Why accurate estimates of unpaid claims are important

Why accurate estimates of unpaid claims are important

1. **Internal Management**: The estimates are used to make business decisions in pricing and underwriting, as well as strategic and financial decisions.
2. **Investors**: The estimates impact the profitability of the insurer and thus the returns paid to investors.
3. **Regulators**: The estimates are used to monitor the solvency of the insurer.

Accounting and valuation date definitions

Accounting and valuation date definitions

1. **Accounting date**: This defines the group of claims being analyzed, and determines the date for the paid/unpaid split.

2. **Valuation date**: This defines the date through which transactions are included in the analysis, and this could be the same as, prior to, or after the accounting date.

5 components of unpaid claims

5 components of unpaid claims

1. Case reserves
2. Provision for development on known claims
3. Reopened claims reserve
4. Provision for claims incurred but not reported (aka "pure" IBNR)
5. Provision for claims in transit (incurred and reported but not recorded)

First principle of reserving

First principle of reserving

An actuarially sound claims reserve for a defined group of claims as of a given valuation date is a provision, based on estimates derived from reasonable assumptions and appropriate actuarial methods, for the unpaid amount required to settle all claims, whether reported or not, for which liability exists on a particular accounting date.

Second principle of reserving

Second principle of reserving

An actuarially sound loss adjustment expense reserve for a defined group of claims as of a given valuation date is a provision, based on estimates derived from reasonable assumptions and appropriate actuarial methods, for the unpaid amount required to investigate, defend and effect the settlement of all claims, whether reported or not, for which loss adjustment expense liability exists on a particular accounting date.

Third principle of reserving

Third principle of reserving

The uncertainty inherent in the estimation of required provisions for unpaid claims or loss adjustment expenses implies that a range of reserves can be actuarially sound. The true value of the liability for losses or loss adjustment expenses at any accounting date can be known only when all attendant claims have been settled.

Fourth principle of reserving

Fourth principle of reserving

The most appropriate reserve within a range of actuarially sound estimates depends on both the relative likelihood of estimates within the range and the financial reporting context in which the reserve will be presented.

Expected Claims Formula for Estimated Ultimate Claims

Expected Claims Formula for Estimated Ultimate Claims

Estimated Ultimate Claims for AY $YYYY$ = Expected Claim Ratio $\times$ Earned Premium for AY $YYYY$

Estimated Ultimate Claims for AY $YYYY$ = Expected Pure Premium $\times$ Earned Exposures for AY $YYYY$

Assumptions of Expected Claims Method

Assumptions of Expected Claims Method

The main assumption is that ultimate claims for an exposure period can be better estimated based on an a priori estimate than using the experience observed to date for that exposure period. Another way of stating this is that the claims reported and paid to date for that exposure period tell you no useful information about your ultimate claims for that exposure period.

A secondary assumption is that a reasonable expected claim ratio can be obtained.

Common uses of Expected Claims Method

Common uses of Expected Claims Method

- When entering a new line of business, as there is insufficient data to obtain historical development factors.
- When operational or environmental changes make historical data irrelevant for projecting ultimate claims (e.g., expanded coverage due to a recent court decision).
- When estimating ultimates at early maturities for long-tailed lines of business where the early age-to-ultimate factors are highly leveraged.
- When data is unavailable so other methods cannot be used.

Advantage and disadvantage of Expected Claims Method

Advantage and disadvantage of Expected Claims Method

This method has the advantage of providing a stable estimate of ultimate claims, but the disadvantage of being unresponsive to recent experience.

2 challenges of using the Expected Claims Method

2 challenges of using the Expected Claims Method

1. Determining the appropriate exposure base.
2. Estimating claims relative to that exposure base.

Why we exclude the data for the year for which we are calculating ultimates in calculating the expected claim ratio when using the Expected Claims method

Why we exclude the data for the year for which we are calculating ultimates in calculating the expected claim ratio when using the Expected Claims method

Because using that data would violate the main assumption of the Expected Claims method.

Briefly describe the steps for calculating the expected claim ratio using the Expected Claims method

Briefly describe the steps for calculating the expected claim ratio using the Expected Claims method

1. Develop claims to ultimate for each year of historical experience (usually using the chain-ladder method to obtain ultimate claims).

2. Calculate the ultimate claim ratio for each year of historical experience by dividing ultimate claims by earned premium.

