; use alternative or supplementary data; or redefine the data to more completely satisfy actuarial assumptions. This is discussed further in Section 10.

The actuary should consider the use of multiple methods or models appropriate to the purpose, nature and scope of the assignment and the characteristics of the claims unless, in the actuary's professional judgment, reliance upon a single method or model is reasonable given the circumstances.[2] The relative strengths and weaknesses of appropriate actuarial techniques are evaluated in consideration of assignment objectives, the degree to which relevant actuarial assumptions are satisfied and the reasonableness of results.

As with all basic actuarial reserving methods, the methods presented herein provide deterministic single point estimates. Except in the most trivial situations and despite best efforts to satisfy actuarial assumptions, the actual future emergence of current accounting date unpaid claims is inherently uncertain.

3. PAYMENT DEVELOPMENT BY ACCOUNTING DATE

We introduce two payment development examples satisfying A1-A2 and A4-A7. A3 is not relevant since case reserves are not used as loss experience in payment development methods.

3.1 Static Example: No Noise

This first example contains no noise in the historical experience.

[2] Actuarial Standard of Practice No. 43 "Property/Casualty Unpaid Claim Estimates", Section 3.6.1

3.1.1 Traditional actuarial triangle chain-ladder accident year representation

Exhibit 1, Table 1 displays payment development data in the familiar CL format. Typically, selected age-to-age LDFs are derived as some average of historical LDFs. For each stage of development, the appropriate product of selected LDFs is the selected CDF. In this static example, since LDFs are identical within each age-to-age interval, simple average LDFs and volume weighted LDFs are identical within each development interval. Similarly, simple average CDFs and volume weighted CDFs are equal as of each stage of development.

Exhibit 1, Table 2 displays case reserves by accident year. Since there is no noise in this example, the ratio of case reserves to cumulative loss payments is the same for all accident years as of each stage of development.

3.1.2 Traditional payment development approach

Exhibit 1, Table 3 displays the traditional payment development method used to derive unpaid loss estimates from cumulative loss payments. The product of cumulative loss payments as of the current accounting date and their corresponding CDFs produce Column (4) estimated ultimate losses by accident year. These estimated ultimate losses are then reduced by cumulative loss payments as of the current accounting date resulting in an unpaid loss estimate for each accident year as of the current accounting date. Estimated unpaid losses by accident year are added to produce a total estimate of unpaid losses as of the current accounting date. The sum of individual accident year Column (5) unpaid loss estimates equals the total unpaid loss estimate of $434,721 as of 12/31/12.[3]

3.1.3 Accounting date representation

This paper presents an alternative approach that organizes the historical experience into an accounting date representation. Exhibit 1, Table 4 displays cumulative loss payment emergence by year-end accounting date and may be derived by the appropriate accumulation of cumulative loss payments from Exhibit 1, Table 1.

For example, year-end accounting date 2009 cumulative loss payments as of 12/31/12 (i.e., as of 3 years of emerged loss payments) of $205,714 are defined as loss payments subsequent to 12/31/09 on losses incurred during accident years 2009 & prior or, equivalently, as payments during calendar years 2010 through 2012 on accident years 2009 & prior. This may be derived from Exhibit 1, Table 1 as the

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[3] Unless otherwise specified, tables in the text are displayed in rounded thousands of dollars (i.e., $000 Omitted).

sum of the appropriate accident year contributions:

85,700 - 82,993 =	2,707	accident year 2001 contribution
+ 88,350 - 81,375 =	6,975	accident year 2002 contribution
+ 95,000 - 82,000 =	13,000	accident year 2003 contribution
+ 93,840 - 76,500 =	17,340	accident year 2004 contribution
+ 86,573 - 66,290 =	20,283	accident year 2005 contribution
+ 85,999 - 59,780 =	26,219	accident year 2006 contribution
+ 79,444 - 46,607 =	32,837	accident year 2007 contribution
+ 63,163 - 28,282 =	34,881	accident year 2008 contribution
+69,857 - 18,383 =	51,474	accident year 2009 contribution
	205,714	Total[4]

The developed payments of Exhibit 1, Table 4 represent the historical emergence of aggregate losses that were incurred and unpaid as of each year-end accounting date. This representation provides useful information as it tracks the historical loss payment emergence of accounting date unpaid losses as opposed to tracking individual accident year loss payment development from accident year inception. Hence, the goal is to estimate the ultimate value of year-end accounting date 2012 (i.e., the value that corresponds to the bold rectangle in the lower right-hand corner of Exhibit 1, Table 4). How might we estimate aggregate unpaid claims as of the current accounting date from the historical aggregate emergence of claims that were unpaid as of prior accounting dates? Despite the absence of noise in this first example, the non-constant LDFs between each development interval resulting from different accident year exposure levels signifies that that an estimate of the bold rectangle value is not readily apparent directly from Exhibit 1, Table 4.

3.1.4 Accounting date representation recast at current accounting date exposure level

Exhibit 1, Table 4 year-end accounting date emergence may be recast into a form that is especially useful for estimating unpaid claims as of the current accounting date. The emerged loss payments of Exhibit 1, Table 4 are recast on Exhibit 1, Table 5 at the year-end accounting date 2012 exposure level where the case reserves of Exhibit 1, Table 2 are used as an A4 measure of the relative accident year exposure to remaining payments as of each stage of development.[5] Accordingly, Exhibit 1, Table 5

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[4] Totals may not add precisely due to rounding

[5] While case reserves may not be a commonly used exposure base for traditional reserving methods that estimate individual accident year ultimate losses, case reserves can be a reasonable A4 accounting date reserving exposure metric. Exceptions would include (a) where zero case reserves at later stages of development do not signify negligible remaining exposure and (b) very long-tailed lines where few claims are reported in the early stages of development. Otherwise, when A1-A7 are satisfied, case reserves would be expected to be a reliable A4 measure of relative accident year exposure to remaining payments at each stage of development. Such case reserves would reflect the relative volume of remaining development exposure between accident years including trend. While A3 should be satisfied to accept case reserves as an

displays the Exhibit 1, Table 4 emergence recast as if each year-end accounting date had emerged at the current year-end 2012 accounting date exposure level. For example, using the loss payments of Exhibit 1, Table 1, the Exhibit 1, Table 4 year-end 2009 accounting date cumulative emerged loss payments as of 12/31/12 (i.e., after 3 years) of $205,714 is recast as:

	(Year-End 2012 Accounting Date Exposure)/	(Year-End 2009 Accounting Date Exposure)			
	(2,040/	1,804)	x (85,700 - 82,993) =	3,061	accident year 2001 contribution
+	(3,958/	3,720)	x (88,350 - 81,375) =	7,421	accident year 2002 contribution
+	(6,293/	6,000)	x (95,000 - 82,000) =	13,635	accident year 2003 contribution
+	(9,533/	9,180)	x (93,840 - 76,500) =	18,007	accident year 2004 contribution
+	(10,370/	10,883)	x (86,573 - 66,290) =	19,327	accident year 2005 contribution
+	(15,932/	13,634)	x (85,999 - 59,780) =	30,638	accident year 2006 contribution
+	(25,418/	18,007)	x (79,444 - 46,607) =	46,351	accident year 2007 contribution
+	(31,399/	18,855)	x (63,163 - 28,282) =	58,087	accident year 2008 contribution
+	(43,173/	30,639)	x (69,857 - 18,383) =	72,531	accident year 2009 contribution
				269,056	Total

This year-end 2009 accounting date emerged loss payments as of 3 years, recast at the year-end 2012 accounting date exposure level total of $269,056, is displayed in its corresponding position on Exhibit 1, Table 5. Appendix A provides a formula to recast accounting date cumulative loss payment emergence at the current accounting date exposure level.

In order for recast year-end accounting date experience to be useful, we must be able to consistently recast each year-end accounting date through the same stage of development. Ideally, this would be though ultimate development (10 years of accident year development in this example). Section 10 discusses approaches under less than ideal circumstances.

The recast Exhibit 1, Table 5 loss payments emerged by year-end accounting date at the year-end 2012 accounting date exposure level visibly clarifies an appropriate aggregate year-end 2012 accounting date unpaid loss estimate. The recast unpaid claims for each year-end accounting date are seen to inevitably emerge towards an ultimate of $434,721. This is the same figure derived from the traditional payment development method on Exhibit 1, Table 3.

A4 exposure metric, A3 is unnecessary to perform payment development accounting date reserving. It is important to recognize that A4 exposure metrics other than case reserves may be appropriate as discussed in Sections 8 and 9.

We now make several important observations:

- In contrast to traditional estimates which require an estimated ultimate for each accident year, the central goal under an accounting date representation is to directly target only one quantity, i.e., estimated aggregate unpaid claims incurred as of the current accounting date.
- Where there is no noise in the data and despite variable accident year exposure, development factors remain constant within development interval under the recast accounting date representation.
- In contrast to traditional indirect accident year estimated ultimate approaches, a reasonable unpaid claim estimate is visibly apparent under a year-end accounting date representation appropriately recast at the current accounting date exposure level.
- Where there is no noise, the recast accounting date representation results in the same unpaid claim estimate as traditional development methods.
- Tail factors converge to unity faster under accounting date representations than for corresponding traditional accident year representations.
- Accident year payments during the first calendar year are not reflected in accounting date representations.
- The final diagonal of accounting date representations contains all calendar year activity through the current accounting date on losses incurred as of each prior year-end accounting date that remained unpaid as of each year-end accounting date.
- Especially for longer tailed lines of business, the data volume for accounting date representations tends to grow faster than under corresponding traditional accident year representations.[6]

3.1.5 Estimation of aggregate unpaid loss

While we may visually observe $434,721 as an obvious unpaid claim estimate as of 12/31/12 for our 'no noise' example, this may be formalized mathematically. We can apply development procedures to the emergence of loss payments by accounting year recast at the current accounting date exposure level. The lower portion of Exhibit 1, Table 5 displays LDFs and corresponding CDFs for the recast accounting

[6] Long-tailed lines of business may exhibit little activity for recent accident years as of the current accounting date (e.g., accident year 2011 cumulative loss activity as of 12/31/12 equals 0), but would be expected to exhibit considerably more activity for recent year-end accounting dates as of the current accounting date. Accordingly, especially for long-tailed lines of business, statistical reliability and credibility (A5) would be expected to be enhanced under the recast accounting date representation since accident year activity is aggregated.

date loss payments. In this static example, since LDFs are identical within each development interval, simple average LDFs and volume weighted LDFs are identical within each development interval. As a result, simple average CDFs and volume weighted CDFs are identical at each development stage.

Exhibit 1, Table 6, Column (4) displays the indicated total emergence of unpaid year-end accounting date losses at year-end 2012 exposure levels using the recast accounting date payment development technique. As expected in this example without noise, the indicated unpaid loss for each prior year-end accounting date at the year-end 2012 accounting date exposure level equals $434,721.

3.1.6 Allocation of aggregate unpaid loss estimate to accident year

Rather than explicitly computing individual accident year unpaid claims as in the traditional payment development method, the accounting date reserving paradigm may be used to allocate the aggregate unpaid loss estimate to accident year by use of a top-down iterative approach that unwinds the exposure adjustment.

Exhibit 1, Table 6, Column (5) displays the indicated unpaid loss as of 12/31/12 at the 2012 year-end accounting date exposure level for each year-end accounting date. Beginning with accident year 2004, the oldest accident year with any remaining unpaid claim liability as of 12/31/12, we know that accident year 2004 is expected to have only one more year of loss payments beyond 12/31/12 (i.e., payments to be made during calendar year 2013). Recasting loss payments emerged at the 2012 year-end accounting date exposure level implies the following equation for accident year 2004:
$5,181= (43,173/25,500)x(acc. yr. 2004 estimated payments during yr. 10)

Solving this equation yields:
acc. yr. 2004 estimated payments during yr. 10 = (25,500/43,173)x$5,181 =
acc. yr. 2004 est. unpaid loss as of 12/31/12 = $3,060

Similarly, we have the following equation for accident year 2005:
$17,662 = (31,399/20,400)x(acc. yr. 2004 estimated payments during yr. 10)
+(43,173/24,735)x(acc. yr. 2005 estimated payments during yrs. 9,10)

Using $3,060 as the acc. yr. 2004 estimated payments during yr. 10 and solving this equation results in:
acc. yr. 2005 est. payments during years 9,10 = (24,735/43,173)x[$17,662- (31,399/20,400)x($3,060)]
acc. yr. 2005 est. unpaid loss as of 12/31/12 = $7,421

This process is continued iteratively to derive unpaid losses as of 12/31/12 for each accident year as displayed on Exhibit 1, Table 6, Column (7). Appendix C provides a formula to allocate the current accounting date aggregate unpaid loss estimate to accident year.

The total of all accident year unpaid claim estimates of the current year end accounting date equals the aggregate unpaid claims estimate. As expected in this 'no noise' example, the individual accident year unpaid losses derived in this manner equal the accident year unpaid loss estimates derived on Exhibit 1, Table 3 by using the traditional payment development method.

3.2 Payment Development with Noise

While the previous example without noise is illustrative of concepts, actual historical experience typically presents with significant noise in the historical experience. This section adds noise to the example introduced in Section 3.1.

3.2.1 Traditional actuarial triangle accident year representation

Exhibit 2, Table 1 displays loss payment experience in CL format. Since noise has been introduced, LDFs no longer remain constant within each development interval. Since interval LDFs are not constant, volume weighted average CDFs are not necessarily equal to unweighted simple average CDFs. Exhibit 2, Table 2 displays case reserves by accident year with noise added.

3.2.2 Accounting date representation

Exhibit 2, Table 3 displays the cumulative emergence of loss payments by year-end accounting date and may be derived by the appropriate accumulation of cumulative loss payments from Exhibit 2, Table 1 as described in Section 3.1.3. This tracks the historical emergence of accounting date unpaid losses and the goal is, once again, to estimate the ultimate value of year-end accounting date 2012 (i.e., the value that corresponds to the bold rectangle in the lower right-hand corner of Exhibit 2, Table 3).

3.2.3 Accounting date representation recast at current accounting date exposure level

Following procedures described in Section 3.1.4, the emerged loss payments of Exhibit 2, Table 3 are recast on Exhibit 2, Table 4 at the year-end accounting date 2012 exposure level where case reserves of Exhibit 2, Table 2 are used as an A4 measure of the relative accident year exposure to remaining payments as of each stage of development. By recasting all loss payment emergence at the 2012 year-end accounting date exposure level, LDFs within each development interval are now on a comparable basis. Weighted LDFs are weighted on the pre-recast actual loss experience of Exhibit 2, Table 3 to preserve the weighting of actual experience.[7]

Recasting the loss payments emerged as displayed on Exhibit 2, Table 4 provides an observable order-of-magnitude aggregate year-end 2012 current accounting date unpaid claim estimate. The recast unpaid claims for each recast year-end accounting date are observed to be emerging towards an ultimate somewhere in the low-to-mid four-hundred million dollar range.

3.2.4 Estimation of aggregate unpaid loss

While we may observe an order-of-magnitude unpaid claim estimate as of 12/31/12, we can apply our formal development procedure to the emergence of loss payments by accounting year recast at the current accounting date exposure level.[8]

Exhibit 2, Table 5, Column (4) displays the indicated total emergence of unpaid year-end accounting date losses at the current 2012 year-end accounting date exposure level. While each figure in Column (4) provides an estimate of unpaid losses as of 12/31/12,[9] the most recent estimate of $433,929 is accepted as the payment development accounting date unpaid loss estimate as of 12/31/12.

