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Measurement of Incurred but Unreported Deaths in Life Settlements

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ABSTRACT

Traditional incurred but unreported insurance claims are evaluated in relation to policies shown in force. Unreported life-settlement mortality causes a significant overstatement of policies in force. Evaluation of unreported deaths in life settlements is different than typical insurance. This paper uses unreported early deaths to reduce the policies in force, which is appropriate, and produces unreported values that are more consistent with the actual number of unreported deaths. The traditional method significantly overstates deaths for life settlements, but the reduction of in-force policies by unreported deaths from prior years produces results that represent the true unreported rate.

1. INTRODUCTION

Life settlements are sales of life insurance policies by the original owner to an unrelated investor. If the life expectancy of the insured person is very short, such as two years or less, the same transaction is called a viatical settlement. The valuation of these policies is based on mortality projections by underwriters who, typically, cannot retain contact with the insured individual, the policy purchaser, or the insurance company, and must determine future mortality from public records. Life settlement underwriters normally cannot obtain future information about the insurance policy, so they cannot determine whether there is a death claim. These information limitations produce a significant percentage of deaths that are unreported to the underwriters. The evaluation of unreported deaths is important in evaluating actual mortality in comparison to the mortality expected on the basis of the underwriting estimates. In addition, the projection of future mortality is intended to project the actual death rate, not the claim rate, so even if a policy is lapsed, the life settlement underwriters want to determine the time of death of the individual. This differs from the insurance company evaluation of Incurred But Not Reported ("IBNR") claims, because the evaluation by insurance companies usually does not include deaths for which there are no claims.

Insurance company incurred but not reported claims represent a future cost to the company, causing greater IBNR estimates to have a conservative effect. Greater IBNR estimates by life settlement underwriter are not conservative, but, on the contrary, increase the estimated value of the life settlements to the third-party purchasers. For this reason the users of life settlement underwriting information want to be confident, when they review the underwriters' historical results, that the IBNR is not overstated. The purchasers of life settlements typically have a contract that provides ongoing contact with the insured person to assure that the purchaser will be aware of the insured person's death. Since the underwriters are not provided with this information, there is a significant potential of unreported mortality information for the persons they have underwritten. In addition, many underwritten policies are not sold as life settlements, but the underwriters are typically not informed about whether the policy was sold to a life settlement investor. In those cases neither the underwriter nor the potential purchaser would have ongoing contact with the insured person, and if the insured person lapses the policy, even the insurance company would not have ongoing contact, so mortality information would only be available from public data.

The evaluation of life settlement mortality is quite different from the evaluation of unreported property and casualty or health claims, and has some components that differ from the typical evaluation of mortality rates by life insurance companies.[1] The comparison with insurance company IBNR determination is not intended as a criticism of the insurance companies' methods, but rather as an indication that the purpose of measuring mortality for life settlement underwriters is different, and benefits from a different approach to evaluation. The evaluation of the effect of unreported deaths is best done by a different method than is used for evaluation of incurred but unreported insurance claims. If done correctly, both methods should produce the same value for actual to expected mortality, but the method described in this paper is easier to use, and produces unreported values that are more consistent with the number of deaths that actually occur but are unreported. In addition, there does not appear to be any published analysis of IBNR that deals with the reduction of current expected mortality for policies for which the insured died in a prior period, but for which the death is still unreported.

2. Basic Methods

There are several different general approaches to the determination of IBNR claims in life and health insurance, as well as property and casualty insurance, for example the completion factor method, the incurred claim method, and the Bornhuetter-Ferguson method.[2] The purpose of this article is to deal with an issue that is specific to life insurance, i.e., the fact that death can occur only once, which is not specifically dealt with by those methods. This article is not intended to discuss the existing methods in detail, however there are some specific issues related to mortality that make some of these methods more desirable than others. The completion factor method assumes a high correlation between reported and unreported claims. I believe that this is a reasonable assumption to make about mortality when the unreported percentage is low. The completion factor method is the approach that I have used for the examples in this article. The Bornhuetter-Ferguson method would also be reasonable to use, but would be more complicated to present in the examples. The issue dealt with in this article, specifically the use of prior unreported deaths to adjust the current in-force number, can be used with any of these methods.