3. Adjust the historical claim ratios to be on the same rate, tort reform, loss trend, premium trend, and exposure trend (if the exposure base is inflation sensitive) levels as the year for which you are estimating ultimate claims.

4. Select an expected claim ratio based on the adjusted historical claim ratios (perhaps by taking some sort of average - usually a straight average is used).

How speedups or slowdowns in settlement impact the Expected Claims method

How speedups or slowdowns in settlement impact the Expected Claims method

The Expected Claims method is unaffected by these changes to the extent that the expected claim ratio is not impacted.

- If the speedup or slowdown started in the most recent accident year, which is not part of the expected claim ratio, then the estimates produced by this method will be unaffected by the change and will be accurate.
- If the speedup or slowdown started in an earlier year that is part of the expected claim ratio calculation, then the error produced by this method will be in the same direction as the chain ladder method, but to a lesser extent. Note that the expected claim ratio will only potentially be impacted if it is calculated based on paid claim data, since reported claim triangles would be unaffected by speedups or slowdowns in settlement.

How changes in case reserve adequacy impact the Expected Claims method

How changes in case reserve adequacy impact the Expected Claims method

The Expected Claims method is unaffected by these changes to the extent that the expected claim ratio is not impacted.

- If the change in case adequacy started in the most recent accident year, which is not part of the expected claim ratio, then the estimates produced by this method will be unaffected by the change and will be accurate.
- If the change in case adequacy started in an earlier year that is part of the expected claim ratio calculation, then the error produced by this method will be in the same direction as the chain ladder method, but to a lesser extent. Note that the expected claim ratio will only potentially be impacted if it is calculated based on reported claim data, since paid claim triangles would be unaffected by these changes.

How changes in claim ratios impact the Expected Claims method

How changes in claim ratios impact the Expected Claims method

The Expected Claims method would not react to any changes in claim ratio in the most recent year since the method is not responsive to these changes. As such, the method will be inaccurate in these situations.

How exposure growth impacts the Expected Claims method

How exposure growth impacts the Expected Claims method

The Expected Claims method is unaffected by exposure growth on its own. If there are changes in the average accident date because of the exposure growth, then:

- The Expected Claims method will still be accurate if the average accident date change only started in the most recent year (which doesn't impact the expected claim ratio).
- If the average accident dates have changed for several years, then the expected claim ratio will be impacted if it is calculated based on historical data using the chain-ladder approach. The error produced by this method will be in the same direction as the chain ladder method, but to a lesser extent.

How mix of business changes impact the Expected Claims method

How mix of business changes impact the Expected Claims method

When you have a changing mix of business, the Expected Claims method will be impacted if either of the following are true:

- The segments of the business that are changing have different expected claim ratios. This would have the same effect as a change in claim ratio, mentioned above.
- The segments of the business that are changing have the same expected claim ratios but have different development patterns, AND this causes the estimate of the expected claim ratio from the historical data using a chain-ladder approach to be inaccurate.

Bornhuetter-Ferguson Formula for Estimated Ultimate Claims using reported claims data

Bornhuetter-Ferguson Formula for Estimated Ultimate Claims using reported claims data

B-F Ultimate = Actual Reported + Expected Unreported Claims

B-F Ultimate = Actual Reported + Expected Claims $\times$ % Unreported

B-F Ultimate = Actual Reported + Earned Premium $\times$ Expected Claim Ratio $\times$ % Unreported

Bornhuetter-Ferguson Formula for Estimated Ultimate Claims using paid claims data

Bornhuetter-Ferguson Formula for Estimated Ultimate Claims using paid claims data

B-F Ultimate = Actual Paid + Expected Unpaid Claims

B-F Ultimate = Actual Paid + Expected Claims $\times$ % Unpaid

B-F Ultimate = Actual Paid + Earned Premium $\times$ Expected Claim Ratio $\times$ % Unpaid

How the B-F method is a credibility weighting of other methods

How the B-F method is a credibility weighting of other methods

B-F Ultimate = Development Technique Ultimate $\times$ (1/CDF) + Expected Claims $\times$ (1 - 1/CDF)

This is essentially a credibility-weighting with credibility Z = (1/CDF).