3.2.5 Allocation of aggregate unpaid loss estimate to accident year

Exhibit 2, Table 5, Column (7) allocates the $433,929 aggregate estimated unpaid loss as of 12/31/12 to accident year using the iterative procedure described in Section 3.1.6.

4. INCURRED (REPORTED) DEVELOPMENT BY ACCOUNTING DATE

This section presents the incurred (reported[10]) loss counterpart to the payment development discussion presented in the Section 3. We introduce two incurred development examples satisfying A1-A7.

4.1 Static Example: No Noise

4.1.1 Traditional actuarial triangle chain-ladder accident year representation

Exhibit 3, Table 1 displays reported losses in the familiar CL format. In this static example, since

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[7] Friedland's [10] Chapter 7 – Development Technique "Mechanics of the Development Technique" discussion beginning p. 85 is written in a traditional accident year development context. Her discussion may be adapted to accounting date development techniques.

[8] Friedland's [10] Chapter 7 – Development Technique 'When the Development Technique Works and When it Does Not' discussion beginning p. 95 is written in a traditional accident year development context. Her discussion may be adapted to accounting date development techniques.

[9] Section 7 revisits this important point.

[10] Reported losses equal cumulative loss payments plus case reserves.

LDFs are identical within each age-to-age interval, volume weighted LDFs are identical to simple average LDFs within each development interval and volume weighted CDFs are identical to simple average CDFs as of each stage of development.

4.1.2 Traditional incurred development approach

Exhibit 3, Table 2 displays the traditional accident year incurred development method used to derive unpaid loss estimates from reported losses. The product of reported losses as of the current accounting date and their corresponding CDFs produce Column (4) estimated ultimate losses by accident year. Estimated ultimate losses are then reduced by reported losses as of the current accounting date resulting in Column (5) IBNR estimates for each accident year as of the current accounting date. These accident year IBNR estimates are added to Column (6) current accounting date case reserves resulting in a Column (7) unpaid loss estimate for each accident year.[11] Estimated unpaid losses by accident year are added to produce a total estimate of unpaid losses as of the current accounting date. The sum of individual accident year Column (7) unpaid loss estimates equals the total unpaid loss estimate of $434,721 as of 12/31/12. Since there is no noise, this total unpaid loss estimate is identical to the traditional payment development estimate derived in Section 3.1.2.

4.1.3 Accounting date representation

As with cumulative payments, our alternative approach organizes reported loss experience into an accounting date representation. Exhibit 3, Table 3 displays the cumulative reported losses emerged by year-end accounting date and may be derived as the sum of cumulative loss payments emerged by year-end accounting date of Exhibit 1, Table 4 and the appropriate accumulation of case reserves from Exhibit 1, Table 2.

For example, the year-end accounting date 2009 reported losses as of 12/31/12 (i.e., as of 3 years of reported loss emergence) of $253,840 are defined as loss payments subsequent to 12/31/09 on losses incurred during accident years 2009 & prior plus case reserves as of 12/31/12 on accident years 2009 & prior. Equivalently, this may be defined as loss payments during calendar years 2010 through 2012 on accident years 2009 & prior plus case reserves as of 12/31/12 on accident years 2009 & prior. The loss payments subsequent to 12/31/09 on losses incurred during accident years 2009 & prior equal $205,714 from Exhibit 1, Table 4. Case reserves as of 12/31/12 on accident years 2009 & prior of $48,126 equal

[11] This derivation of unpaid loss estimates by accident year is equivalent to solving for unpaid loss estimates as Column (4) accident year estimated ultimate losses less cumulative loss payments as of the current accounting date.

the sum of appropriate accident year contributions from Exhibit 1, Table 2:

2,040	accident year 2004 contribution
+ 3,958	accident year 2005 contribution
+ 6,293	accident year 2006 contribution
+ 9,533	accident year 2007 contribution
+ 10,370	accident year 2008 contribution
+ 15,932	accident year 2009 contribution
48,126	Total

The sum of these two components, \$205,714 + \$48,126, equals the \$253,840 year-end accounting date 2009 reported losses emerged as of 12/31/12.

Exhibit 3, Table 3 tracks historical reported loss emergence of accounting date unpaid losses as opposed to tracking individual accident year reported loss development from accident year inception. It is important to observe that exhibits displaying cumulative reported losses emerged by accounting date display one additional diagonal (as of 0 years) for each accounting date compared with exhibits that display the corresponding cumulative loss payments emerged.[12] In particular, the 2012 current accounting date contains an entry as of 0 years (i.e., as of 12/31/12) that equals the aggregate case reserves as of the current year-end accounting date. Our goal is to estimate the ultimate value of unpaid losses as of year-end accounting date 2012 (i.e., the value that corresponds to the bold rectangle in the lower right-hand corner of Exhibit 3, Table 3). As with Exhibit 1, Table 4, an estimate of the bold rectangle value is not readily apparent directly from Exhibit 3, Table 3.

4.1.4 Accounting date representation recast at current accounting date exposure level

Exhibit 3, Table 3 accounting year reported loss emergence may be recast into a form that is especially useful for unpaid claim estimation. Exhibit 3, Table 4 displays the recast cumulative reported losses emerged by year-end accounting date at the current accounting date exposure level and may be derived as the sum of recast cumulative loss payments emerged by year-end accounting date of Exhibit 1, Table 5 and the appropriate accumulation of recast case reserves of Exhibit 1, Table 2.

The emerged reported losses of Exhibit 3, Table 3 are recast on Exhibit 3, Table 4 at the 2012 year-end accounting date exposure level where the case reserves of Exhibit 1, Table 2 are used as an A4 measure of the relative accident year exposure to remaining reported losses (IBNR) as of each stage of development.

[12] Since there can be no emerged payments as of 0 years, reported emerged as of 0 years = case reserves as of 0 years.

For example, the emerged reported losses of accounting year-end 2009 as of 12/31/12 (i.e., after 3 years) from Exhibit 3, Table 3 of $253,840 is recast on Exhibit 3, Table 4 as $335,474. This is derived as the recast loss payments subsequent to 12/31/09 on losses incurred during accident years 2009 & prior equal to $269,056 from Exhibit 1, Table 5 plus recast case reserves as of 12/31/12 on accident years 2009 & prior of $66,418. The $66,418 of recast case reserves equals the sum of appropriate recast accident year contributions from Exhibit 1, Table 2, computed as:

(Year-End 2012 Accounting Date Exposure) / (Year-End 2009 Accounting Date Exposure)				
(9,533 / 9,180)	x 2,040	=	2,118	accident year 2004 contribution
+ (10,370/10,883)	x 3,958	=	3,771	accident year 2005 contribution
+ (15,932/13,634)	x 6,293	=	7,354	accident year 2006 contribution
+ (25,418/18,007)	x 9,533	=	13,456	accident year 2007 contribution
+ (31,399/18,855)	x 10,370	=	17,269	accident year 2008 contribution
+ (43,173/30,639)	x 15,932	=	22,450	accident year 2009 contribution
			66,418	Total

The year-end 2009 accounting date emerged reported losses as of 3 years, recast at the year-end 2012 accounting date exposure level of $335,474, is displayed in its corresponding position on Exhibit 3, Table 4. Appendix B provides a formula to recast accounting date reported loss emergence at the current accounting date exposure level.

It is important to observe that the recast year-end accounting date 2012 emerged reported losses of $148,116 displayed on Exhibit 3, Table 4 equals the pre-recast amount displayed on Exhibit 3, Table 3. This must always be true because the aggregate year-end accounting date 2012 case reserves recast at the 2012 year-end exposure level, by definition, equals the pre-recast aggregate year-end 2012 case reserves.

The recast Exhibit 3, Table 4 reported losses emerged by year-end accounting date at the year-end 2012 accounting date exposure level visibly clarifies an appropriate aggregate year-end 2012 accounting date unpaid loss estimate. The recast unpaid claims for each year-end accounting date are seen to inevitably emerge towards an ultimate of $434,721. This is the same figure derived from the traditional incurred development method of Exhibit 3, Table 2 as well as the ‘no noise’ payment development indication of Exhibit 1, Table 3 and the recast accounting date payment indication of Exhibit 1, Table 5.

The bullet point observations at the conclusion of Section 3.1.4 also apply to accounting date emerged reported loss representations. There are two additional observations for emerged reported losses under an accounting date representation:

- Accounting date reported emergence of unpaid claims converges to ultimate faster than accounting date payment emergence.
- Exhibits displaying cumulative reported losses emerged by year-end accounting date display one additional diagonal (as of 0 years) for each accounting date as compared with exhibits displaying the corresponding cumulative emerged loss payments. In particular, the current recast year-end accounting date contains an entry as of 0 years that equals total current year-end accounting date case reserves.

4.1.5 Estimation of aggregate unpaid loss

While we may observe \$434,721 as an obvious unpaid claim estimate as of 12/31/12 for our 'no noise' example, this can be formalized using development factors.

Exhibit 3, Table 5, Column (4) displays the indicated total reported emergence of unpaid year-end accounting date losses at the 2012 year-end accounting date exposure level. As expected in this example with no noise, the indicated unpaid loss for each year-end accounting date at the 2012 year-end accounting date exposure level equals \$434,721.

4.1.6 Allocation of aggregate unpaid loss estimate to accident year

As with loss payments, the emerged reported loss accounting date paradigm may be used to allocate the aggregate unpaid loss estimate to accident year by use of a top-down iterative approach that unwinds the exposure adjustment.

Exhibit 3, Table 5, Column (5) displays the indicated IBNR as of 12/31/12 at the 2012 year-end accounting date exposure level for each year-end accounting date. Beginning with accident year 2004, the oldest accident year with any remaining unreported losses as of 12/31/12, we know that accident year 2004 is expected to have only one more year of loss reportings beyond 12/31/12 (i.e., reportings to be made during calendar year 2013). Recasting reported losses emerged at the 2012 year-end accounting date exposure level implies the following equation for accident year 2004:

\$1,727 = (43,173/25,500)x(est. acc. yr. 2004 estimated reportings during yr. 10)

Solving this equation yields:

acc. yr. 2004 estimated reportings during yr. 10 = (25,500/43,173)x$1,727 =

acc. yr. 2004 estimated IBNR as of 12/31/12 = $1,020

Similarly, we have the following equation for accident year 2005:

$7,614 = (31,399/20,400)x(acc. yr. 2004 estimated reportings during yr. 10)

+(43,173/24,735)x(acc. yr. 2005 estimated reportings during yrs. 9,10)

Using $1,020 as the acc. yr. 2004 estimated reportings during yr. 10 and solving this equation results in:

acc. yr. 2005 est. reportings during years 9,10 = (24,735/43,173)x[$7,614 –(31,399/20,400)x($1,020)]

acc. yr. 2005 estimated IBNR as of 12/31/12 = $3,463

This process is continued iteratively to derive IBNR estimates as of 12/31/12 for each accident year as displayed on Exhibit 3, Table 5, Column (7). These IBNR estimates are added to the Column (8) case reserves as of 12/31/12 resulting in the Column (9) accident year unpaid loss estimates as of 12/31/12. Appendix C provides a formula to allocate the current accounting date aggregate IBNR estimate to accident year.

The total of all accident year unpaid claim estimates of the current year end accounting date equals the aggregate unpaid claims estimate. As expected in this 'no noise' example, the individual accident year unpaid losses derived in this manner equal the accident year unpaid loss estimates derived on Exhibit 3, Table 2 by using the traditional incurred development method.

4.2 Incurred Development with Noise

This section adds noise to the example introduced in Section 4.1.

4.2.1 Traditional actuarial triangle accident year representation

Exhibit 4, Table 1 displays reported losses in the traditional CL format derived as the sum of Exhibit 2, Table 1 and Exhibit 2, Table 2. Since noise has been introduced, LDFs no longer remain constant within each development interval. Since interval LDFs are not constant, volume weighted average CDFs do not necessarily equal the unweighted simple average CDFs.

4.2.2 Accounting date representation

Exhibit 4, Table 2 displays the cumulative reported losses emerged by year-end accounting date and may be derived as the sum of cumulative loss payments emerged by year-end accounting date of Exhibit

2, Table 3 and the appropriate accumulation of case reserves from Exhibit 2, Table 2 as described in Section 4.1.3. This tracks the historical reported emergence of accounting date unpaid losses and our goal is, once again, to estimate the ultimate value of unpaid losses as of year-end accounting date 2012 (i.e., the value that corresponds to the bold rectangle in the lower right-hand corner of Exhibit 4, Table 2).

4.2.3 Accounting date representation recast at current accounting date exposure level

Following procedures described in Section 4.1.4, reported losses emerged of Exhibit 4, Table 2 are recast on Exhibit 4, Table 3 at the year-end 2012 accounting date exposure level where case reserves of Exhibit 2, Table 2 are used as an A4 measure of the relative accident year exposure to remaining reported losses (IBNR) as of each stage of development. By recasting all reported loss emergence at the 2012 year-end accounting date exposure level, LDFs within each development interval are now on a comparable basis. Weighted LDFs are weighted on the pre-recast actual loss experience of Exhibit 4, Table 2 to preserve the weighting of actual experience.[13]

It is again important to observe that recast year-end accounting date 2012 emerged reported losses of $148,006 displayed on Exhibit 4, Table 3 equals the pre-recast amount displayed on Exhibit 4, Table 2. While this relationship must be true, the fact that each prior recast year-end accounting date emerged reported loss at 0 years also equals $148,006 is only true, in this instance, because accident year case reserves are used as the A4 exposure metric. Examples using different exposure metrics, presented in subsequent sections, help clarify this point.

Recasting the reported losses emerged as on Exhibit 4, Table 3 provides an observable order-of-magnitude aggregate year-end 2012 current accounting date unpaid claim estimate. It is visually apparent that the recast unpaid claims for each year-end accounting date are emerging towards an ultimate somewhere in the low-to-mid four-hundred million dollar range.

4.2.4 Estimation of aggregate unpaid loss

While we may observe an order-of-magnitude unpaid claim estimate as of 12/31/12, we can apply our formal development treatment to the emergence of reported losses by accounting year recast at the current accounting date exposure level.[14]

The recast accounting date representation results in a CDF which is appropriate to develop the

[13] Footnote 7 applies.
[14] Footnote 8 applies.

current accounting date total case reserves to ultimate. Exhibit 4, Table 4, Column (4) displays the indicated total emergence of unpaid year-end accounting date losses at the current 2012 year-end accounting date exposure level. While each figure in Column (4) provides an estimate of unpaid losses as of 12/31/12, the most recent estimate is the only one that incorporates the entire actual available 2012 year-end accounting date experience (i.e., the aggregate case reserves as of 12/31/12). As such, the most recent estimate of $437,699 (= 148,006 x 2.957307) is accepted as the incurred development accounting date unpaid claim estimate.

While accident year case outstanding reserving methods appear in the actuarial literature [1], [8], [13], [20], the procedure described above is seen to reduce the current accounting date incurred development unpaid claim estimate to a particularly parsimonious formulation:

Aggregate Unpaid Claim Estimate = Aggregate Case Reserves x CDF

4.2.5 Allocation of aggregate unpaid loss estimate to accident year

Exhibit 4, Table 4, Column (9) allocates the $437,699 aggregate estimated unpaid loss as of 12/31/12 to accident year using the iterative Column (7) IBNR procedure described in Section 4.1.6.