Incurred but unreported deaths in life settlement mortality evaluation have two issues that are different from unreported claims of insurance companies. First, an insurance claim only occurs if it is eventually reported, while the evaluation of mortality for life settlement underwriting can include deaths that are never reported in public records. When life insurance companies evaluate unreported claims they do not need to consider deaths that occur after a policy is lapsed, or deaths that may have occurred, but for which no claim is ever made. For example, the term IBNyR used in *Stochastic Claims Reserving Methods in Insurance* means incurred by not yet reported,[3] meaning that they assume that all mortality would eventually be reported. The second

[1] Chadick, Cabe; W. Campbell; and F. Knox-Seith, *Comparison of Incurred But Not Reported ("IBNR") Methods,* Society of Actuaries, 2009.
[2] Fearrington, Doug; and R. Lynch, Approaches to Determining Unpaid Claim Liabilities: Old and New, Valuation Actuary Symposium Session 39TS, 2008, p. 2.
[3] Wüthrich, Mario V. and Michael Merz, *Stochastic Claims Reserving Methods in Insurance*, page 376.

issue that differs from typical insurance experience is the degree of unreported mortality. Life insurance companies typically receive almost all death claims within a few weeks of the death of an insured individual, but it has not been unusual for deaths to be reported in the Social Security data a number of months, or even years, after the date of death. In addition, it may be difficult to match Social Security death reports to the underwritten life, because of the relatively common differences in stated names, errors in Social Security numbers, and deaths that are unreported by the Social Security Administration. The very large number of people in the Social Security records make it difficult to match an individual to records that do not correspond exactly. For these reasons the methodology in this paper has a significant effect for life settlement mortality evaluation, but would not produce very different results for life insurance company rates of incurred but unreported claims.

Life insurance claims and life settlement mortality differ from property and casualty insurance and health insurance claims in relation to the effect of unreported claims. Property and casualty and health claims can occur multiple times from the same policy, but, of course, a death can occur only once. When a particular insured person has a large number of property and casualty or health claims, the unreported number for that person could be higher than the number for someone with a low number of reported claims. This means that an unreported property and casualty or health claim does not have the effect of reducing the count of reported claims. But if a death occurs, and is unreported, the future projection of the death of that person is based on a life that no longer exists, for which a death cannot occur in the future. As stated above, this is not an issue for life insurance, because a death that is never reported is not a claim, and the policy is likely to be considered as having lapsed. But for life settlement mortality, the death measurement is intended to include all deaths, whether or not there is an insurance claim.

When a death is never reported, the related record will continue to indicate a living individual, and future death rates applied to that individual will project mortality that is impossible to occur, because the individual is no longer actually alive. The reason that these projected future deaths will not be in the death records is not because future deaths are unreported, but because a past death was unreported, and future deaths cannot occur for an individual who already died. If the projected deaths include the mortality rate applied to individuals who are no longer alive, then the IBNR number will need to include these projected deaths, which means that the IBNR number may include more than a single death per individual. As a result, the IBNR under this method exceeds the actual number of deaths that are unreported, and the term “incurred but not reported” is not exactly correct for that method. Some of the deaths that must be removed from the expected mortality were not actually “incurred.” The issue of a significant percentage of policies that are in the records as being in force, but for which the insured individuals actually died in the past, does not exist for insurance companies, and is not discussed in previously published articles about IBNR that we have reviewed. The approach to IBNR proposed in this paper is measured by reducing the expected deaths, to eliminate those that are unreported, and comparing the reported deaths to the number of deaths that are expected to have occurred. This differs from the typical approach to IBNR, in which the expected results are not adjusted, but the adjustment is made by computing the actual claims as the reported claims plus the estimated number of claims that are unreported.