Benktander Formula for Estimated Ultimate Claims using reported claims data

Benktander Formula for Estimated Ultimate Claims using reported claims data

Benktander Ultimate Claims = Actual Reported Claims + B-F Ultimate $\times$ % Unreported

How the Benktander method is a credibility weighting of other methods

How the Benktander method is a credibility weighting of other methods

Benktander Ultimate = Development Technique Ultimate $\times$ (1/CDF) + B-F Ultimate $\times$ (1 - 1/CDF)

This is essentially a credibility-weighting with credibility Z = (1/CDF).

What happens with many iterations of the Benktander method?

What happens with many iterations of the Benktander method?

More and more weight is given to the Development technique with each iteration, so the Benktander estimates approach the Development technique estimates.

Assumptions of B-F Method

Assumptions of B-F Method

The main assumption is that IBNR or unpaid claims for an exposure period can be better estimated based on an a priori estimate than using the experience observed to date for that exposure period. Another way of stating this is that the claims reported and paid to date for that exposure period tell you no useful information about your IBNR or unpaid claims for that exposure period.

A secondary assumption is that a reasonable expected claim ratio can be obtained.

Common uses of the B-F Method

Common uses of the B-F Method

- When there are random fluctuations or large claims at early maturities.
- When entering a new line of business.
- When estimating ultimates at early maturities for long-tailed lines of business where the early age-to-ultimate factors are highly leveraged.

Advantages of the B-F and Benktander Methods

Advantages of the B-F and Benktander Methods

The B-F method has the advantages of providing more stable estimates than the Development technique and more responsive estimates than the Expected Claims technique.

The Benktander method has the advantage of being even more responsive than the B-F method while still being more stable than the Development technique (but not as stable as B-F).

2 challenges of using the B-F and Benktander Methods

2 challenges of using the B-F and Benktander Methods

1. Estimating the expected claims.
2. Estimating the expected % unreported (or % unpaid).

When the credibility interpretation of the B-F and Benktander methods does not hold

When the credibility interpretation of the B-F and Benktander methods does not hold

When there is downward development, because the "credibility" that is equal to 1/CDF will be greater than 1.

Options for dealing with downward development in using the B–F or Benktander method

Options for dealing with downward development in using the B–F or Benktander method

- Continuing to use the B-F and Benktander methods.
- Limiting the CDFs to a minimum value of 1.
- Rely on a different technique to select ultimates for years with CDFs below 1.

How speedups or slowdowns in settlement impact the B-F and Benktander methods

How speedups or slowdowns in settlement impact the B-F and Benktander methods

When dealing with the reported B-F or Benktander methods, estimates will still be accurate since both the Development and Expected Claims estimates based on reported claims will be accurate.

The paid B-F or Benktander methods will overestimate when there has been a speedup in settlement, and will underestimate when there has been a slowdown in settlement. However, the error will not be as big in magnitude as it would be using the Development technique, since the weight given to the Expected Claims technique reduces the amount of the error.

How changes in case reserve adequacy impact the B-F and Benktander methods

How changes in case reserve adequacy impact the B-F and Benktander methods

When dealing with the paid B-F or Benktander methods, estimates will still be accurate since both the Development and Expected Claims estimates based on paid claims will be accurate.

The reported B-F or Benktander methods will overestimate when there has been an increase in case reserve adequacy, and will underestimate when there has been a decrease in case reserve adequacy. However, the error will not be as big in magnitude as it would be using the Development technique, since the weight given to the Expected Claims technique reduces the amount of the error.

How changes in claim ratios impact the B-F and Benktander methods

How changes in claim ratios impact the B-F and Benktander methods

The B-F and Benktander techniques do not fully react to changes in claim ratios due to the weighting given to the Expected Claims technique. Note that reported B-F and Benktander methods will be more responsive than paid B-F and Benktander methods since more weight will be given to the Development technique when reported claims are used.

How exposure growth impacts the B-F and Benktander methods

How exposure growth impacts the B-F and Benktander methods

The B-F and Benktander methods are unaffected by exposure growth on its own. However, if there are changes in the average accident date because of the exposure growth, then these methods will be affected in the same direction but not to the same extent as the Development technique. For example, if the book of business is growing causing the average accident date to be later in more recent years, then the B-F and Benktander methods will underestimate ultimate claims.