5. EXPECTED UNPAID LOSSES

The key assumption of the traditional accident year expected loss technique is that the actuary can better estimate total unpaid claims based on an *a priori* (or initial) estimate than from claims experience observed to date. In certain circumstances, claims experience reported to date may provide little information about ultimate claims (e.g., assumptions A1-A7 are not generally well satisfied) especially when compared to the *a priori* estimate.[15]

To be compatible with our accounting date paradigm, expected loss by accident year is reframed as aggregate expected unpaid loss as of the current accounting date.[16] Continuing with our Section 4.2 example, comparable industry experience[17] is used to derive expected unpaid losses as of the current year-end accounting date. The critical assumption in this calculation is that the industry loss reserve to earned premium ratio by accident year as of the current accounting date is appropriate for the particular

[15] Adapted from Friedland's [10] Chapter 8 – Expected Claims Technique p. 131.

[16] Friedland's [10] Chapter 8 – Expected Claims Technique is written in a traditional accident year ultimate context. Her Chapter 8 discussion of expected claims may be generally adapted to accounting date expected unpaid claims.

[17] This 'comparable industry experience' is artificially constructed for illustrative purposes only and does not represent actual industry experience.

insurer under review. Exhibit 5 displays an example of this calculation which results in a Column (6) expected unpaid loss of $432,407 as of 12/31/12.

6. BORNHUETTER-FERGUSON BY ACCOUNTING DATE

The traditional Bornhuetter-Ferguson [4] method is essentially a blend of development and expected loss techniques by accident year. The Exhibit 5, Column (9) aggregate unpaid loss estimate of $434,197 [= 148,006 + (1 - 1/2.957307)x(432,407)] as of accounting date 12/31/12 is the result of an accounting date analogue to the traditional Bornhuetter-Ferguson method.[18] As a hybrid of development and expected unpaid losses, the Bornhuetter-Ferguson by accounting date technique may be particularly suitable when assumptions A1-A7 are partially satisfied.

The accounting date analogue of the traditional Bornhuetter-Ferguson method is seen to reduce to a concise formulation:

Aggregate Unpaid Claim Estimate = Aggregate Case Reserves
+ (1-1/CDF)x(Aggregate Expected Unpaid Losses)

Column (12) displays an accident year allocation of the aggregate $434,197 unpaid claim estimate.

Application of the Bornhuetter-Ferguson method by accounting date is ill-advised where the Column (8) CDF is below unity. Caution is advised if any Column (10) implied IBNR is negative.

7. CAPE COD BY ACCOUNTING DATE

The traditional Cape Cod method is a Bornhuetter-Ferguson accident year ultimate calculation where expected losses are obtained from reported loss experience instead of an independent, and often judgmental, selection.[19] While we have previously observed relative consistency in the emergence of each recast accounting date at the current accounting date exposure level, the Cape Cod by accounting date technique explicitly reflects this important feature. Exhibit 6 displays a Cape Cod by accounting date technique applied to our example resulting in a Column (7) aggregate unpaid loss estimate of $437,867 as of accounting date 12/31/12.[20] Column (12) displays an accident year allocation of the aggregate $437,867 unpaid loss estimate.

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[18] Friedland's [10] Chapter 9 – Bornhuetter-Ferguson Technique is written in a traditional accident year ultimate context. Her Chapter 9 discussion may be adapted to the Bornhuetter-Ferguson method by accounting date.

[19] Adapted from Friedland [10] Chapter 10 – Cape Cod Technique p. 174.

[20] Friedland's [10] Chapter 10 – Cape Cod Technique is written in a traditional accident year ultimate context. Her Chapter 10 discussion may be adapted to the Cape Cod method by accounting date.

Application of the Cape Cod method by accounting date is ill-advised when the Column (3) CDF for the current year-end accounting date is below unity. Caution is advised if any Column (10) IBNR is negative.

8. EXPOSURE MEASURES

As indicated in Section 2, the exposure metric as of each stage of development is intended to provide a reasonable measure of the relative accident year exposure to remaining development. In order to properly apply the accounting date paradigm, it is important that the exposure metric reflects volume and total frequency and severity trend or, if necessary, be adjusted to reflect volume and total trend. Several alternative exposure metrics may be reasonable, as follows:

8.1 Case Reserves

Case reserves have been used as the exposure metric for examples presented in previous sections. Footnote 5 outlines situations under which case reserves may serve as a reasonable exposure measure.

8.2. Earned Premium

Earned premium is a commonly used exposure metric. Ideally, earned premium (or more precisely, the pure premium portion of earned premium) would be brought to the same premium adequacy level[21] to more accurately measure relative exposure. Exhibit 7, Table 1 displays an example of (independently derived) earned premium at the same adequacy level for each accident year. As indicated by this exhibit, earned premium is insensitive to actual emerged experience since it is remains unchanged at each stage of development.

Using earned premium at the same adequacy level as the A4 exposure metric, Exhibit 7, Table 2 and Exhibit 7, Table 3 display techniques described in Sections 3.2.3-3.2.5 to derive unpaid claim estimates based upon loss payments emerged by year-end accounting date.

Using earned premium at the same adequacy level as the A4 exposure measure, Exhibit 8, Table 1 and Exhibit 8, Table 2 display techniques described in Sections 4.2.3-4.2.5 to derive unpaid claim estimates based upon reported losses emerged by year-end accounting date. Note that, unlike Exhibit 4, Table 3 where case reserves are used as the A4 exposure measure, only the Exhibit 8, Table 1 recast year-end accounting date 2012 reported losses as of 0 years equals actual aggregate case reserves as of

[21] An example of the 'same premium adequacy level' would be where all earned premium is 7% inadequate. Under the assumption that all earned premium is at the same premium adequacy level, it would be appropriate to use actual (unadjusted) earned premium as the exposure measure. Used here, 'same premium adequacy level' is not to be interpreted as actual earned premium for each accident year should be brought to a common (e.g., current) rate level.

12/31/12.

8.3 Claim Counts; Averages and Counts (Frequency/Severity)

Claim counts are a rich source of exposure metrics. Use of claim counts as an exposure metric allows the practitioner to incorporate and estimate average cost per claim. Claim count exposures provide a means to derive an accounting date analogue to traditional averages and counts (frequency/severity) methods. While claim counts already reflect frequency trend, they need to be adjusted to additionally reflect any severity trend. As an example, Exhibit 9, Table 1 displays (independently derived) projected remaining claim counts to be closed with payment where we are confident these are reasonable estimates. These exposures are sensitive to actual emerged experience but need to be adjusted to reflect severity trend. Although a suitable severity trend index would be appropriate, Exhibit 9, Table 2 restates the Table 1 claim count exposure assuming a constant 5% annual severity trend.

Using the trend adjusted claim count exposure metric, Exhibit 9, Table 3 and Exhibit 9, Table 4 display techniques described in Sections 3.2.3-3.2.5 to derive unpaid claim estimates based upon loss payments emerged by year-end accounting date. Exhibit 9, Table 4, Column (9) displays estimated unpaid average cost per claim projected to be closed with payment.

Using the trend adjusted claim count exposure metric, Exhibit 10, Table 1 and Exhibit 10, Table 2 display techniques described in Sections 4.2.3-4.2.5 to derive unpaid claim estimates based upon reported losses emerged by year-end accounting date. Exhibit 10, Table 2, Column (11) displays estimated unpaid average cost per claim projected to be closed with payment.[22]

8.4 Other Exposure Measures

Freidland [10 p. 35, 132] extends the list of potential exposure measures to include: payroll, number of vehicles, etc. for particular coverages. The Struzzieri and Hussian [19] 'Best Exposure Base' section adds base class equivalent exposures and contains other valuable exposure discussion. Several of these other exposure measures may require trend adjustments.

Section 9 expands the meaning of "exposures" in different contexts to include exposure metrics beyond those discussed in this section.

[22] Friedland's [10] Chapter 11 – Frequency-Severity Techniques is written in a traditional accident year ultimate context. Her Chapter 11 discussion of frequency/severity techniques may be generally adapted to accounting date averages and counts methods.

9. BROAD APPLICABILITY

We have narrowly referred to the quantity being estimated by development methods as "losses" (or "claims") and the exposure base as "exposures". However, the accounting date paradigm has much broader application. Accounting date techniques described herein are useful any time we make a development-based projection where the ratio of remaining accident year "losses" to "exposures" is expected to be equal at each stage of development. For example, if we are estimating unpaid DCCE where we expect a constant ratio of accident year unpaid DCCE to unpaid loss at each stage of development, then unpaid "losses" are unpaid DCCE and "exposures" could be estimated unpaid losses when we are confident we have reasonable estimates of unpaid losses.[23]

10. ACCOUNTING DATE IMPLEMENTATION CHALLENGES

As previously indicated, factors to consider in an unpaid claim analysis require professional actuarial judgment.[24] This section briefly addresses several accounting date implementation challenges requiring actuarial judgment.

10.1 Data Availability

For all but relatively fast developing lines of business, it is optimal to have accident year experience available for older accident years as well as several years of calendar year activity (e.g., Exhibit 1, Table 1 upper right corner experience and 10 calendar year diagonals). If this experience were not readily available, one could: (1) obtain compatible supplementary (e.g., industry, prior insurer, competitor) experience where the exposure measure is consistent with available experience; (2) perform the accounting date representation though a common (though incomplete) stage of development and estimate tail development factors; and/or (3) create pseudo-data based upon available experience. These three approaches may also be useful in situations where some available experience is relatively old and deemed unrepresentative of future development.

10.2 Supplementary Experience

As indicated in Section 10.1, supplementary experience may permit completion of accounting date representations through a further stage of development than would otherwise be possible.

[23] This entire Section is derived from Gluck [11] p. 505-6 who also provides additional examples where we may apply this general principle.
[24] These factors are outlined in Actuarial Standard of Practice No. 43 "Property/Casualty Unpaid Claim Estimates", especially Section 3.6.

Supplementary data may also be used to increase the A5 credibility of experience. The use of supplementary experience should be carefully weighed and balanced with the consideration of the use of tail development factors and pseudo-data.

10.3 Tail Development Factors

At comparable late stages of development, recast accounting date CDFs typically converge to unity more quickly than for traditional accident year reserving methods. However, additional historical data is often necessary to attain this quicker convergence. The actuary should consider the trade-offs and interplay between faster convergence, reliance on supplementary experience and the use of pseudo-data. When we perform accounting date representations through a late (but incomplete) common stage of development, we may capitalize on faster convergence and estimate tail development by adapting accident year tail factor procedures discussed in the actuarial literature.[25] When A1-A7 are satisfied, all other things being equal, faster CDF convergence implies accounting date tail development factors with less leverage and less uncertainty than for traditional accident year reserving methods.

10.4 Pseudo-Data

In addition to increasing A5 credibility, pseudo-data may also permit completion of accounting date representations through a further stage of development than would otherwise be possible. For example, if accident year 2002 & prior experience were unavailable on Exhibit 2, Table 1, then we would be unable to create Exhibit 2, Table 3 with as many year-end accounting dates and through 9 years of development. However, we could create pseudo-data to substitute for the missing experience. On the theory that accident year 2003 is the most recent fully developed accident year, a simple approach would be to use accident year 2003 experience to serve as the missing experience. A more nuanced approach would consider all accident year 2003 & subsequent experience in the creation of pseudo-data. As with previously discussed data availability tools, the actuary should consider the impact of pseudo-data and its interaction with supplementary data and tail development factors.

10.5 Actuarial Consistency Assumptions Initially Unsatisfied

Assumptions A1-A7 should be satisfied to make optimal use of accounting date reserving methods. When assumptions A1-A7 are satisfied, the noise that remains is expected to be reduced and credibility

[25] Friedland's [10] Chapter 7- Development Technique "Step 5 - Select Tail Factor" is written in a traditional accident year context. Her discussion may be adapted to an accounting date framework.

increased by aggregating all accident years.[26] When assumptions A1-A7 are not initially satisfied, it may be appropriate to pre-process the data using approaches described by Berquist and Sherman [2] that address situations where an insurer's historical experience has been inconsistent as a result of changes in operations and procedures.[27]

11. SUMMARY RESULTS AND DISCUSSION

This paper introduces the accounting date reserving paradigm. The general principle is always the same: recast the aggregate emergence of unpaid claims of prior year-end accounting dates at the current accounting date exposure level; use this recast emergence as basis to estimate the current accounting date aggregate unpaid claims; and, if necessary, allocate the aggregate unpaid claim estimate to accident year using an iterative top-down procedure.

11.1 Accounting Date Analogues to Basic Reserving Methods

The new reserving techniques presented are seen to be accounting date analogues to basic reserving methods including:

- Payment Development
- Incurred Development
- Bornhuetter-Ferguson
- Cape Cod
- Averages & Counts (Frequency/Severity)

11.2 Characteristics of Accounting Date Reserving Paradigm

As discussed, highlights of the accounting date paradigm are:

- In contrast to traditional estimates which require an estimated ultimate for each accident year, the central goal under the accounting date representation is to directly target only one quantity, i.e., the aggregate estimate of unpaid claims incurred as of the current accounting date.
- In contrast to traditional indirect accident year estimated ultimate approaches, a reasonable unpaid claim estimate is visibly apparent under a year-end accounting date representation appropriately recast at the current accounting date exposure level.

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26 As a consequence of The Law of Large Numbers

27 Friedland's [10] Chapter 13 - Berquist-Sherman Techniques provides a summary. Fleming and Mayer [7] also address an aspect of this issue.

- Tail factors converge to unity faster in the accounting date representation than in the traditional accident year representation.
- Accident year payments during first year calendar year are not reflected in the accounting date representation.
- The final diagonal of the accounting date representation contains all calendar year activity through the current accounting date on losses incurred as of the year-end accounting date that had remained unpaid as of that accounting date.
- Especially for longer tailed lines of business, the data volume for the accounting date representation tends to grow faster than under the traditional accident year representation.
- Accounting date reported emergence of unpaid claims converges to ultimate faster than accounting date payment emergence.
- Exhibits displaying cumulative reported losses emerged by year-end accounting date display one additional diagonal (as of 0 years) for each accounting date as compared with exhibits displaying the corresponding cumulative emerged loss payments. In particular, the current recast year-end accounting date contains an entry as of 0 years that equals total current year-end accounting date case reserves.
- When appropriate assumptions are satisfied, the accounting date reserving paradigm is associated with improved accuracy over traditional accident year reserving methods as further discussed below.

11.3 Accounting Date Paradigm Consistent with Improved Accuracy

When assumptions A1-A7 are satisfied, two powerful forces imply improved accuracy of the accounting date reserving paradigm over traditional accident year reserving methods: **forward-looking** and **aggregation.**[28]

11.3.1 Forward-looking

The recent Forray [8], [9] empirical studies "…suggest that there are many more valuable methods for reserve analysis beyond the [accident year] incurred- and paid-chain-ladder methods and that the paid chain ladder, in particular, should not receive the weight it often does."[29] Forray's analysis found

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[28] When assumptions are insufficiently satisfied and absent appropriate adjustments, these forces may serve to leverage distinctive individual accident year attributes and distort the resulting unpaid claim estimate.

[29] Forray goes on to note: "Of course, this is a general observation, and a particular company's circumstances always

that the best-performing reserving methods "…were observed to satisfy the following two criteria: 1. each relies at least in part on case reserves ("Criteria 1")"; and "2. amounts paid to date do not directly influence the indicated unpaid loss ("Criteria 2")." Despite the inclination to place more reliance on paid loss triangle experience ("real money changing hands, less vulnerable to changes in case reserving practices, etc."), Meyers [14] has also recently observed instances of superior empirical results using reported loss experience.

While all accounting date reserving methods incorporate forward-looking A4 exposure measures, accounting date incurred methods also rely upon forward-looking A3 case reserves.

11.3.2 Aggregation

When assumptions A1-A7 are satisfied, the noise that remains is expected to be reduced and credibility increased as a result of aggregating accident years.