3. CALCULATION EXAMPLES

To understand the method described in this paper, consider the following specific example. This example is based on mortality that would actually be a viatical settlement, because this high rate of mortality provides a more clear presentation of the difference between the method described in this publication and the traditional method. Suppose that an insured individual has a projected mortality rate that is constant over time, and is 50% per year. Suppose also that 2% of deaths are never reported, and that all death reports that do occur are reported within four years of the date of death. Assume further that the unreported percentage of deaths that have occurred in the most recent four years starts at 10% for the most recent year, and declines by two percent per year, until it reaches the permanent unreported rate of 2%. These values are not necessarily typical for life settlements, but are chosen to provide simple examples that are not grossly different from actual experience. Also, this is information that would not be known on the basis of reported data, but is an assumption that is provided to help explain the basis of the IBNR method proposed in this paper. Assume, for this example, that the actual mortality for the portfolio is exactly as expected. The mortality is evaluated over twelve month periods, starting from the date of underwriting. For the first example, suppose that the individual was underwritten in 2009, and that the actual to expected mortality is being evaluated through the twelve month periods starting in 2009 through 2011. The in-force results are as follows:

Twelve Months Starting Year	Probability of Death From Total	Probability of Survival at Beginning of Year	Unreported Percentage	Expected Number Shown as In-Force Currently
2009	0.500	1.000	6%	1.00
2010	0.250	0.500	8%	0.53
2011	0.125	0.250	10%	0.30

As an example of the evaluation of the number of individuals not reported to have died, the value 0.30 for in-force in 2011 consists of 25% that are still actually alive, as well as 6% of 50% that died in 2009 but have not been reported, and 8% of 25% that died in 2010 but have not been reported, i.e. the reported in force fraction is 0.25 + 0.03+0.02 = 0.30. The expected number of deaths occurring in 2010 would be 0.125 per initial case, and the number expected to be reported would be 10% less, or 0.1125. If the number of reported deaths is the expected ratio of 0.1125 per initial case, then the actual to expected result would be 100% for both this method and the traditional method of dealing with unreported deaths. The difference would be in the evaluation of incurred but unreported. Here the incurred but unreported value for 2009 would be 10% of the actual deaths, which is 0.0125. The traditional method would take the mortality rate, 50%, times the reported in-force value of 0.30. In this way the traditional method would produce 0.15 as the expected deaths, and would have to use this value minus 0.1125, or 0.0375 as the incurred but not reported value, 25% of the expected value. The traditional terminology is not correct, because 25% is not "incurred but not reported," but is rather "projected but not reported." In addition, typical methods of determining incurred but unreported deaths do not deal with the necessary reduction of the number of in-force policies for individuals who are no longer surviving.

Now consider an example with the same mortality and reporting results as the case above, but suppose that 64 individuals with these same conditions were underwritten in the year 2006. Suppose further that the results to be presented are for the entire six-year period, and that the actual mortality is exactly as expected for the group as a whole. Then the results over time are as follows:

Year	Actual Starting Number	Actual Deaths	Reported Deaths (Actual and Expected)	Reported Starting Number	Death Rate Times Reported Starting Number
2006	64	32	31.36	64.00	32.00
2007	32	16	15.68	32.64	16.32
2008	16	8	7.68	16.96	8.48
2009	8	4	3.76	9.28	4.64
2010	4	2	1.84	5.52	2.76
2011	2	1	0.90	3.68	1.84
Total		63	61.22		66.04

The method proposed by this paper would be to project the reported deaths on the basis of the actual survivors, resulting in the total expected deaths of 61.22, as shown in the fourth column of the table above. The incurred but unreported deaths would be the difference between the actual deaths, 63, and the reported deaths, 61.22, or 1.78 unreported deaths, which is 2.83% of the actual deaths. The traditional method would measure the expected deaths as 66.04, which is more than the total number of individuals in the population. It would then have to use 5.82 as the number of incurred but unreported deaths, or 9.54% of the expected number, a percentage almost as high as the highest percentage of actual deaths unreported from any year. In addition, the percentage by year becomes extremely high over time. For example the number of 2011 deaths that the traditional method would identify as unreported would be 1.84 minus 0.90, or more than 51% IBNR under the traditional method.