How mix of business changes impact the B-F and Benktander methods

How mix of business changes impact the B-F and Benktander methods

When you have a changing mix of business, the B-F and Benktander methods will be inaccurate if either of the following are true:

- The segments of the business that are changing have different development patterns (this impacts the Development technique, and possibly the Expected Claims technique depending on how the expected claim ratio is calculated).
- The segments of the business that are changing have different expected claim ratios (this impacts the Expected Claims technique).

Cape Cod Formula for Estimated Ultimate Claims

Cape Cod Formula for Estimated Ultimate Claims

CC Ultimate =

Reported + On-Level EP $\times$ ECR $\times$ % Unreported

How to calculate the Cape Cod ECR

How to calculate the Cape Cod ECR

First adjust reported claims to be at common trend levels and tort reform levels, and adjust earned premium to be at current rate level and a common premium trend level. Then using all years of data (including latest):

$$\text{Cape Cod ECR} = \frac{\sum \text{Reported Claims}}{\sum(\text{On-Level Earned Premium} \times \%\ \text{Reported})}$$

Main assumption of Cape Cod Method

Main assumption of Cape Cod Method

Unreported claims will develop based on expected claims, and expected claims are derived using reported claims and earned premium.

Advantages of the Cape Cod Method

Advantages of the Cape Cod Method

The key innovation and advantage of the Cape Cod method is that the ECR is estimated from historical data rather than being judgmentally selected.

Another advantage compared to the development method is that random fluctuations at early maturities do not significantly distort estimates.

Disadvantages of the Cape Cod Method

Disadvantages of the Cape Cod Method

- Cape Cod can't be used for a new line of business since there is no data to calculate the ECR.
- Cape Cod estimates are highly dependent on the appropriate on-leveling of premium, and this can be difficult (especially for older years).
- When data is thin or volatile, the Cape Cod ECR will not be reliable, and B-F may perform better.

How speedups or slowdowns in settlement impact the Cape Cod method

How speedups or slowdowns in settlement impact the Cape Cod method

Cape Cod estimates will be accurate since reported claims are unaffected by a change in settlement rates.

How changes in case reserve adequacy impact the Cape Cod method

How changes in case reserve adequacy impact the Cape Cod method

The Cape Cod method will overestimate when there has been an increase in case reserve adequacy and will underestimate when there has been a decrease in case reserve adequacy. The error will be larger in magnitude than the B-F method, but not as large as the Development method.

How changes in claim ratios impact the Cape Cod method

How changes in claim ratios impact the Cape Cod method

The Cape Cod method is more responsive to changing claim ratios than the B-F method since it calculates the ECR using the most recent exposure periods. However, it is still not fully responsive (like the Development method). As such, for increasing claim ratios, Cape Cod will understate estimates, but not by as much as the B-F method.

How exposure growth impacts the Cape Cod method

How exposure growth impacts the Cape Cod method

The Cape Cod method is unaffected by exposure growth on its own. However, if there are changes in the average accident date because of the exposure growth, then the Cape Cod method will be affected in the same direction but not to the same extent as the Development technique. For example, if the book of business is growing causing the average accident date to be later in more recent years, then the Cape Cod method will underestimate ultimate claims.

How mix of business changes impact the Cape Cod method

How mix of business changes impact the Cape Cod method

When you have a changing mix of business, the Cape Cod method will be inaccurate if either of the following are true:

- The segments of the business that are changing have different development patterns.
- The segments of the business that are changing have different expected claim ratios.

Assumptions of frequency-severity techniques

Assumptions of frequency-severity techniques

The 3 main assumptions of frequency-severity methods are:

1. Claim counts and severities will continue to develop in future periods as they have in past periods.
2. Consistent definition of claim counts throughout the experience period.
3. The mix of types of claims is relatively homogeneous.

The disposal rate technique has the additional assumption that there are no significant partial payments (i.e., claims are paid when they are closed).

Advantages of frequency-severity techniques

Advantages of frequency-severity techniques

- The disposal rate technique only uses paid data, so it isn't impacted by changes in case reserve adequacy.
- Assumptions about inflation and expected claim disposal rates can be explicitly incorporated into the methods.
- Gain greater insight into the claims process by understanding the rate of claim reporting and settlement and average dollar value of claims separately.