11.3.3 Excellent candidates for improved accuracy – accounting date incurred methods

The Section 4 accounting date incurred development method (i.e., aggregate case reserves x CDF): essentially relies on forward-looking case reserves (Criteria 1) in conjunction with a forward-looking exposure adjusted CDF; and uses limited amounts of paid to date (to estimate CDF) which do not directly influence the indicated unpaid loss (Criteria 2). Furthermore, when assumptions A1-A7 are satisfied, the accounting date incurred development method capitalizes on the aggregation of accident years which would be expected to result in reduced volatility and commensurate increased credibility. As such, all accounting date incurred methods[30] are excellent candidates to be relatively more accurate performing methods as compared with reserving methods in common use.

11.4 Areas for Future Research

Future areas of research include:

1. Compare accounting date reserving methods with traditional actuarial reserving methods using relative "method skill" measures [8], [9] as well as other performance analytics. Empirically test the hypothesis that incurred development accounting date methods produce relatively more accurate aggregate unpaid claim estimates than analogous accident year methods.

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should be considered in selecting methods for any reserving analysis."

[30] This includes: incurred development; (incurred) Bornhuetter-Ferguson; (incurred) Cape Cod; and (reported) averages & counts.

2. Explore the impact of changing environments (e.g., changes in payment pattern, changes in case reserve adequacy, changes in calendar year inflation trend) on accounting date reserving methods. As described by Boles and Staudt [3], compare the performance of accounting date reserving techniques to other reserving methods under changing environments.
3. Investigate techniques to organize or modify historical experience such that actuarial assumptions A1-A7 are well satisfied for application to accounting date reserving methods.
4. Consider optimal weighting scheme(s) to credibly represent historical experience and recast it at the current accounting date exposure level.
5. Adapt tail development factor and expected unpaid loss procedures to apply to the accounting date paradigm.
6. Analyze impacts, trade-offs, interactions and sensitivities associated with the use of various combinations of supplementary data, tail factors and pseudo-data. Consider the appropriate balance of stability and responsiveness.
7. Generalize Appendix A, B and C formulas to incorporate all situations including where no actual accident year experience has reached maturity as well as for run-off business.
8. Experiment with the most effective exposure measures to use under different circumstances. Is it advisable to use different exposures for payments versus case reserves? Would a hybrid exposure metric be more effective than any one particular exposure measure?
9. Conceive of the recast accounting date representation as sample emergence from the aggregate distribution of unpaid future payments which have been incurred and unpaid as of the current accounting date. From this perspective, consider use of the recast accounting date representation as a basis to address the stochastic analysis and estimation of loss variability [4].

12. CONCLUSION

As actuarial science has evolved, the continued widespread practice of estimating unpaid claims on an individual accident year basis may have been motivated by several considerations including: conception of the total unpaid claim estimate as the sum of individual accident year ultimate estimates reduced by cumulative payments to date; the link to ratemaking, which requires cost estimates for an individual future policy year and is often derived by trending forward individual accident year estimated ultimate loss costs; statutory annual statement Schedule P reporting requirements by individual accident year; and the natural tendency to apply familiar methods. Actuarial reserving methods that develop individual accident years to estimated ultimate values have become ingrained into common actuarial practice. However, as we have seen, this familiar paradigm may not take full advantage of reasonable actuarial assumptions.

This paper introduces a new accounting date paradigm that provides practical and powerful additions to the loss reserving methodologies available to actuaries. In addition to revealing visibly apparent aggregate unpaid claim estimates, the structure of appropriate accounting date reserving applications suggests improved accuracy over corresponding accident year development methods.

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Appendix A, B and C formulas pertain to specific exhibits presented in this paper and may not necessarily be more generally applicable.

Appendix A

Where required data for appropriate application is available, compute cumulative emerged loss payments $a_{i,j}$ as of year-end accounting date i, at year-end valuation date j, recast at current year-end accounting date c exposure level as:

$$a_{i,j} = \sum_{k=0}^{k=n-2} \left(e_{c-k}^{c} / e_{i-k}^{i}\right)\left(p_{i-k}^{j} - p_{i-k}^{i}\right)$$

where, $i < j$

n = number of years until accident year payments reach ultimate

e_m^s = exposure to remaining payments for accident year m as of year-end s

p_m^s = cumulative loss payment for accident year m through year-end s

Appendix B

Where required data for appropriate application is available, compute cumulative emerged reported losses $b_{i,j}$ for year-end accounting date i, at year-end valuation date j, recast at the current year-end accounting date c exposure level as:

$$b_{i,j} = a_{i,j} + \sum_{k=0}^{k=n-2-j+i} \left(e_{c-k}^{c} / e_{i-k}^{i}\right)\left(r_{i-k}^{j}\right)$$

where, $i \leq j$

$a_{i,j}$ = computed via Appendix A and equals 0 when $i=j$

n = number of years until accident year payments reach ultimate

e_m^s = exposure to unreported loss (IBNR) for accident year m as of year-end s

r_m^s = case reserves of accident year m as of year-end s

Appendix C

Where required data for appropriate application is available, compute the unpaid claim [or IBNR] estimate u_i iteratively for accident year i associated with the aggregate unpaid claim [or IBNR] estimate d_c at current year-end accounting date c as:

$$u_i = (e_i^i / e_c^c)\left[d_i - \sum_{k=c-n+1}^{k=i-1} \left(e_{c+k-i}^{c} / e_k^i\right) u_k \right]$$

where, $i \leq c$

n = number of years until accident year payments reach ultimate

e_m^s = remaining exposure for accident year m as of year-end s

d_i = estimated aggregate remaining unpaid [or IBNR] at year-end accounting date i at year-end accounting date c exposure level

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Abbreviations and notations

ALAE, allocated loss adjustment expenses
BF, Bornhuetter-Ferguson
CAS, Casualty Actuarial Society
CDF, cumulative age-ultimate development factor
CL, chain-ladder
DCCE, defense and cost containment expenses
IBNR, incurred but not reported loss (i.e., all unreported development beyond case reserves)
IRIS, Insurance Regulatory Information System
LDF, age-to-age loss development factor
NAIC, National Association of Insurance Commissioners
PCAS, Proceedings of the Casualty Actuarial Society

Biography of Author

Bertram A. Horowitz is President of Bertram Horowitz, Inc. Actuarial and Risk Consultants which provides property/casualty and title insurance actuarial and risk assessment services. He has a B.S. degree in Applied Mathematics from the State University of New York at Stony Brook and a M.S. in Mathematics from Brown University. He is a Fellow of the CAS and a Member of the American Academy of Actuaries. Mr. Horowitz is the former Special Deputy Superintendent and Financial Actuary of the New York State Insurance Department (now the New York State Department of Financial Services). He has served on the CAS Committee on Reserves and has been an active participant in the development of actuarial research, principles and standards.

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Exhibit 1
Table 1

NO NOISE IN PAYMENT PATTERN

CUMULATIVE LOSS PAYMENTS BY ACCIDENT YEAR
($000 Omitted)

Accident Year	As of 1 Year		As of 2 Years		As of 3 Years		As of 4 Years		As of 5 Years		As of 6 Years		As of 7 Years		As of 8 Years		As of 9 Years		As of 10 Years
1995																	57,014	1.032609	58,873
1996															63,795	1.051429	67,075	1.032609	69,263
1997													55,873	1.067073	59,621	1.051429	62,687	1.032609	64,731
1998											51,620	1.093333	56,438	1.067073	60,223	1.051429	63,320	1.032609	65,385
1999									45,210	1.119403	50,608	1.093333	55,331	1.067073	59,042	1.051429	62,079	1.032609	64,103
2000							43,707	1.175439	51,375	1.119403	57,509	1.093333	62,876	1.067073	67,094	1.051429	70,544	1.032609	72,845
2001					39,692	1.295455	51,420	1.175439	60,441	1.119403	67,658	1.093333	73,972	1.067073	78,934	1.051429	82,993	1.032609	85,700
2002			27,900	1.466667	40,920	1.295455	53,010	1.175439	62,310	1.119403	69,750	1.093333	76,260	1.067073	81,375	1.051429	85,560	1.032609	88,350
2003	15,000	2.000000	30,000	1.466667	44,000	1.295455	57,000	1.175439	67,000	1.119403	75,000	1.093333	82,000	1.067073	87,500	1.051429	92,000	1.032609	95,000
2004	15,300	2.000000	30,600	1.466667	44,880	1.295455	58,140	1.175439	68,340	1.119403	76,500	1.093333	83,640	1.067073	89,250	1.051429	93,840		
2005	14,841	2.000000	29,682	1.466667	43,534	1.295455	56,396	1.175439	66,290	1.119403	74,205	1.093333	81,131	1.067073	86,573				
2006	15,731	2.000000	31,463	1.466667	46,146	1.295455	59,780	1.175439	70,267	1.119403	78,657	1.093333	85,999						
2007	15,889	2.000000	31,778	1.466667	46,607	1.295455	60,377	1.175439	70,970	1.119403	79,444								
2008	14,141	2.000000	28,282	1.466667	41,480	1.295455	53,736	1.175439	63,163										
2009	18,383	2.000000	36,767	1.466667	53,924	1.295455	69,857												
2010	22,428	2.000000	44,855	1.466667	65,788														
2011	23,549	2.000000	47,098																
2012	25,904																		

	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10
Average LDF	2.000000	1.466667	1.295455	1.175439	1.119403	1.093333	1.067073	1.051429	1.032609
Average CDF	6.333333	3.166667	2.159091	1.666667	1.417910	1.266667	1.158537	1.085714	1.032609
Weighted LDF	2.000000	1.466667	1.295455	1.175439	1.119403	1.093333	1.067073	1.051429	1.032609
Weighted CDF	6.333333	3.166667	2.159091	1.666667	1.417910	1.266667	1.158537	1.085714	1.032609

Exhibit 1
Table 2

NO NOISE IN CASE RESERVES

CASE RESERVES BY ACCIDENT YEAR
($000 Omitted)

Accident Year	As of 1 Year	As of 2 Years	As of 3 Years	As of 4 Years	As of 5 Years	As of 6 Years	As of 7 Years	As of 8 Years	As of 9 Years	As of 10 Years
1995									1,239	0
1996								2,916	1,458	0
1997							4,088	2,726	1,363	0
1998						6,194	4,130	2,753	1,377	0
1999					7,422	6,073	4,049	2,699	1,350	0
2000				9,968	8,435	6,901	4,601	3,067	1,534	0
2001			15,336	11,727	9,923	8,119	5,413	3,608	1,804	0
2002		18,600	15,810	12,090	10,230	8,370	5,580	3,720	1,860	0
2003	25,000	20,000	17,000	13,000	11,000	9,000	6,000	4,000	2,000	0
2004	25,500	20,400	17,340	13,260	11,220	9,180	6,120	4,080	2,040	
2005	24,735	19,788	16,820	12,862	10,883	8,905	5,936	3,958		
2006	26,219	20,975	17,829	13,634	11,536	9,439	6,293			
2007	26,481	21,185	18,007	13,770	11,652	9,533				
2008	23,568	18,855	16,026	12,256	10,370					
2009	30,639	24,511	20,834	15,932						
2010	37,379	29,904	25,418							
2011	39,248	31,399								
2012	43,173									

Exhibit 1
Table 3

NO NOISE IN PAYMENT PATTERN

TRADITIONAL PAYMENT DEVELOPMENT METHOD BY ACCIDENT YEAR
($000 Omitted)

(1) Accident Year	(2) Cumulative Loss Payments as of 12/31/12	(3) Cumulative Loss Development Factor to Ultimate	(4)= (2)x(3) Payment Development Method Estimated Ultimate Losses	(5)= (4)-(2) Unpaid Loss Estimate as of 12/31/12
2003	95,000	1.000000	95,000	0
2004	93,840	1.032609	96,900	3,060
2005	86,573	1.085714	93,993	7,421
2006	85,999	1.158537	99,633	13,634
2007	79,444	1.266667	100,629	21,185
2008	63,163	1.417910	89,560	26,397
2009	69,857	1.666667	116,428	46,571
2010	65,788	2.159091	142,042	76,254
2011	47,098	3.166667	149,144	102,046
2012	25,904	6.333333	164,058	138,154
Total	712,665		1,147,386	**434,721**

(2) Exhibit 1, Table 1 final diagonal
(3) Exhibit 1, Table 1 corresponding CDF; payments completed as of 10 years

Exhibit 1
Table 4

NO NOISE IN PAYMENT PATTERN

CUMULATIVE LOSS PAYMENTS EMERGED BY YEAR-END ACCOUNTING DATE
($000 Omitted)

Cumulative Emerged Payments of Losses which were Unpaid as of Year-End Accounting Date
Derived by appropriate accumulation of Cumulative Loss Payments of Exhibit 1, Table 1

Year-End Accounting Date	As of 1 Year		As of 2 Years		As of 3 Years		As of 4 Years		As of 5 Years		As of 6 Years		As of 7 Years		As of 8 Years		As of 9 Years
2003	66,519	1.826948	121,526	1.359896	165,263	1.200125	198,337	1.125778	223,283	1.082742	241,758	1.051255	254,149	1.028684	261,439	1.011475	264,439
2004	70,308	1.825186	128,324	1.361063	174,658	1.201230	209,804	1.126951	236,439	1.082606	255,970	1.050396	268,870	1.028229	276,460		
2005	72,858	1.826059	133,043	1.360851	181,051	1.201759	217,580	1.126144	245,027	1.080913	264,852	1.049204	277,884				
2006	75,916	1.825794	138,608	1.361905	188,770	1.200954	226,705	1.124461	254,920	1.079919	275,293						
2007	78,580	1.827083	143,572	1.360128	195,277	1.198736	234,085	1.123233	262,932								
2008	79,133	1.820169	144,036	1.354522	195,100	1.196178	233,374										
2009	83,286	1.819126	151,508	1.357781	205,714												
2010	90,649	1.828898	165,788														
2011	98,688																
2012																	?