As shown in this example, the traditional method, by evaluating what is referred to as IBNR, but which is actually projected but unreported, can produce IBNR percentages that are much greater than the actual percentage of deaths that are not reported. In addition, if some deaths are never reported, the percentage that is referred to as IBNR by that method becomes greater in relation to the current reported deaths the longer that the experience is evaluated, even though, over time, the actual unreported number goes down. In order to determine a correct expected death count in the later years, it is necessary to evaluate the probability that some of the policies that are still in the population may be for people who have already died. The method that is proposed by this paper does that. It is not clear whether the actual applications of the traditional IBNR method do that, but if the fact that some of the policies are no longer in force is not considered, the expected values are incorrect. The traditional method must use a different IBNR percentage for reports of the same period, depending on the duration of the policies. In addition, this adjustment varies widely based on the mortality rate. For example, in the table above, if the mortality rate was 1%, which is a typical rate for healthy people at the age of life settlements, the 2011 reported starting number would be 61, and the traditional IBNR percentage would be 10.2%, compared to the value over 51% above.

Reports of actual to expected results typically refer to IBNR only as an overall percentage. For this reason it is not possible to determine whether the method that is being used takes into account the reduction in expected mortality caused by unreported earlier deaths, because the test of that approach would be to see whether the IBNR decreases with increasing duration. It is clear that if the expected number of reported deaths does not consider the fact that some policies listed as in-force insure people who died in prior years, and is based only on the percentage of deaths occurring in the current period that are not reported, the result will be significantly incorrect for policies that have very high expected mortality and were underwritten a number of years ago.

4. USE OF ACTUAL EXPERIENCE

The examples that were shown above assumed that the actual experience was exactly as expected. This was done to simplify the examples, but, of course, it never really happens. The evaluation of incurred but not reported deaths requires a determination of the actual percentage of deaths in prior periods for the group considered, because actual deaths in a particular period can only occur for insured individuals who were alive at the beginning of the period. The actual percentage of earlier deaths can be determined on the basis of the experience, taking into account the unreported percentages. If the number of reported deaths in the second example was significantly different from the values shown in the fourth column of that table, then the actual to expected percentages used to project the number of survivors could be used to adjust the percentage from the original expected values. For example, if the number of reported deaths, multiplied by the ratio of actual deaths to reported deaths, is different from the expected number of deaths, the adjustment to future-year expected mortality should be based on the actual number of deaths, not the expected number. Consider the following results:

Year	Actual Starting Number	Expected Reported Deaths	Actual Reported Deaths
2006	64.00	31.36	28.22
2007	35.20	17.25	15.52
2008	19.36	9.29	8.36
2009	10.65	5.00	4.50
2010	5.86	2.69	2.42
2011	3.22	1.45	1.30

The number of reported deaths in 2000 is 90% of the expected number, taking into account both the expected mortality rate and the fact that 2% of the deaths are never reported. Of course the actual number of cases at the beginning of the year is known, because that was the first year, so there were no prior deaths. This means that, if the unreported rate of 2% is considered reliable, it would be reasonable to assume an actual to expected result for that year of 90%. For the second year it is now necessary to recalculate the expected number of survivors. If the actual to expected is 90%, then the number of survivors at the beginning of the second year would be 64 minus 90% of the expected death number 32, or 64 - 0.90 × 32 = 35.20, and the expected number of deaths in the second year would be 17.60. This is the expected mortality rate of 50% times the number of survivors at the beginning of the second year. The assumed unreported percentage for the second year is 2%, so the expected number of reported deaths would be17.25 .. The actual number of reported deaths, 15.52, is 90% of this amount, so, based on the assumed unreported percentage, it appears that the actual to expected result for the second year is also 90%. The actual number of survivors starting the third year would then be estimated as 19.36, using the same calculation as used for the beginning of the second year. This process can be continued year by year. The example shown in table above is based on an actual-to-expected result of 90% every year, but the rate for each year has to be based on the results for the years that precede it.