Disadvantages of frequency-severity techniques

Disadvantages of frequency-severity techniques

- Estimates are highly sensitive to the assumed trend rate.
- Changes in the definition of claim counts impact the estimates.
- Changes in claim reporting or processing impact the estimates.
- The methods require a relatively homogeneous mix of claims.
- The data may not be available (i.e., claim counts may be unavailable).

Formula to calculate incremental closed claim counts using the disposal rate technique

Formula to calculate incremental closed claim counts using the disposal rate technique

Incremental claim counts closed between y_1 and y_2 for AY =

$$\frac{\text{Ultimate claim counts for AY - Closed counts at latest diagonal for AY}}{\text{1 - selected disposal rate at latest diagonal}} \times$$

(disposal rate at y_2 - disposal rate at y_1)

Considerations for the maturity age to begin the tail and combine data for the tail severity

Considerations for the maturity age to begin the tail and combine data for the tail severity

- Combine data at the age at which results become erratic, since combining the data may provide more stability.
- The influence on the total projections of selecting a particular age. If the impact on the total estimate is very small, more refined analysis may not be necessary.
- The percentage of claims expected to be closed beyond the selected age. Enough claims should be there to provide a more stable severity estimate when grouped, but not too many claims since some should remain to provide estimates for earlier maturities where the age-to-age factors are more stable.

Assumptions of case outstanding techniques

Assumptions of case outstanding techniques

1. Development of future claims will be similar to development in prior periods.
2. Case outstanding to date provides useful information about future claims development.

Additionally, all the same assumptions from the development technique also apply here (consistent claims processing, consistent mix of claims, stable policy limits and deductibles, etc.).

When case outstanding techniques are most useful

When case outstanding techniques are most useful

- When looking at report year triangles.
- For claims-made policies, since there is no pure IBNR.
- When looking at accident year triangles, but nearly all claims are reported by the first column of the triangle.
- The 2nd approach is useful when only current case outstanding data is available so other techniques cannot be used.

Disadvantages of case outstanding techniques

Disadvantages of case outstanding techniques

- In most lines of business, case outstanding do not provide sufficient information about pure IBNR.
- There is a lack of industry benchmark data for accident year applications of this method.
- It is not intuitive as to what paid-on-case and remaining-in-case ratios are appropriate at each maturity including the tail.
- The projections can be distorted by case reserves for large losses.
- The 2nd approach depends on industry CDFs, which may not be appropriate for the particular self-insurer.
- The CDFs for the 2nd approach may be highly leveraged for immature years, making estimates highly volatile.

Formula for case O/S development factor for case outstanding method #2

Formula for case O/S development factor for case outstanding method #2

$$\text{Case O/S Dev Factor} = 1 + \frac{(ReptCDF - 1)(PaidCDF)}{PaidCDF - ReptCDF}$$

$$\text{Case O/S Dev Factor} = \frac{\text{Unpaid Claims}}{\text{Case Outstanding}}$$

2 ways to deal with operational changes when estimating unpaid claims

2 ways to deal with operational changes when estimating unpaid claims

1. Using data selection and rearrangement to isolate or neutralize the impact of the changes
2. Using data adjustment to restate historical data as if the changes never occurred.

Examples of using data selection and rearrangement to address operational changes

Examples of using data selection and rearrangement to address operational changes

- Using earned exposures instead of claim counts when the definition of claim counts has changed.
- Using policy year data instead of accident year data when policy limits have significantly changed between policy years.
- Using report year data instead of accident year data when social or legal climate changes cause severity to correlate closer with report date than accident date.
- Using shorter time periods when the average accident date has changed over time.

When subdividing triangles by size of loss would be useful

When subdividing triangles by size of loss would be useful

If there was a shift in emphasis in the claims department between handling small versus large claims.

Purpose of Berquist-Sherman techniques

Purpose of Berquist-Sherman techniques

The Berquist-Sherman techniques can be used to adjust triangles for changes in claim settlement rates and/or case reserve adequacy. After the adjustments, all years in the adjusted triangles will have the same settlement rates and/or case reserve adequacy so the regular development methods can then be used on the adjusted triangles to produce estimates.

Assumptions of the paid B-S technique

Assumptions of the paid B-S technique

1. Changes in disposal rates are due to speedups or slowdowns in settlement rates.

2. Higher disposal rates are associated with a higher percentage of ultimate paid claims.

Assumption of the reported B-S technique

Assumption of the reported B-S technique

Any differences between the annual changes in average case reserves at each maturity and the severity trend are due to changes in case reserve adequacy.