Exhibit 1
Table 5

NO NOISE IN PAYMENT PATTERN OR CASE RESERVES

LOSS PAYMENTS EMERGED BY YEAR-END ACCOUNTING DATE RECAST AT 2012 YEAR-END ACCOUNTING DATE EXPOSURE LEVEL
USING CASE RESERVES AS EXPOSURE MEASURE
($000 Omitted)

Cumulative Emerged Payments of Losses which were Unpaid as of Year-End Accounting Date
Derived by appropriate accumulation of Cumulative Loss Payments of Exhibit 1, Table 1 Exposure Adjusted to 2012 Year-End Accounting Date Exposure Level

Year-End Accounting Date	As of 1 Year		As of 2 Years		As of 3 Years		As of 4 Years		As of 5 Years		As of 6 Years		As of 7 Years		As of 8 Years		As of 9 Years
2003	107,813	1.829724	197,268	1.363909	269,056	1.202395	323,511	1.127883	364,883	1.085310	396,011	1.053151	417,059	1.029926	429,540	1.012061	434,721
2004	107,813	1.829724	197,268	1.363909	269,056	1.202395	323,511	1.127883	364,883	1.085310	396,011	1.053151	417,059	1.029926	429,540		
2005	107,813	1.829724	197,268	1.363909	269,056	1.202395	323,511	1.127883	364,883	1.085310	396,011	1.053151	417,059				
2006	107,813	1.829724	197,268	1.363909	269,056	1.202395	323,511	1.127883	364,883	1.085310	396,011						
2007	107,813	1.829724	197,268	1.363909	269,056	1.202395	323,511	1.127883	364,883								
2008	107,813	1.829724	197,268	1.363909	269,056	1.202395	323,511										
2009	107,813	1.829724	197,268	1.363909	269,056												
2010	107,813	1.829724	197,268														
2011	107,813																
2012																	434,721
Average LDF		1.829724		1.363909		1.202395		1.127883		1.085310		1.053151		1.029926		1.012061	
Average CDF		4.032178		2.203708		1.615729		1.343759		1.191399		1.097750		1.042348		1.012061	
Weighted LDF		1.829724		1.363909		1.202395		1.127883		1.085310		1.053151		1.029926		1.012061	
Weighted CDF		4.032178		2.203708		1.615729		1.343759		1.191399		1.097750		1.042348		1.012061	

Exhibit 1
Table 6

NO NOISE IN PAYMENT PATTERN OR CASE RESERVES

ACCOUNTING DATE PAYMENT DEVELOPMENT INDICATED AGGREGATE UNPAID LOSS AS OF 12/31/12;
ALLOCATION OF TOTAL UNPAID CLAIM ESTIMATE TO ACCIDENT YEAR
($000 Omitted)

(1) Year-End Accounting Date	(2) Recast Cumulative Loss Payments As of 12/31/12 at 2012 Year-End Accounting Date Exposure Level	(3) Weighted Cumulative Development Factor	(4)= (2)x(3) Indicated Total Emergence at 2012 Year-End Accounting Date Exposure Level	(5)= (4)-(2) Payment Development Indicated Unpaid Loss as of 12/31/12 at 2012 Year-End Accounting Date Exposure Level	(6) Accident Year	(7) Accident Year Allocation of Aggregate Accounting Date Payment Development Indicated Unpaid Loss as of 12/31/12
2003	434,721	1.000000	434,721		2003	
2004	429,540	1.012061	434,721	5,181	2004	3,060
2005	417,059	1.042348	434,721	17,662	2005	7,421
2006	396,011	1.097750	434,721	38,710	2006	13,634
2007	364,883	1.191399	434,721	69,838	2007	21,185
2008	323,511	1.343759	434,721	111,210	2008	26,397
2009	269,056	1.615729	434,721	165,665	2009	46,571
2010	197,268	2.203708	434,721	237,453	2010	76,254
2011	107,813	4.032178	434,721	326,908	2011	102,046
2012			$\boxed{434,721}$ *	434,721	2012	138,154
					Total	**434,721**

(2) Exhibit 1, Table 5 final diagonal
(3) Exhibit 1, Table 5 corresponding CDF
(7) Iterative Formula

* Accept most recent indication

Exhibit 2
Table 1

NOISE IN PAYMENT PATTERN

CUMULATIVE LOSS PAYMENTS BY ACCIDENT YEAR
($000 Omitted)

Accident Year	As of 1 Year		As of 2 Years		As of 3 Years		As of 4 Years		As of 5 Years		As of 6 Years		As of 7 Years		As of 8 Years		As of 9 Years		As of 10 Years
1995																	56,900	1.036922	59,001
1996															64,432	1.051174	67,730	1.031325	69,851
1997													56,432	1.069198	60,337	1.057425	63,802	1.030117	65,724
1998											52,136	1.093333	57,002	1.068401	60,901	1.044753	63,627	1.036021	65,919
1999									44,848	1.121570	50,300	1.096721	55,165	1.068755	58,958	1.042747	61,478	1.033915	63,563
2000							44,668	1.181962	52,796	1.119674	59,115	1.092251	64,568	1.065708	68,811	1.061177	73,020	1.031818	75,344
2001					39,534	1.284775	50,792	1.152742	58,550	1.125847	65,918	1.108249	73,054	1.064928	77,797	1.064181	82,790	1.031708	85,415
2002			27,370	1.532790	41,952	1.291066	54,163	1.151099	62,347	1.115752	69,564	1.094144	76,113	1.066665	81,187	1.053042	85,494	1.033287	88,339
2003	15,480	1.962209	30,375	1.445695	43,913	1.292191	56,744	1.182574	67,104	1.110873	74,544	1.093904	81,544	1.066504	86,967	1.046052	90,972	1.032186	93,900
2004	15,973	1.881226	30,049	1.470468	44,186	1.342105	59,303	1.176127	69,748	1.129863	78,805	1.090784	85,959	1.080274	92,860	1.047848	97,303		
2005	14,514	2.025562	29,400	1.433451	42,143	1.347928	56,806	1.182879	67,195	1.133108	76,139	1.089507	82,954	1.062975	88,178				
2006	15,574	2.020202	31,463	1.476000	46,439	1.301513	60,441	1.175426	71,044	1.120459	79,602	1.088167	86,621						
2007	16,365	1.955340	32,000	1.469911	47,037	1.283971	60,394	1.171531	70,754	1.120965	79,313								
2008	13,547	2.078288	28,155	1.469714	41,379	1.289659	53,365	1.175773	62,746										
2009	18,494	2.019881	37,355	1.444160	53,946	1.300354	70,149												
2010	21,082	2.055319	43,330	1.473913	63,865														
2011	24,138	1.954146	47,169																
2012	25,567																		

	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10
Average LDF	1.994686	1.468456	1.303729	1.172235	1.122012	1.094118	1.068156	1.052044	1.033033
Average CDF	6.379437	3.198216	2.177945	1.670550	1.425099	1.270128	1.160869	1.086797	1.033033
Weighted LDF	1.993299	1.467589	1.303666	1.172358	1.122104	1.093804	1.068275	1.052074	1.032894
Weighted CDF	6.370319	3.195867	2.177631	1.670390	1.424813	1.269769	1.160874	1.086680	1.032894

Exhibit 2
Table 2

NOISE IN CASE RESERVES

CASE RESERVES BY ACCIDENT YEAR
($000 Omitted)

Accident Year	As of 1 Year	As of 2 Years	As of 3 Years	As of 4 Years	As of 5 Years	As of 6 Years	After 7 Years	As of 8 Years	As of 9 Years	As of 10 Years
1995									1,273	0
1996								2,779	1,516	0
1997							4,096	2,671	1,357	0
1998						6,207	4,183	3,056	1,374	0
1999					7,393	6,152	4,109	2,669	1,511	0
2000				10,297	8,409	7,005	4,615	3,156	1,580	0
2001			15,504	11,704	10,052	8,143	5,174	3,500	1,824	0
2002		18,321	15,494	11,981	10,373	8,002	5,591	3,638	1,823	0
2003	25,550	20,520	17,170	14,820	10,780	9,018	6,108	4,012	1,958	0
2004	25,245	20,318	17,721	13,432	11,523	9,345	6,120	4,015	1,973	
2005	24,191	19,748	17,324	12,978	10,949	8,905	5,925	4,068		
2006	26,062	20,535	17,686	13,457	11,502	9,420	6,255			
2007	26,428	21,397	17,953	14,004	11,069	9,476				
2008	22,885	18,987	15,946	12,170	10,391					
2009	31,313	24,732	21,064	16,315						
2010	37,903	28,588	24,910							
2011	39,680	31,618								
2012	43,001									

Exhibit 2
Table 3

NOISE IN PAYMENT PATTERN

CUMULATIVE LOSS PAYMENTS EMERGED BY YEAR-END ACCOUNTING DATE
($000 Omitted)

Cumulative Emerged Payments of Losses which were Unpaid as of Year-End Accounting Date
Derived by appropriate accumulation of Cumulative Loss Payments of Exhibit 2, Table 1

Year-End Accounting Date	As of 1 Year		As of 2 Years		As of 3 Years		As of 4 Years		As of 5 Years		As of 6 Years		As of 7 Years		As of 8 Years		As of 9 Years
2003	68,485	1.791063	122,661	1.344663	164,937	1.204728	198,705	1.125951	223,732	1.086669	243,122	1.050816	255,477	1.026816	262,327	1.011162	265,255
2004	68,252	1.826554	124,666	1.392118	173,549	1.204390	209,021	1.136102	237,469	1.082153	256,978	1.053511	270,729	1.027227	278,100		
2005	71,299	1.864343	132,926	1.377161	183,061	1.212152	221,898	1.128225	250,351	1.082149	270,917	1.046491	283,512				
2006	77,516	1.839971	142,627	1.370469	195,466	1.199810	234,522	1.124185	263,646	1.074393	283,259						
2007	80,746	1.840616	148,622	1.352661	201,035	1.196401	240,518	1.117131	268,690								
2008	82,484	1.795766	148,121	1.347481	199,591	1.188147	237,143										
2009	84,499	1.805464	152,560	1.352356	206,315												
2010	90,309	1.822621	164,599														
2011	97,321																
2012																	$\boxed{?}$

Exhibit 2
Table 4

NOISE IN PAYMENT PATTERN AND CASE RESERVES

LOSS PAYMENTS EMERGED BY YEAR-END ACCOUNTING DATE RECAST AT 2012 YEAR-END ACCOUNTING DATE EXPOSURE LEVEL
USING CASE RESERVES AS EXPOSURE MEASURE
($000 Omitted)

Cumulative Emerged Payments of Losses which were Unpaid as of Year-End Accounting Date
Derived by appropriate accumulation of Cumulative Loss Payments of Exhibit 2, Table 1 Exposure Adjusted to 2012 Year-End Accounting Date Exposure Level

Year-End Accounting Date	As of 1 Year		As of 2 Years		As of 3 Years		As of 4 Years		As of 5 Years		As of 6 Years		As of 7 Years		As of 8 Years		As of 9 Years
2003	110,337	1.793203	197,857	1.346831	266,480	1.206838	321,598	1.127627	362,643	1.088906	394,884	1.052614	415,660	1.028032	427,312	1.011532	432,240
2004	104,450	1.831614	191,313	1.396273	267,125	1.205181	321,934	1.137304	366,137	1.085009	397,262	1.056637	419,762	1.028778	431,841		
2005	105,407	1.863660	196,442	1.385869	272,243	1.212790	330,174	1.131679	373,651	1.087079	406,188	1.050341	426,636				
2006	107,687	1.854530	199,709	1.371618	273,924	1.201549	329,133	1.127578	371,123	1.079253	400,536						
2007	111,076	1.844031	204,827	1.356930	277,936	1.199481	333,378	1.121370	373,841								
2008	112,354	1.808011	203,136	1.354758	275,201	1.195522	329,009										
2009	108,263	1.815070	196,504	1.359876	267,222												
2010	106,421	1.827327	194,466														
2011	107,469																
2012																	?
Average LDF		1.829681		1.367451		1.203560		1.129112		1.085062		1.053198		1.028405		1.011532	
Average CDF		4.042031		2.209145		1.615521		1.342285		1.188798		1.095604		1.040264		1.011532	
Weighted LDF		1.829531		1.366944		1.203286		1.128899		1.084878		1.053156		1.028416		1.011532	
Weighted CDF		4.037726		2.206973		1.614531		1.341768		1.188563		1.095573		1.040275		1.011532	

Exhibit 2
Table 5

NOISE IN PAYMENT PATTERN AND CASE RESERVES

ACCOUNTING DATE PAYMENT DEVELOPMENT INDICATED AGGREGATE UNPAID LOSS AS OF 12/31/12;
ALLOCATION OF TOTAL UNPAID CLAIM ESTIMATE TO ACCIDENT YEAR
($000 Omitted)

(1) Year-End Accounting Date	(2) Recast Cumulative Loss Payments As of 12/31/12 at 2012 Year-End Accounting Date Exposure Level	(3) Weighted Cumulative Development Factor	(4)= (2)x(3) Indicated Total Emergence at 2012 Year-End Accounting Date Exposure Level	(5)= (4)-(2) Payment Development Indicated Unpaid Loss as of 12/31/12 at 2012 Year-End Accounting Date Exposure Level	(6) Accident Year	(7) Accident Year Allocation of Aggregate Accounting Date Payment Development Indicated Unpaid Loss as of 12/31/12
2003	432,240	1.000000	432,240		2003	
2004	431,841	1.011532	436,821	4,980	2004	2,924
2005	426,636	1.040275	443,819	17,183	2005	7,107
2006	400,536	1.095573	438,816	38,280	2006	13,814
2007	373,841	1.188563	444,333	70,492	2007	21,790
2008	329,009	1.341768	441,453	112,444	2008	26,195
2009	267,222	1.614531	431,437	164,216	2009	46,535
2010	194,466	2.206973	429,180	234,715	2010	75,706
2011	107,469	4.037726	433,929	326,460	2011	99,442
2012			$\boxed{433,929}$ *	433,929	2012	140,416
					Total	**433,929**

(2) Exhibit 2, Table 4 final diagonal
(3) Exhibit 2, Table 4 corresponding Weighted CDF
(7) Iterative Formula

* Accept most recent indication

Exhibit 3
Table 1

NO NOISE IN PAYMENT PATTERN OR CASE RESERVES

REPORTED LOSSES BY ACCIDENT YEAR: Exhibit 1, Table 1 + Exhibit 1, Table 2
($000 Omitted)

Accident Year	As of 1 Year		As of 2 Years		As of 3 Years		As of 4 Years		As of 5 Years		As of 6 Years		As of 7 Years		As of 8 Years		As of 9 Years		As of 10 Years
1995																	58,254	1.010638	58,873
1996															66,711	1.027322	68,534	1.010638	69,263
1997													59,962	1.039773	62,347	1.027322	64,050	1.010638	64,731
1998											57,814	1.047619	60,567	1.039773	62,976	1.027322	64,697	1.010638	65,385
1999									52,632	1.076923	56,681	1.047619	59,380	1.039773	61,742	1.027322	63,428	1.010638	64,103
2000							53,675	1.114286	59,809	1.076923	64,410	1.047619	67,477	1.039773	70,161	1.027322	72,078	1.010638	72,845
2001					55,028	1.147541	63,147	1.114286	70,364	1.076923	75,776	1.047619	79,385	1.039773	82,542	1.027322	84,797	1.010638	85,700
2002			46,500	1.220000	56,730	1.147541	65,100	1.114286	72,540	1.076923	78,120	1.047619	81,840	1.039773	85,095	1.027322	87,420	1.010638	88,350
2003	40,000	1.250000	50,000	1.220000	61,000	1.147541	70,000	1.114286	78,000	1.076923	84,000	1.047619	88,000	1.039773	91,500	1.027322	94,000	1.010638	95,000
2004	40,800	1.250000	51,000	1.220000	62,220	1.147541	71,400	1.114286	79,560	1.076923	85,680	1.047619	89,760	1.039773	93,330	1.027322	95,880		
2005	39,576	1.250000	49,470	1.220000	60,353	1.147541	69,258	1.114286	77,173	1.076923	83,110	1.047619	87,067	1.039773	90,530				
2006	41,951	1.250000	52,438	1.220000	63,975	1.147541	73,413	1.114286	81,804	1.076923	88,096	1.047619	92,291						
2007	42,370	1.250000	52,963	1.220000	64,614	1.147541	74,148	1.114286	82,622	1.076923	88,977								
2008	37,709	1.250000	47,137	1.220000	57,507	1.147541	65,991	1.114286	73,533										
2009	49,022	1.250000	61,278	1.220000	74,759	1.147541	85,789												
2010	59,807	1.250000	74,759	1.220000	91,206														
2011	62,797	1.250000	78,497																
2012	69,077																		

	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10
Average LDF	1.250000	1.220000	1.147541	1.114286	1.076923	1.047619	1.039773	1.027322	1.010638
Average CDF	2.375000	1.900000	1.557377	1.357143	1.217949	1.130952	1.079545	1.038251	1.010638
Weighted LDF	1.250000	1.220000	1.147541	1.114286	1.076923	1.047619	1.039773	1.027322	1.010638
Weighted CDF	2.375000	1.900000	1.557377	1.357143	1.217949	1.130952	1.079545	1.038251	1.010638