This process shows that the proposed method can be adjusted to determine the expected results when the earlier results differ from the original expected mortality, but the process is somewhat more complex than the original examples. Of course this issue is not related to the method of defining incurred but not reported deaths, because the results that are presented are the results that would occur with an actual to expected ratio of 90%, and whatever method is used to deal with unreported mortality, if it is correct, should determine the rate of 90%. The issue with the method presented in this paper is not to determine a different rate of mortality, but to determine the rate in a way that is more straightforward and meaningful in relation to the actual proportion of reported mortality.

The approach to determination of the unreported deaths in this example follows the completion factor method. If the Bornhuetter-Ferguson method were used, the unreported number each year would be the unreported percentage times the expected mortality rate. For example, in the year 2006 the unreported number would be calculated as 2% times 64 times 50% deaths, or 0.64 deaths. This would project the number surviving at the beginning of 2007 as the initial number, 64 minus the reported deaths, 28.22 and the unreported deaths, 0.64, resulting in 35.14 estimated lives at the beginning of 2007. This is a difference of only about 0.06 in the number of survivors at that point compared to the results from the completion factor method, so the effect is fairly minor. The Bornhuetter-Ferguson method would increase the mortality rate from 0.45 to 0.451 in the year 2006, an actual to expected rate of 90.2%. With the same reported mortality as presented in the table above, this would increase gradually to than 95.8% in the year 2011, so the Bornhuetter-Ferguson method continues to show that mortality is less than expected, but produces results that are closer to 100% than the results from the completion factor method.

5. **APPLICATION OF UNREPORTED MORTALITY**

There are several situations in which the unreported mortality percentage should be set to zero for a particular policy. For example, if an underwritten individual is known to have died in a later year, then there was no unreported death in an earlier years. The expected deaths for that individual in those earlier years should be the full amount, with no unreported percentage, and the unreported mortality for that individual should be zero in the earlier years.

If an individual is underwritten again at a later date, that means that the individual is still alive at the time of the most recent underwriting, so the unreported death percentage should be zero up to the most recent underwriting date for any individual. It is quite common for individuals to be underwritten multiple times. A third example comes from the process of determining mortality for the entire population. As stated above, life settlement underwriters usually do not have access to personal records of an individual after the completion of the underwriting process, so the underwriters use public information to identify deaths. Sometimes the process of searching public information actually shows that the individual is still alive as of a particular date. When that occurs, the unreported mortality for the individual should be set to zero before the date at which they are known to still be alive.

In summary, the unreported deaths apply only to individuals who do not have a later reported death, have not been underwritten at a later date, and for whom no other information determines continued survival.

6. **DETERMINATION OF NEVER-REPORTED MORTALITY**

The percentage of unreported insurance claims is evaluated by recording the reported date for each claim in relation to the date of occurrence. Insurance claims that are never reported did not occur, because a claim only exists if it is eventually reported. The evaluation of life settlement mortality is different, because the evaluation is intended to be based on all actual deaths, not just those deaths that appear in public records. The number of deaths that are never reported cannot be determined in the process used for insurance unreported claims, because a death that is never reported would not be included in the IBNR method used for insurance.

Of course there is a limit to the lifetime of individuals, so eventually it will be possible to identify individuals who must have died, but did not have a reported death. A typical life settlement evaluation for a 75-year-old with a mortality multiple of 200% would produce a life expectancy of about ten years, and the time until the death could be assumed to have occurred, whether reported or not, could be thirty years or more. Life settlement underwriting started in the 1990s, so the possibility of determining unreported mortality after the maximum life of the individuals will not be possible for decades into the future. Even when it becomes possible, the change in data recording practices over time will make the historical results questionable as a projection for cases that are current at those future dates.