Challenges in using paid loss data to obtain the severity trend for the reported B-S technique

Challenges in using paid loss data to obtain the severity trend for the reported B-S technique

It assumes that the average paid severity is only changing because of the severity trend (and not things like shifts in the prioritization between large and small claims).

Additionally, for lines like medical malpractice:

1. Limited paid data at early maturities to calculate paid severity.
2. Trends can be distorted by irregular settlements and variation in the rate of claims closed without payment.

The advantage of using the latest diagonal as the common level for B-S techniques

The advantage of using the latest diagonal as the common level for B-S techniques

It has the advantage that the adjusted paid or reported triangles would have the latest diagonal remain unchanged from the unadjusted paid or reported triangles.

Benefits of using multiple estimation methods rather than a single method to estimate unpaid claims

Benefits of using multiple estimation methods rather than a single method to estimate unpaid claims

Seeing multiple estimates can help you better understand the range and distribution of possible outcomes, as well as the sensitivity of estimates to varying assumptions.

Examples of common diagnostics used to check estimation methods for reasonability

Examples of common diagnostics used to check estimation methods for reasonability

Common diagnostics to review for reasonability would include implied ultimate frequencies, severities, claim ratios, pure premiums, and unpaid severities.

2 reasons why unpaid claims estimates should be reviewed between annual analyses

2 reasons why unpaid claims estimates should be reviewed between annual analyses

1. The unpaid claims estimate should be updated if there has been a change in exposures.
2. To see if claims are developing as expected as a diagnostic check as to whether unpaid claims estimates are reasonable.

Different options an actuary can take based on a retroactive test if actual emergence exceeded expected emergence

Different options an actuary can take based on a retroactive test if actual emergence exceeded expected emergence

1. Reduce the IBNR. For example, this might be appropriate if there was a speedup in reporting.

2. Leave the IBNR unchanged. For example, this might be appropriate if there was a large reported claim (and you think future development will return to expected levels).

3. Increase the IBNR. For example, this might be appropriate if there was a deterioration in the claim ratio.

Formula to calculate expected reported claim emergence

Formula to calculate expected reported claim emergence

Expected Reported Claims between t and $t+1$ =

(Estimated Ultimate Claims at t - Cum. Reported Claims at t)

$$\times \frac{\%\ \text{Reported}_{t+1}\ \text{-}\ \%\ \text{Reported}_{t}}{1-\%\ \text{Reported}_{t}}$$

Why linear interpolation of development within quarters is more reasonable than linear interpolation within a year

Why linear interpolation of development within quarters is more reasonable than linear interpolation within a year

Because development tends to be higher in earlier maturities and tends to decrease over time. As such, the linear interpolation assumption is usually not reasonable for prolonged periods of time, since most of the development will tend to occur earlier in the year than later in the year.

Some ways S&S data availability can vary by insurer

Some ways S&S data availability can vary by insurer

- Some insurers treat S&S recoveries as negative payments, while other insurers record S&S recoveries separately.
- Some insurers capture data for different types of recoveries separately, while others combine all recovery types together.
- Some insurers estimate case outstanding amounts for recoveries, while other insurers do not.

Two ways to estimate S&S recoverables

Two ways to estimate S&S recoverables

1. Use the development technique (or one of the other previously discussed techniques) on a S&S triangle directly. This may work better for salvage than subrogation, since salvage is related to property coverage and develops quickly, while subrogation is mostly related to liability coverage and takes longer to develop.

2. Use a ratio approach that develops ratios of S&S to gross claims, and use those ratios along with ultimate claim estimates to project ultimate S&S.

Two advantages of using the ratio approach to estimate S&S recoverables

Two advantages of using the ratio approach to estimate S&S recoverables

1. The development factors for the ratio approach tend to be less leveraged than the development factors based on received S&S dollars.

2. The ratio approach produces ratios of ultimate S&S to ultimate claims, which can be used as a diagnostic. If a ratio for a particular year seems unreasonable, a more reasonable S&S ratio can be selected for that year.