Exhibit 3
Table 2

NO NOISE IN PAYMENT PATTERN OR CASE RESERVES

TRADITIONAL INCURRED DEVELOPMENT METHOD BY ACCIDENT YEAR
($000 Omitted)

(1) Accident Year	(2) Reported Losses as of 12/31/12	(3) Cumulative Loss Development Factor to Ultimate	(4)= (2)x(3) Incurred Development Method Estimated Ultimate Losses	(5)= (4) - (2) Incurred Development IBNR Estimate as of 12/31/12	(6) Case Reserves as of 12/31/12	(7)= (5) + (6) Unpaid Loss Estimate as of 12/31/12
2003	95,000	1.000000	95,000	0	0	0
2004	95,880	1.010638	96,900	1,020	2,040	3,060
2005	90,530	1.038251	93,993	3,463	3,958	7,420
2006	92,291	1.079545	99,633	7,341	6,293	13,634
2007	88,977	1.130952	100,629	11,652	9,533	21,185
2008	73,533	1.217949	89,560	16,026	10,370	26,397
2009	85,789	1.357143	116,428	30,639	15,932	46,571
2010	91,206	1.557377	142,042	50,836	25,418	76,254
2011	78,497	1.900000	149,144	70,647	31,399	102,046
2012	69,077	2.375000	164,058	94,981	43,173	138,154
Total	860,780		1,147,386	286,605	148,116	**434,721**

(2) Exhibit 3, Table 1 final diagonal
(3) Exhibit 3, Table 1 corresponding CDF; reportings completed as of 10 years
(6) Exhibit 1, Table 2 final diagonal

Exhibit 3
Table 3

NO NOISE IN PAYMENT PATTERN OR CASE RESERVES

CUMULATIVE REPORTED LOSSES EMERGED BY YEAR-END ACCOUNTING DATE
($000 Omitted)

Cumulative Emerged Reported Losses which were Unpaid as of Year-End Accounting Date
Derived as Exhibit 1, Table 4 plus appropriate accumulation of Case Reserves of Exhibit 1, Table 2

Year-End Accounting Date	After 0 Years		After 1 Year		After 2 Years		After 3 Years		After 4 Years		After 5 Years		After 6 Years		After 7 Years		After 8 Years		After 9 Years
2003	90,765	1.508040	136,877	1.282941	175,605	1.169036	205,289	1.108371	227,536	1.067985	243,005	1.042291	253,282	1.026560	260,009	1.013192	263,439	1.003796	264,439
2004	95,858	1.510421	144,786	1.282510	185,690	1.169247	217,117	1.108831	240,746	1.068109	257,143	1.042028	267,950	1.026124	274,950	1.012911	278,500		
2005	99,214	1.512001	150,011	1.282051	192,322	1.169163	224,856	1.108124	249,168	1.067198	265,911	1.041208	276,869	1.025329	283,882				
2006	103,372	1.510759	156,171	1.282192	200,241	1.168553	233,992	1.107412	259,126	1.066571	276,376	1.040553	287,584						
2007	106,736	1.512131	161,398	1.281310	206,801	1.167634	241,468	1.106533	267,192	1.065733	284,756								
2008	106,387	1.515387	161,217	1.279357	206,254	1.165858	240,463	1.104404	265,568										
2009	112,722	1.508262	170,015	1.280504	217,705	1.165983	253,840												
2010	124,108	1.504734	186,750	1.281565	239,332														
2011	135,349	1.504486	203,631																
2012	148,116																		$\boxed{?}$

Exhibit 3
Table 4

NO NOISE IN PAYMENT PATTERN OR CASE RESERVES

CUMULATIVE REPORTED LOSSES EMERGED BY YEAR-END ACCOUNTING DATE RECAST AT 2012 YEAR-END ACCOUNTING DATE EXPOSURE LEVEL
USING CASE RESERVES AS EXPOSURE MEASURE
($000 Omitted)

Cumulative Emerged Reported Losses which were Unpaid as of Year-End Accounting Date
Derived as Exhibit 1, Table 5 plus Case Reserves of Exhibit 1, Table 2 Adjusted to 2012 Year-End Accounting Date Exposure Level

Year-End Accounting Date	After 0 Years		After 1 Year		After 2 Years		After 3 Years		After 4 Years		After 5 Years		After 6 Years		After 7 Years		After 8 Years		After 9 Years
2003	148,116	1.505397	222,973	1.284923	286,503	1.170929	335,474	1.110057	372,396	1.069499	398,277	1.043603	415,643	1.027582	427,107	1.013784	432,994	1.003988	434,721
2004	148,116	1.505397	222,973	1.284923	286,503	1.170929	335,474	1.110057	372,396	1.069499	398,277	1.043603	415,643	1.027582	427,107	1.013784	432,994		
2005	148,116	1.505397	222,973	1.284923	286,503	1.170929	335,474	1.110057	372,396	1.069499	398,277	1.043603	415,643	1.027582	427,107				
2006	148,116	1.505397	222,973	1.284923	286,503	1.170929	335,474	1.110057	372,396	1.069499	398,277	1.043603	415,643						
2007	148,116	1.505397	222,973	1.284923	286,503	1.170929	335,474	1.110057	372,396	1.069499	398,277								
2008	148,116	1.505397	222,973	1.284923	286,503	1.170929	335,474	1.110057	372,396										
2009	148,116	1.505397	222,973	1.284923	286,503	1.170929	335,474												
2010	148,116	1.505397	222,973	1.284923	286,503														
2011	148,116	1.505397	222,973																
2012	148,116																		434,721
Average LDF		1.505397		1.284923		1.170929		1.110057		1.069499		1.043603		1.027582		1.013784		1.003988	
Average CDF		2.935012		1.949660		1.517336		1.295840		1.167364		1.091505		1.045901		1.017827		1.003988	
Weighted LDF		1.505397		1.284923		1.170929		1.110057		1.069499		1.043603		1.027582		1.013784		1.003988	
Weighted CDF		2.935012		1.949660		1.517336		1.295840		1.167364		1.091505		1.045901		1.017827		1.003988	

Exhibit 3
Table 5

NO NOISE IN PAYMENT PATTERN OR CASE RESERVES

ACCOUNTING DATE INCURRED DEVELOPMENT INDICATED AGGREGATE UNPAID LOSS AS OF 12/31/12;
ALLOCATION OF TOTAL UNPAID CLAIM ESTIMATE TO ACCIDENT YEAR
($000 Omitted)

(1) Year-End Accounting Date	(2) Recast Reported Losses As of 12/31/12 at 2012 Year-End Accounting Date Exposure Level	(3) Weighted Cumulative Development Factor	(4)= (2)x(3) Indicated Total Emergence at 2012 Year-End Accounting Date Exposure Level	(5)= (4)-(2) Indicated IBNR as of 12/31/12 at 2012 Year-End Accounting Date Exposure Level	(6) Accident Year	(7) Accident Year Allocation of Aggregate Accounting Date Incurred Development Indicated IBNR as of 12/31/12	(8) Case Reserves as of 12/31/12	(9)= (7)+(8) Accident Year Allocation of Aggregate Incurred Development Aggregate Unpaid Loss as of 12/31/12
2003	434,721	1.000000	434,721		2003			
2004	432,994	1.003988	434,721	1,727	2004	1,020	2,040	3,060
2005	427,107	1.017827	434,721	7,614	2005	3,463	3,958	7,421
2006	415,643	1.045901	434,721	19,078	2006	7,341	6,293	13,634
2007	398,277	1.091505	434,721	36,444	2007	11,652	9,533	21,185
2008	372,396	1.167364	434,721	62,325	2008	16,026	10,370	26,397
2009	335,474	1.295840	434,721	99,247	2009	30,639	15,932	46,571
2010	286,503	1.517336	434,721	148,218	2010	50,836	25,418	76,254
2011	222,973	1.949660	434,721	211,748	2011	70,647	31,399	102,046
2012	148,116	2.935012	$\boxed{434,721}$	286,605	2012	94,981	43,173	138,154
					Total	286,605	148,116	**434,721**

(2) Exhibit 3, Table 4 final diagonal
(3) Exhibit 3, Table 4 corresponding CDF
(7) Iterative Formula
(8) Exhibit 1, Table 2 final diagonal

Exhibit 4
Table 1

NOISE IN PAYMENT PATTERN AND CASE RESERVES

REPORTED LOSSES BY ACCIDENT YEAR: Exhibit 2, Table 1 + Exhibit 2, Table 2
($000 Omitted)

Accident Year	As of 1 Year		As of 2 Years		As of 3 Years		As of 4 Years		As of 5 Years		As of 6 Years		As of 7 Years		As of 8 Years		As of 9 Years		As of 10 Years
1995																	58,173	1.014232	59,001
1996															67,212	1.030270	69,246	1.008739	69,851
1997													60,529	1.040965	63,008	1.034140	65,159	1.008659	65,724
1998											58,343	1.048721	61,185	1.045299	63,957	1.016314	65,001	1.014125	65,919
1999									52,241	1.080612	56,452	1.049999	59,275	1.039695	61,627	1.022106	62,990	1.009106	63,563
2000							54,965	1.113528	61,206	1.080280	66,119	1.046330	69,182	1.040244	71,967	1.036588	74,600	1.009970	75,344
2001					55,038	1.135500	62,496	1.097708	68,602	1.079582	74,062	1.056261	78,228	1.039231	81,297	1.040801	84,614	1.009467	85,415
2002			45,691	1.257277	57,446	1.151417	66,144	1.099419	72,720	1.066629	77,566	1.053355	81,704	1.038200	84,825	1.029366	87,316	1.011716	88,339
2003	41,030	1.240434	50,895	1.200177	61,083	1.171586	71,564	1.088313	77,884	1.072903	83,562	1.048946	87,652	1.037957	90,979	1.021445	92,930	1.010438	93,900
2004	41,218	1.221975	50,368	1.229121	61,908	1.174894	72,735	1.117348	81,271	1.084654	88,150	1.044572	92,079	1.052075	96,875	1.024785	99,276		
2005	38,705	1.269811	49,148	1.209965	59,468	1.173480	69,784	1.119790	78,144	1.088300	85,044	1.045093	88,879	1.037893	92,247				
2006	41,636	1.248866	51,998	1.233239	64,126	1.152394	73,898	1.117028	82,546	1.078455	89,022	1.043283	92,875						
2007	42,794	1.247772	53,397	1.217120	64,990	1.144764	74,399	1.099791	81,823	1.085131	88,789								
2008	36,432	1.293958	47,141	1.216038	57,326	1.143205	65,535	1.115988	73,136										
2009	49,807	1.246555	62,087	1.208152	75,010	1.152700	86,464												
2010	58,985	1.219265	71,918	1.234387	88,775														
2011	63,818	1.234563	78,787																
2012	68,568																		

	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10
Average LDF	1.247022	1.222831	1.155549	1.107657	1.079616	1.048507	1.041284	1.028424	1.010717
Average CDF	2.391364	1.917660	1.568214	1.357116	1.225213	1.134860	1.082358	1.039446	1.010717
Weighted LDF	1.244471	1.222709	1.155689	1.107618	1.079717	1.048268	1.041355	1.028434	1.010646
Weighted CDF	2.386138	1.917392	1.568151	1.356896	1.225058	1.134610	1.082366	1.039383	1.010646

Exhibit 4
Table 2

NOISE IN PAYMENT PATTERN AND CASE RESERVES

CUMULATIVE REPORTED LOSSES EMERGED BY YEAR-END ACCOUNTING DATE
($000 Omitted)

Cumulative Emerged Reported Losses which were Unpaid as of Year-End Accounting Date
Derived as Exhibit 2, Table 3 plus appropriate accumulation of Case Reserves of Exhibit 2, Table 2

Year-End Accounting Date	After 0 Years		After 1 Year		After 2 Years		After 3 Years		After 4 Years		After 5 Years		After 6 Years		After 7 Years		After 8 Years		After 9 Years
2003	91,421	1.521914	139,134	1.274962	177,391	1.166527	206,932	1.098568	227,328	1.070788	243,420	1.046306	254,692	1.025988	261,311	1.011381	264,285	1.003670	265,255
2004	95,895	1.494355	143,301	1.286674	184,381	1.169345	215,605	1.114225	240,233	1.075559	258,385	1.040823	268,933	1.028888	276,702	1.012183	280,073		
2005	99,240	1.519185	150,763	1.275555	192,307	1.181709	227,251	1.116661	253,762	1.068758	271,210	1.042786	282,814	1.023828	289,553				
2006	105,526	1.491873	157,431	1.299000	204,503	1.177423	240,787	1.108379	266,883	1.067745	284,963	1.037170	295,555						
2007	106,344	1.542345	164,019	1.291900	211,896	1.167557	247,400	1.103089	272,905	1.064337	290,462								
2008	106,158	1.551881	164,744	1.277332	210,433	1.160211	244,147	1.103049	269,306										
2009	113,574	1.510409	171,543	1.271869	218,180	1.167812	254,793												
2010	124,946	1.476768	184,517	1.289782	237,986														
2011	133,888	1.511168	202,327																
2012	148,006																		?

Exhibit 4
Table 3

NOISE IN PAYMENT PATTERN AND CASE RESERVES

CUMULATIVE REPORTED LOSSES EMERGED BY YEAR-END ACCOUNTING DATE RECAST AT 2012 YEAR-END ACCOUNTING DATE EXPOSURE LEVEL
USING CASE RESERVES AS EXPOSURE MEASURE
($000 Omitted)

Cumulative Emerged Reported Losses which were Unpaid as of Year-End Accounting Date
Derived as Exhibit 2, Table 4 plus Case Reserves of Exhibit 2, Table 2 Adjusted to 2012 Year-End Accounting Date Exposure Level

Year-End Accounting Date	After 0 Years		After 1 Year		After 2 Years		After 3 Years		After 4 Years		After 5 Years		After 6 Years		After 7 Years		After 8 Years		After 9 Years
2003	148,006	1.520684	225,070	1.276014	287,193	1.168440	335,568	1.099595	368,988	1.072108	395,595	1.047466	414,373	1.026993	425,558	1.011864	430,607	1.003791	432,240
2004	148,006	1.489210	220,412	1.289541	284,230	1.171306	332,921	1.115211	371,277	1.076982	399,858	1.042366	416,799	1.030754	429,617	1.012999	435,201		
2005	148,006	1.515247	224,266	1.277923	286,594	1.185282	339,695	1.118295	379,879	1.072197	407,305	1.045425	425,807	1.026139	436,938				
2006	148,006	1.490966	220,672	1.303327	287,608	1.179673	339,283	1.111792	377,212	1.070882	403,950	1.040086	420,142						
2007	148,006	1.536145	227,359	1.294217	294,252	1.171426	344,694	1.105837	381,175	1.068106	407,135								
2008	148,006	1.542578	228,311	1.283167	292,961	1.163355	340,817	1.109798	378,238										
2009	148,006	1.506422	222,960	1.274553	284,174	1.173655	333,522												
2010	148,006	1.476909	218,591	1.293966	282,850														
2011	148,006	1.513372	223,988																
2012	148,006																		?
Average LDF		1.510170		1.286589		1.173305		1.110088		1.072055		1.043836		1.027962		1.012432		1.003791	
Average CDF		2.958485		1.959041		1.522663		1.297755		1.169056		1.090482		1.044687		1.016270		1.003791	
Weighted LDF		1.509636		1.286796		1.173275		1.110150		1.071929		1.043710		1.027948		1.012448		1.003791	
Weighted CDF		2.957307		1.958953		1.522349		1.297521		1.168780		1.090352		1.044689		1.016286		1.003791	