In a relatively short number of years there is a high probability that individuals with a very low life expectancy will have died. At that point, the number of deaths related to individuals with unreported deaths will become lower than the mortality rate for healthy individuals, and that will indicate that most of the remaining cases are individuals who have died, but whose death has been unreported. Even that process, however, requires a longer experience period than exists currently. At best, the current evaluation of the never-reported mortality must be based on the pattern of mortality for individuals with high rates of mortality. As the reported mortality rate for the group drops, part of the reason is the fact that some of the individuals who do not have a reported death have actually died, and the future mortality for those individuals is zero. This process is difficult, because it is certainly the case for many health problems that the initial mortality rate is much higher than average, but over time the people who are still alive tend to have mortality rates that move closer to average mortality.

Another issue that makes this process difficult is the fact that there are some methods of identifying unreported deaths that are costly, and tend to be done only for the cases for which the probability of a prior death is very high. This means that the rate of unreported deaths may not be constant for all individuals, but may actually be lower for individuals with very high projected mortality rates, whose records are reviewed more completely than for individuals whose expected mortality is closer to normal. An evaluation of unreported deaths for the entire group of insured individuals should consider the effects of different mortality identification processes applied to individuals with different expected rates of mortality.

7. SUMMARY

This paper presents a method of evaluating unreported deaths for life settlements that is different from the typical method used by insurance companies, but measures the actual unreported deaths, rather than the unreported projected deaths. The results of actual to expected deaths based on this method and the typical method should be exactly the same, if both are done properly, but the percentage of deaths that are unreported based on this method is appropriate in relation to the unreported rate, while the typical method would tend to produce unreasonably high unreported percentages when the majority of the individuals in a group have died. In addition, if the results of different underwriters are compared, even if they have the same rate of unreported deaths, the traditional method could show a higher unreported percentage for underwriters that have been evaluating mortality for a longer period. An example shown earlier in this paper, a case in which 10% of actual deaths that occurred in the current year were unreported, showed an IBNR rate of more than 51% under the traditional method. The calculation of the actual mortality rate during the current year under the proposed method is as follows:

$$Q = \frac{D \div (1-F)}{P - U}$$

where Q is the determined mortality rate, D is the number of reported deaths that occurred in the current year, F is the estimated fraction of unreported deaths in the current year, P is the number of individuals with reported in-force policies, and U is the estimated number of unreported deaths that occurred in prior years.

The incurred but not reported percentage to be identified under this method is the estimated actual number of unreported deaths divided by the estimated total number of actual deaths. To show the details of this method the following example uses data that is different from the previous examples. Specifically, suppose that a group of 400 policies have just completed the third year since the insured individuals were underwritten. Suppose that the percentage of deaths that are unreported is 10% for the deaths that occurred between two and three years ago, 15% for deaths that occurred one to two years ago, and 20% for deaths that occurred within the past year. Assume further that the number of deaths reported from two to three years ago is 180, the number reported from one to two years ago is 85, and the number reported in the current year is 32. Then the unreported deaths from two to three years ago would be (180 / 90%) × 10% = 20, and the number of unreported deaths from one to two years ago would be (85 / 85%) × 15% = 15. Using the same formula as shown above, the mortality rate for the current year would be as shown in the next formula:

$$\frac{32 \div (1 - 20\%)}{135 - 20 - 15} = 0.4$$

where the number 135 is the number of original policies, 400, minus the deaths reported from the two prior years, 180 and 85, resulting in 135 policies remaining in the records at the beginning of the current year. The actual number of deaths that would have occurred in the current year but are unreported would be 8. If the traditional IBNR method were applied, the expected deaths at a 40% rate would be 40% of 135, or 54, and the IBNR would have to be $54 - 35 = 19$ to produce the correct mortality rate. In other words, the traditional IBNR would have to be more than two times the number of deaths that were actually unreported in the current year to obtain the correct mortality rate.

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