Considerations for whether to develop gross and ceded losses separately rather than developing net of reinsurance losses directly

Considerations for whether to develop gross and ceded losses separately rather than developing net of reinsurance losses directly

- Data availability
- Characteristics of the reinsurance program
- The actuary's personal preferences

Formula for ceded and net losses for Quota Share and XOL treaties

Formula for ceded and net losses for Quota Share and XOL treaties

Quota Share Ceded = Ceded % $\times$ Gross Loss

XOL Ceded = max[\$0, min[XOL Limit, Gross Loss - XOL Retention]]

Net Loss = Gross Loss - Ceded Loss

Relationship between tail factors for gross, ceded, and net loss triangles for Quota Share and XOL treaties

Relationship between tail factors for gross, ceded, and net loss triangles for Quota Share and XOL treaties

- For Quota Share treaties, the tail factors for gross, net, and ceded triangles will be the same since the net and ceded triangles are just constant multiples of the gross triangle.

- For Excess of Loss and Stop Loss treaties, the tail factor for the ceded triangle will typically be larger than for the gross triangle since once the retention is hit, all development occurs in the ceded layer (at least up to the treaty limit). For the same reason, the tail factor for the net triangle will typically be smaller than for the gross triangle since the net losses may be capped by the reinsurance protection.

Some ways ALAE data availability can vary by insurer

Some ways ALAE data availability can vary by insurer

- Some insurers maintain data for different types of expenses, others combine all expenses into a single ALAE category. When data for legal expenses can be isolated from the rest of ALAE, it is often preferable to develop this piece separately.
- Some insurers estimate case outstanding amounts for ALAE, while other insurers do not.

Three ways to estimate unpaid ALAE

Three ways to estimate unpaid ALAE

1. ALAE can be combined with claims to estimate claims and ALAE together. However, this may not be a good idea if ALAE has a very different development pattern than claims.

2. Use the development technique (or one of the other previously discussed techniques) on an ALAE triangle directly.

3. Use a ratio approach that develops ratios of paid ALAE-to-paid claims (or reported ALAE-to-reported claims), and use those ratios along with ultimate claim estimates to project ultimate ALAE.

Assumption of using the ratio approach to estimate unpaid ALAE

Assumption of using the ratio approach to estimate unpaid ALAE

The relationship between ALAE and claims is stable over the experience period.

Advantages of using the ratio approach to estimate unpaid ALAE

Advantages of using the ratio approach to estimate unpaid ALAE

1. It recognizes the inherent relationship between claims and ALAE.

2. The development factors for the ratio approach tend to be less leveraged than the development factors based on ALAE dollars.

3. The ratio approach produces ratios of ultimate ALAE to ultimate claims, which can be used as a diagnostic. If a ratio for a particular year seems unreasonable, a more reasonable ALAE ratio can be selected for that year.

Disadvantages of using the ratio approach to estimate unpaid ALAE

Disadvantages of using the ratio approach to estimate unpaid ALAE

- For some lines of business, there may be claims with no claim payment but have substantial ALAE.
- An error in the estimation of ultimate claims will lead to an error in the estimation of ultimate ALAE.

Advantage of using additive development instead of multiplicative development when developing the paid-to-paid ratios

Advantage of using additive development instead of multiplicative development when developing the paid-to-paid ratios

The advantage of the additive approach is that it is more stable if the ratios are very small at early maturities.

Describe how ULAE can be estimated using a market value approach

Describe how ULAE can be estimated using a market value approach

With this approach, the market value of the unpaid ULAE would be equal to the cost that a Third-Party Administrator (TPA) would require to take over handling of the book of claims.

Using this approach to quantify unpaid ULAE is common among self-insurers.

One common assumption for dollar-based techniques to estimate unpaid ULAE

One common assumption for dollar-based techniques to estimate unpaid ULAE

One common assumption of the dollar-based techniques is that ULAE costs track with claim costs in both timing (similar payment patterns) and amount. The amount assumption implies that a single $10,000 claim would have the same ULAE costs as ten $1,000 claims.