Exhibit 4
Table 4

NOISE IN PAYMENT PATTERN AND CASE RESERVES

ACCOUNTING DATE INCURRED DEVELOPMENT INDICATED AGGREGATE UNPAID LOSS AS OF 12/31/12;
ALLOCATION OF TOTAL UNPAID CLAIM ESTIMATE TO ACCIDENT YEAR
($000 Omitted)

(1) Year-End Accounting Date	(2) Recast Reported Losses As of 12/31/12 at 2012 Year-End Accounting Date Exposure Level	(3) Weighted Cumulative Development Factor	(4)= (2)x(3) Indicated Total Emergence at 2012 Year-End Accounting Date Exposure Level	(5)= (4)-(2) Indicated IBNR as of 12/31/12 at 2012 Year-End Accounting Date Exposure Level	(6) Accident Year	(7) Accident Year Allocation of Aggregate Accounting Date Incurred Development Indicated IBNR as of 12/31/12	(8) Case Reserves as of 12/31/12	(9)= (7)+(8) Accident Year Allocation of Aggregate Incurred Development Aggregate Unpaid Loss as of 12/31/12
2003	432,240	1.000000	432,240		2003			
2004	435,201	1.003791	436,851	1,650	2004	969	1,973	2,941
2005	436,938	1.016286	444,054	7,116	2005	3,155	4,068	7,224
2006	420,142	1.044689	438,918	18,776	2006	7,493	6,255	13,748
2007	407,135	1.090352	443,921	36,786	2007	12,007	9,476	21,483
2008	378,238	1.168780	442,078	63,839	2008	16,341	10,391	26,731
2009	333,522	1.297521	432,752	99,230	2009	30,801	16,315	47,116
2010	282,850	1.522349	430,597	147,747	2010	50,893	24,910	75,803
2011	223,988	1.958953	438,782	214,794	2011	71,103	31,618	102,721
2012	148,006	2.957307	437,699	289,693	2012	96,931	43,001	139,932
					Total	289,693	148,006	**437,699**

(2) Exhibit 4, Table 3 final diagonal
(3) Exhibit 4, Table 3 corresponding Weighted CDF
(7) Iterative Formula
(8) Exhibit 2, Table 2 final diagonal

Exhibit 5

NOISE IN PAYMENT PATTERN AND CASE RESERVES

ACCOUNTING DATE EXPECTED UNPAID LOSSES AS OF 12/31/12;
ACCOUNTING DATE BORNHUETTER-FERGUSON UNPAID LOSSES AS OF 12/31/12;
ALLOCATION OF TOTAL UNPAID CLAIM ESTIMATE TO ACCIDENT YEAR
($000 Omitted)

(1) Accident Year	(2) Earned Premium	(3) Industry Earned Premium	(4) Industry Loss Reserve as of 12/31/12	(5)=(4)/(3) Industry Loss Reserve to Earned Premium Ratio as of 12/31/12	(6)=(2)x(5) Expected Unpaid Loss as of 12/31/12	(7) Case Reserves as of 12/31/12	(8) Weighted Cumulative Development Factor	(9)=(7)+[1-1/(8)]x(6) BF Indicated Loss Unpaid as of 12/31/12	(10)=(6)-(7) Implied IBNR as of 12/31/12	(11) BF Indicated IBNR as of 12/31/12	(12)=(7)+(11) Accident Year Allocation of Aggregate Unpaid Loss as of 12/31/12
2003	123,500	3,723,521									
2004	122,191	3,861,662	98,800	0.025584945	3,126	1,973			1,154	1,161	3,134
2005	124,635	4,123,678	245,997	0.059654726	7,435	4,068			3,367	3,388	7,456
2006	129,911	4,446,857	463,898	0.104320506	13,552	6,255			7,298	7,343	13,598
2007	136,312	4,672,778	691,376	0.147958279	20,168	9,476			10,692	10,760	20,236
2008	116,893	4,801,223	1,105,797	0.230315732	26,922	10,391			16,532	16,636	27,026
2009	148,026	5,113,441	1,672,912	0.327159761	48,428	16,315			32,114	32,316	48,630
2010	185,947	5,117,821	2,077,899	0.406012529	75,497	24,910			50,587	50,905	75,815
2011	197,765	5,433,211	2,715,561	0.499807766	98,844	31,618			67,226	67,649	99,267
2012	210,930	5,642,668	3,703,297	0.656302564	138,434	43,001			95,433	96,034	139,034
Year-End Accounting Date 2012 Total					**432,407**	148,006	2.957307	**434,197**	284,401	286,191	**434,197**

(3), (4) figures are used here to illustrate methodology and do not represent actual Industry figures
(7) Exhibit 2, Table 2 final diagonal
(8) Exhibit 4, Table 4, Column (3) Year-End Accounting Date 2012
(11) Total = Total (9) - Total (7); otherwise (10)x[Total (11)/Total (10)]

Exhibit 6

NOISE IN PAYMENT PATTERN AND CASE RESERVES

ACCOUNTING DATE CAPE COD AGGREGATE UNPAID LOSS ESTIMATE AS OF 12/31/12;
ALLOCATION OF TOTAL UNPAID CLAIM ESTIMATE TO ACCIDENT YEAR
($000 Omitted)

(1) Year-End Accounting Date	(2) Recast Reported Losses Through 12/31/12 at 2012 Year-End Accounting Date Exposure Level	(3) Weighted Cumulative Development Factor	(4)= (2)x(3) Indicated Total Emergence at 2012 Year-End Accounting Date Exposure Level	(5)=1/(3) Development Factor Weight	(6) Volume Weight	(7) Cape Cod Indicated Total Emergence at 2012 Year-End Accounting Date Exposure Level	(8)=(7)-(2) Indicated IBNR as of 12/31/12 at 2012 Year-End Accounting Date Exposure Level	(9) Accident Year	(10) Accident Year Allocation of Aggregate Cape Cod IBNR as of 12/31/12	(11) Case Reserves as of 12/31/12	(12)=(10)+(11) Accident Year Allocation of Aggregate Cape Cod Unpaid Loss as of 12/31/12
2003	432,240	1.000000	432,240	1.000000	0.613677			2003			
2004	435,201	1.003791	436,851	0.996223	0.643548	436,855	1,654	2004	971	1,973	2,944
2005	436,938	1.016286	444,054	0.983975	0.662688	443,956	7,018	2005	3,098	4,068	7,167
2006	420,142	1.044689	438,918	0.957222	0.703464	438,877	18,735	2006	7,521	6,255	13,776
2007	407,135	1.090352	443,921	0.917135	0.713430	443,426	36,291	2007	11,724	9,476	21,201
2008	378,238	1.168780	442,078	0.855593	0.712001	441,482	63,244	2008	16,261	10,391	26,652
2009	333,522	1.297521	432,752	0.770700	0.763947	433,944	100,423	2009	32,064	16,315	48,378
2010	282,850	1.522349	430,597	0.656879	0.841387	433,121	150,271	2010	52,124	24,910	77,033
2011	223,988	1.958953	438,782	0.510477	0.903292	438,377	214,388	2011	68,465	31,618	100,083
2012	148,006	2.957307	437,699	0.338146	1.000000	$\boxed{\textbf{437,867}}$	289,861	2012	97,633	43,001	140,633
			437,953 = Expected Unpaid Loss as of 12/31/12						289,861	148,006	**437,867**

(2) Exhibit 4, Table 3 final diagonal
(3) Exhibit 4, Table 3 corresponding Weighted CDF
(4) Expected Unpaid Loss at 12/31/12 equals weighted average of Column (4), weighted on Columns (5) and (6)
(6) [Exhibit 4, Table 2 final diagonal]/[corresponding Exhibit 4, Table 3 final diagonal]
(7) (2)+[1-1/(3)]x(Expected Unpaid Loss as of 12/31/12)
(10) Iterative Formula
(11) Exhibit 2, Table 2 final diagonal

Exhibit 7
Table 1

NOISE IN EARNED PREMIUM

EARNED PREMIUM AT SAME ADEQUACY LEVEL
($000 Omitted)

Accident Year	As of 1 Year	As of 2 Years	As of 3 Years	As of 4 Years	As of 5 Years	As of 6 Years	As of 7 Years	As of 8 Years	As of 9 Years	As of 10 Years
1995									94,405	94,405
1996								110,403	110,403	110,403
1997							104,433	104,433	104,433	104,433
1998						105,912	105,912	105,912	105,912	105,912
1999					102,909	102,909	102,909	102,909	102,909	102,909
2000				115,327	115,327	115,327	115,327	115,327	115,327	115,327
2001			136,361	136,361	136,361	136,361	136,361	136,361	136,361	136,361
2002		137,150	137,150	137,150	137,150	137,150	137,150	137,150	137,150	137,150
2003	149,264	149,264	149,264	149,264	149,264	149,264	149,264	149,264	149,264	149,264
2004	149,204	149,204	149,204	149,204	149,204	149,204	149,204	149,204	149,204	
2005	145,307	145,307	145,307	145,307	145,307	145,307	145,307	145,307		
2006	152,793	152,793	152,793	152,793	152,793	152,793	152,793			
2007	158,179	158,179	158,179	158,179	158,179	158,179				
2008	143,032	143,032	143,032	143,032	143,032					
2009	184,454	184,454	184,454	184,454						
2010	220,083	220,083	220,083							
2011	226,928	226,928								
2012	252,616									

Exhibit 7
Table 2

NOISE IN PAYMENT PATTERN AND CASE RESERVES

LOSS PAYMENTS EMERGED BY YEAR-END ACCOUNTING DATE RECAST AT 2012 YEAR-END ACCOUNTING DATE EXPOSURE LEVEL
USING EARNED PREMIUM AT SAME ADEQUACY LEVEL AS EXPOSURE MEASURE
($000 Omitted)

Cumulative Emerged Payments of Losses which were Unpaid as of Year-End Accounting Date
Derived by appropriate accumulation of Cumulative Loss Payments of Exhibit 2, Table 1 Exposure Adjusted to 2012 Accounting Date Exposure Level

Year-End Accounting Date	As of 1 Year		As of 2 Years		As of 3 Years		As of 4 Years		As of 5 Years		As of 6 Years		As of 7 Years		As of 8 Years		As of 9 Years
2003	108,725	1.792728	194,915	1.348996	262,939	1.208042	317,642	1.128176	358,356	1.089345	390,373	1.052617	410,913	1.027954	422,400	1.011731	427,355
2004	103,130	1.831391	188,872	1.397195	263,891	1.205942	318,237	1.137493	361,992	1.085137	392,811	1.056868	415,149	1.028843	427,123		
2005	104,630	1.863201	194,947	1.384720	269,947	1.212657	327,353	1.131270	370,324	1.086614	402,400	1.050092	422,556				
2006	109,483	1.850491	202,597	1.372892	278,143	1.202374	334,432	1.128239	377,319	1.079334	407,254						
2007	110,657	1.838851	203,482	1.356668	276,057	1.200056	331,284	1.121657	371,587								
2008	110,808	1.806309	200,154	1.354917	271,192	1.195243	324,141										
2009	107,572	1.814544	195,195	1.360172	265,498												
2010	105,963	1.826470	193,538														
2011	105,993																
2012																	?
Average LDF		1.827998		1.367937		1.204052		1.129367		1.085107		1.053192		1.028399		1.011731	
Average CDF		4.043237		2.211839		1.616916		1.342895		1.189069		1.095807		1.040463		1.011731	
Weighted LDF		1.827809		1.367396		1.203758		1.129155		1.084912		1.053146		1.028411		1.011731	
Weighted CDF		4.038622		2.209543		1.615877		1.342360		1.188818		1.095774		1.040476		1.011731	

Exhibit 7
Table 3

NOISE IN PAYMENT PATTERN

ACCOUNTING DATE PAYMENT DEVELOPMENT INDICATED AGGREGATE UNPAID LOSS AS OF 12/31/12
USING EARNED PREMIUM AT SAME ADEQUACY LEVEL AS EXPOSURE MEASURE;
ALLOCATION OF TOTAL UNPAID CLAIM ESTIMATE TO ACCIDENT YEAR
($000 Omitted)

(1) Year-End Accounting Date	(2) Recast Cumulative Loss Payments As of 12/31/12 at 2012 Year-End Accounting Date Exposure Level	(3) Weighted Cumulative Development Factor	(4)= (2)x(3) Indicated Total Emergence at 2012 Year-End Accounting Date Exposure Level	(5)= (4)-(2) Payment Development Indicated Unpaid Loss as of 12/31/12 at 2012 Year-End Accounting Date Exposure Level	(6) Accident Year	(7) Accident Year Allocation of Aggregate Accounting Date Payment Development Indicated Unpaid Loss as of 12/31/12
2003	427,355	1.000000	427,355		2003	
2004	427,123	1.011731	432,134	5,011	2004	2,960
2005	422,556	1.040476	439,660	17,103	2005	7,249
2006	407,254	1.095774	446,258	39,004	2006	14,104
2007	371,587	1.188818	441,749	70,162	2007	21,651
2008	324,141	1.342360	435,113	110,973	2008	26,927
2009	265,498	1.615877	429,012	163,514	2009	46,271
2010	193,538	2.209543	427,631	234,093	2010	75,240
2011	105,993	4.038622	428,065	322,072	2011	98,702
2012			$\boxed{428,065}$ *	428,065	2012	134,962
					Total	**428,065**

(2) Exhibit 7, Table 2 final diagonal
(3) Exhibit 7, Table 2 corresponding Weighted CDF
(7) Iterative Formula

* Accept most recent indication

Exhibit 8
Table 1

NOISE IN PAYMENT PATTERN AND CASE RESERVES

CUMULATIVE REPORTED LOSSES EMERGED BY YEAR-END ACCOUNTING DATE RECAST AT 2012 YEAR-END ACCOUNTING DATE EXPOSURE LEVEL
USING EARNED PREMIUM AT SAME ADEQUACY LEVEL AS EXPOSURE MEASURE
($000 Omitted)

Cumulative Emerged Reported Losses which were Unpaid as of Year-End Accounting Date
Derived as Exhibit 7, Table 2 plus Case Reserves of Exhibit 2, Table 2 Adjusted to 2012 Year-End Accounting Date Exposure Level

Year-End Accounting Date	As of 0 Years		As of 1 Year		As of 2 Years		As of 3 Years		As of 4 Years		As of 5 Years		As of 6 Years		As of 7 Years		As of 8 Years		As of 9 Years
2003	146,256	1.518783	222,131	1.276210	283,486	1.169264	331,470	1.100027	364,626	1.072455	391,045	1.047640	409,674	1.026961	420,719	1.011871	425,714	1.003856	427,355
2004	146,320	1.488243	217,759	1.289847	280,876	1.171689	329,099	1.115537	367,122	1.077043	395,406	1.042466	412,197	1.030874	424,923	1.013038	430,463		
2005	146,773	1.515521	222,437	1.277448	284,152	1.184890	336,688	1.117985	376,413	1.071909	403,480	1.045138	421,692	1.025936	432,630				
2006	150,466	1.490612	224,287	1.302933	292,230	1.179661	344,733	1.111704	383,241	1.071096	410,488	1.039881	426,858						
2007	147,075	1.536631	226,000	1.293665	292,368	1.171483	342,504	1.105869	378,765	1.068237	404,611								
2008	145,669	1.543271	224,808	1.283003	288,429	1.163472	335,579	1.108985	372,152										
2009	147,019	1.505954	221,404	1.274660	282,215	1.173426	331,159												
2010	147,416	1.476158	217,609	1.293807	281,544														
2011	146,333	1.510143	220,984																
2012	148,006																		?
Average LDF		1.509480		1.286446		1.173412		1.110018		1.072148		1.043781		1.027924		1.012454		1.003856	
Average CDF		2.957138		1.959045		1.522834		1.297783		1.169155		1.090479		1.044739		1.016359		1.003856	
Weighted LDF		1.508888		1.286646		1.173365		1.110062		1.072019		1.043645		1.027907		1.012471		1.003856	
Weighted CDF		2.955693		1.958855		1.522451		1.297508		1.168861		1.090337		1.044739		1.016375		1.003856	

Exhibit 8
Table 2

NOISE IN PAYMENT PATTERN AND CASE RESERVES

ACCOUNTING DATE INCURRED DEVELOPMENT INDICATED AGGREGATE UNPAID LOSS AS OF 12/31/12
USING EARNED PREMIUM AT SAME ADEQUACY LEVEL AS EXPOSURE MEASURE;
ALLOCATION OF TOTAL UNPAID CLAIM ESTIMATE TO ACCIDENT YEAR
($000 Omitted)

(1) Year-End Accounting Date	(2) Recast Reported Losses As of 12/31/12 at 2012 Year-End Accounting Date Exposure Level	(3) Weighted Cumulative Development Factor	(4)= (2)x(3) Indicated Total Emergence at 2012 Year-End Accounting Date Exposure Level	(5)= (4)-(2) Indicated IBNR as of 12/31/12 at 2012 Year-End Accounting Date Exposure Level
2003	427,355	1.000000	427,355	
2004	430,463	1.003856	432,123	1,660
2005	432,630	1.016375	439,714	7,085
2006	426,858	1.044739	445,955	19,097
2007	404,611	1.090337	441,162	36,551
2008	372,152	1.168861	434,994	62,842
2009	331,159	1.297508	429,681	98,522
2010	281,544	1.522451	428,637	147,093
2011	220,984	1.958855	432,876	211,892
2012	148,006	2.955693	$\boxed{437,460}$	289,454

(6) Accident Year	(7) Accident Year Allocation of Aggregate Accounting Date Incurred Development Indicated IBNR as of 12/31/12	(8) Case Reserves as of 12/31/12	(9)=(7)+(8) Accident Year Allocation of Aggregate Incurred Development Aggregate Unpaid Loss as of 12/31/12
2003			
2004	980	1,973	2,953
2005	3,217	4,068	7,286
2006	7,637	6,255	13,892
2007	11,975	9,476	21,451
2008	16,782	10,391	27,172
2009	30,529	16,315	46,844
2010	50,611	24,910	75,521
2011	70,577	31,618	102,196
2012	97,146	43,001	140,146
Total	289,454	148,006	**437,460**

(2) Exhibit 8, Table 1 final diagonal
(3) Exhibit 8, Table 1 corresponding Weighted CDF
(7) Iterative Formula
(8) Exhibit 2, Table 2 final diagonal

Exhibit 9
Table 1

NOISE IN CLAIM COUNTS

PROJECTED REMAINING CLAIM COUNTS TO BE CLOSED WITH PAYMENT

Accident Year	As of 1 Year	As of 2 Years	As of 3 Years	As of 4 Years	As of 5 Years	As of 6 Years	As of 7 Years	As of 8 Years	As of 9 Years	As of 10 Years
1995									11	0
1996								25	10	0
1997							48	26	10	0
1998						72	39	21	6	0
1999					124	74	31	18	10	0
2000				228	131	75	41	24	8	0
2001			397	248	163	94	49	28	9	0
2002		624	391	233	144	79	47	23	8	0
2003	912	617	404	248	139	82	44	21	10	0
2004	904	630	432	253	157	87	51	27	10	
2005	847	579	399	233	134	72	42	23		
2006	847	580	378	224	129	72	43			
2007	801	540	350	207	127	75				
2008	690	459	304	185	110					
2009	841	563	375	227						
2010	977	652	432							
2011	976	670								
2012	1,023									

Exhibit 9
Table 2

NOISE IN CLAIM COUNTS

SEVERITY ADJUSTED PROJECTED REMAINING CLAIM COUNTS TO BE CLOSED WITH PAYMENT
Exhibit 9, Table 1 Accident Year 2003 inflated/deflated annually by 5%

Accident Year	As of 1 Year	As of 2 Years	As of 3 Years	As of 4 Years	As of 5 Years	As of 6 Years	As of 7 Years	As of 8 Years	As of 9 Years	As of 10 Years
1995									7.445	0.000
1996								17.767	7.107	0.000
1997							35.818	19.402	7.462	0.000
1998						56.414	30.558	16.454	4.701	0.000
1999					102.015	60.880	25.504	14.809	8.227	0.000
2000				196.955	113.163	64.788	35.417	20.732	6.911	0.000
2001			360.091	224.943	147.846	85.261	44.444	25.397	8.163	0.000
2002		594.286	372.381	221.905	137.143	75.238	44.762	21.905	7.619	0.000
2003	912.000	617.000	404.000	248.000	139.000	82.000	44.000	21.000	10.000	0.000
2004	949.200	661.500	453.600	265.650	164.850	91.350	53.550	28.350	10.500	
2005	933.818	638.348	439.898	256.883	147.735	79.380	46.305	25.358		
2006	980.508	671.423	437.582	259.308	149.334	83.349	49.778			
2007	973.621	656.373	425.427	251.610	154.369	91.163				
2008	880.634	585.813	387.990	236.112	140.391					
2009	1,127.020	754.474	502.536	304.202						
2010	1,374.737	917.429	607.867							
2011	1,441.997	989.895								
2012	1,587.009									

Exhibit 9
Table 3

NOISE IN CLAIM COUNTS AND PAYMENT PATTERN

LOSS PAYMENTS EMERGED BY YEAR-END ACCOUNTING DATE RECAST AT 2012 YEAR-END ACCOUNTING DATE EXPOSURE LEVEL
USING SEVERITY ADJUSTED REMAINING CLAIM COUNTS AS EXPOSURE MEASURE
($000 Omitted)

Cumulative Emerged Payments of Losses which were Unpaid as of Year-End Accounting Date
Derived by appropriate accumulation of Cumulative Loss Payments of Exhibit 2, Table 1 Exposure Adjusted to 2012 Accounting Date Exposure Level

Year-End Accounting Date	As of 1 Year		As of 2 Years		As of 3 Years		As of 4 Years		As of 5 Years		As of 6 Years		As of 7 Years		As of 8 Years		As of 9 Years
2003	110,230	1.794628	197,822	1.349383	266,937	1.209110	322,757	1.127755	363,990	1.089701	396,641	1.053049	417,682	1.028034	429,391	1.011866	434,486
2004	104,817	1.829471	191,759	1.396832	267,856	1.204772	322,705	1.137252	366,997	1.085128	398,239	1.056770	420,847	1.028814	432,973		
2005	105,955	1.858437	196,911	1.381993	272,130	1.208387	328,839	1.129128	371,301	1.085739	403,136	1.049444	423,068				
2006	108,858	1.839290	200,222	1.366073	273,518	1.199205	328,004	1.126500	369,496	1.078502	398,503						
2007	108,359	1.844729	199,893	1.358151	271,485	1.200068	325,800	1.121431	365,362								
2008	110,410	1.804541	199,239	1.354728	269,915	1.195568	322,702										
2009	110,566	1.810792	200,212	1.358820	272,052												
2010	109,800	1.822147	200,071														
2011	107,313																
2012																	?
Average LDF		1.825504		1.366568		1.202852		1.128413		1.084768		1.053087		1.028424		1.011866	
Average CDF		4.025231		2.204996		1.613528		1.341419		1.188766		1.095872		1.040627		1.011866	
Weighted LDF		1.825263		1.366010		1.202541		1.128184		1.084543		1.053022		1.028435		1.011866	
Weighted CDF		4.020162		2.202511		1.612368		1.340801		1.188459		1.095816		1.040639		1.011866	

Exhibit 9
Table 4

NOISE IN CLAIM COUNTS AND PAYMENT PATTERN

ACCOUNTING DATE PAYMENT DEVELOPMENT INDICATED AGGREGATE UNPAID LOSS AS OF 12/31/12
USING SEVERITY ADJUSTED REMAINING CLAIM COUNTS AS EXPOSURE MEASURE;
ALLOCATION OF TOTAL UNPAID CLAIM ESTIMATE TO ACCIDENT YEAR
($000 Omitted)

(1) Year-End Accounting Date	(2) Recast Cumulative Loss Payments As of 12/31/12 at 2012 Year-End Accounting Date Exposure Level	(3) Weighted Cumulative Development Factor	(4)= (2)x(3) Indicated Total Emergence at 2012 Year-End Accounting Date Exposure Level	(5)= (4)-(2) Payment Development Indicated Unpaid Loss as of 12/31/12 at 2012 Year-End Accounting Date Exposure Level	(6) Accident Year	(7) Accident Year Allocation of Aggregate Accounting Date Payment Development Indicated Unpaid Loss as of 12/31/12	(8) Number of Remaining Claims Projected to be Closed with Payment as of 12/31/12	(9)=(7)x1,000/(8) Projected Average per Remaining Claims to be Closed with Payment as of 12/31/12 ($000 Included)
2003	434,486	1.000000	434,486		2003			
2004	432,973	1.011866	438,111	5,138	2004	3,073	10	307,285
2005	423,068	1.040639	440,261	17,193	2005	7,411	23	322,212
2006	398,503	1.095816	436,686	38,183	2006	13,946	43	324,331
2007	365,362	1.188459	434,218	68,856	2007	21,187	75	282,494
2008	322,702	1.340801	432,679	109,977	2008	26,224	110	238,396
2009	272,052	1.612368	438,648	166,596	2009	46,544	227	205,042
2010	200,071	2.202511	440,659	240,588	2010	76,525	432	177,141
2011	107,313	4.020162	431,414	324,102	2011	96,504	670	144,036
2012			$\boxed{431,414}$ *	431,414	2012	140,000	1,023	136,853
					Total	**431,414**	2,613	165,103

(2) Exhibit 9, Table 3 final diagonal
(3) Exhibit 9, Table 3 corresponding Weighted CDF
(7) Iterative Formula
(8) Exhibit 9, Table 1 final diagonal

* Accept most recent indication

Exhibit 10
Table 1

NOISE IN CLAIM COUNTS, PAYMENT PATTERN AND CASE RESERVES

REPORTED LOSSES EMERGED BY YEAR-END ACCOUNTING DATE RECAST AT 2012 YEAR-END ACCOUNTING DATE EXPOSURE LEVEL
USING SEVERITY ADJUSTED REMAINING CLAIM COUNTS AS EXPOSURE MEASURE
($000 Omitted)

Cumulative Emerged Payments of Losses which were Unpaid as of Year-End Accounting Date
Derived as Exhibit 9, Table 3 plus Case Reserves of Exhibit 2, Table 2 Adjusted to 2012 Year-End Accounting Date Exposure Level

Year-End Accounting Date	After 0 Years		After 1 Year		After 2 Years		After 3 Years		After 4 Years		After 5 Years		After 6 Years		After 7 Years		After 8 Years		After 9 Years
2003	148,713	1.516970	225,594	1.276297	287,924	1.169655	336,772	1.100249	370,533	1.072358	397,344	1.047979	416,409	1.027115	427,699	1.011922	432,798	1.003900	434,486
2004	148,440	1.489371	221,082	1.289433	285,071	1.171103	333,847	1.115058	372,259	1.076742	400,827	1.042553	417,883	1.030671	430,700	1.012934	436,271		
2005	147,818	1.516116	224,108	1.275938	285,948	1.182763	338,209	1.115700	377,340	1.070990	404,128	1.044616	422,158	1.025527	432,935				
2006	148,184	1.490925	220,932	1.299782	287,163	1.176916	337,967	1.110810	375,417	1.070042	401,712	1.039498	417,579						
2007	144,843	1.533907	222,175	1.293788	287,447	1.171842	336,843	1.105835	372,492	1.068238	397,910								
2008	145,399	1.540427	223,977	1.282804	287,319	1.163299	334,238	1.109705	370,905										
2009	150,814	1.505562	227,059	1.273481	289,156	1.173403	339,296												
2010	152,204	1.475937	224,643	1.292515	290,355														
2011	148,060	1.510921	223,707																
2012	148,006																		?
Average LDF		1.508904		1.285505		1.172711		1.109560		1.071674		1.043662		1.027771		1.012428		1.003900	
Average CDF		2.948836		1.954290		1.520251		1.296355		1.168351		1.090211		1.044602		1.016377		1.003900	
Weighted LDF		1.508351		1.285687		1.172668		1.109610		1.071536		1.043507		1.027744		1.012442		1.003900	
Weighted CDF		2.947347		1.954019		1.519826		1.296040		1.168014		1.090037		1.044590		1.016391		1.003900	

Exhibit 10
Table 2

NOISE IN CLAIM COUNTS, PAYMENT PATTERN AND CASE RESERVES

ACCOUNTING DATE INCURRED DEVELOPMENT INDICATED AGGREGATE UNPAID LOSS AS OF 12/31/12
USING SEVERITY ADJUSTED REMAINING CLAIM COUNTS AS EXPOSURE MEASURE;
ALLOCATION OF TOTAL UNPAID CLAIM ESTIMATE TO ACCIDENT YEAR
($000 Omitted)

(1)	(2)	(3)	(4)= (2)x(3)	(5)= (4)-(2)	(6)	(7)	(8)	(9)=(7)+(8)	(10)	(11)=(9)x1,000/(10)
Year-End Accounting Date	Recast Reported Losses As of 12/31/12 at 2012 Year-End Accounting Date Exposure Level	Weighted Cumulative Development Factor	Indicated Total Emergence at 2012 Year-End Accounting Date Exposure Level	Indicated IBNR as of 12/31/12 at 2012 Year-End Accounting Date Exposure Level	Accident Year	Accident Year Allocation of Aggregate Accounting Date Incurred Development Indicated IBNR as of 12/31/12	Case Reserves as of 12/31/12	Accident Year Allocation of Aggregate Incurred Development Aggregate Unpaid Loss as of 12/31/12	Number of Remaining Claims Projected to be Closed with Payment as of 12/31/12	Projected Average per Remaining Claims to be Closed with Payment as of 12/31/12 ($000 Included)
2003	434,486	1.000000	434,486		2003					
2004	436,271	1.003900	437,973	1,701	2004	1,018	1,973	2,990	10	299,035
2005	432,935	1.016391	440,031	7,096	2005	3,279	4,068	7,348	23	319,472
2006	417,579	1.044590	436,199	18,620	2006	7,519	6,255	13,774	43	320,330
2007	397,910	1.090037	433,737	35,827	2007	11,683	9,476	21,159	75	282,124
2008	370,905	1.168014	433,223	62,317	2008	16,371	10,391	26,761	110	243,286
2009	339,296	1.296040	439,741	100,445	2009	30,633	16,315	46,948	227	206,818
2010	290,355	1.519826	441,289	150,934	2010	51,271	24,910	76,180	432	176,344
2011	223,707	1.954019	437,127	213,420	2011	69,664	31,618	101,282	670	151,167
2012	148,006	2.947347	$\boxed{436,225}$	288,219	2012	96,781	43,001	139,782	1,023	136,639
					Total	288,219	148,006	**436,225**	2,613	166,944

(2) Exhibit 10, Table 1 final diagonal
(3) Exhibit 10, Table 1 corresponding Weighted CDF
(7) Iterative Formula
(8) Exhibit 2, Table 2 final diagonal
(10) Exhibit 9, Table 1 final diagonal