Formula for the claims basis for the dollar-based Generalized Approach

Formula for the claims basis for the dollar-based Generalized Approach

$$B = [(U_1 \times R) + (U_2 \times P) + (U_3 \times C)]$$

- B = claims basis for the calendar year
- U_1 = percent of ultimate ULAE spent opening claims
- U_2 = percent of ultimate ULAE spent maintaining claims
- U_3 = percent of ultimate ULAE spent closing claims
- $U_1 + U_2 + U_3 = 100\%$
- R = ultimate cost of claims reported in the CY
- P = paid claims during the calendar year
- C = ultimate cost of claims closed during the calendar year

Three ways to estimate unpaid ULAE using the generalized approach

Three ways to estimate unpaid ULAE using the generalized approach

1. Expected Claims approach: Unpaid ULAE = $(W^* \times L) - M$
2. B-F approach: Unpaid ULAE = $W^* \times (L - B)$
3. Development approach: Unpaid ULAE = $M \times (L/B - 1)$

Key assumptions of the Generalized Approach

Key assumptions of the Generalized Approach

- ULAE costs are proportional to the dollars of claims being handled.
- ULAE amounts spent opening claims are proportional to the ultimate cost of claims being reported.
- ULAE amounts spent maintaining claims are proportional to payments made.
- ULAE amounts spent closing claims are proportional to the ultimate cost of claims being closed.

Furthermore, the generalized approach also assumes that there is no cost to re-open or re-close claims.

One weakness of the generalized approach

One weakness of the generalized approach

It does not account for the case when ULAE inflation is occurring at a different rate than claims inflation.

Formula for the claims basis and unpaid ULAE for the Simplified Generalized Approach

Formula for the claims basis and unpaid ULAE for the Simplified Generalized Approach

$$B_{est} = (U_1 \times L) + (U_2 \times P)$$

Unpaid ULAE = $W^* \times$ [Pure IBNR + $U_2 \times$ (Case + IBNER)]

Additional assumptions of the Simplified Generalized Approach

Additional assumptions of the Simplified Generalized Approach

- R is approximated using the accident year ultimate claims when calculating W.
- That no extra effort is required to close claims, so $U_3 = 0$.

Key assumptions of the Classical Approach

Key assumptions of the Classical Approach

- ULAE costs are proportional to the dollars of claims being handled.
- Half of ULAE is spent when opening a claim ($U_1 = 50\%$), and half of ULAE is spent when closing the claim ($U_3 = 50\%$).
- ULAE amounts spent closing claims are proportional to the ultimate cost of claims being closed.
- There are no partial payments, so all claim payments are made when the claim is closed (i.e., $C = P$).

When the Classical Approach does not work well

When the Classical Approach does not work well

The classical approach does not work well for long-tail lines of business, in times when ULAE inflation rates differ from claims inflation rates, when the insurer is significantly growing or shrinking, or when the 50/50 assumption is not appropriate.

Claims basis formula under the Kittel Approach

Claims basis formula under the Kittel Approach

B_{est} = (50% $\times$ CY Incurred Claims) + (50% $\times$ P)

Note that CY Incurred = CY Paid + change in TOTAL reserves (including IBNR)

Unpaid ULAE formula for Classical and Kittel approaches

Unpaid ULAE formula for Classical and Kittel approaches

$$\text{Unpaid ULAE} = W^* \times [\text{Pure IBNR} + 50\% \times (\text{Case} + \text{IBNER})]$$

How the Kittel Approach is an improvement over the Classical Approach

How the Kittel Approach is an improvement over the Classical Approach

The Kittel approach is an improvement over the classical approach when the book of business is growing or shrinking and for longer tailed lines of business. This is because when an insurer grows, ULAE tends to increase quickly, but the claims from the additional exposures may not be paid for many years (resulting in higher paid ULAE-to-paid claim ratios). However, the reserves will start increasing sooner, so including incurred claims will reduce this distortion.

When the Kittel Approach does not work well

When the Kittel Approach does not work well

When the 50/50 assumption is not appropriate or when ULAE inflation rates differ from claims inflation rates.

How the Mango-Allen Approach differs from the Classical Approach

How the Mango-Allen Approach differs from the Classical Approach

The only difference between the Mango-Allen approach and the classical approach is that expected paid claims are used instead of actual paid claims when estimating the claims basis for each year.

The Mango-Allen approach is useful when insurers have limited or volatile calendar year paid claims. However, for larger companies with more stable actual paid claims, the extra effort to estimate the expected paid claims may not be justified.

Reasons for the development of the Generalized Approach

Reasons for the development of the Generalized Approach

- Recognize an insurer's rapid growth
- Be consistent with the insurer's ULAE expenditures over the life of a claim
- Reproduce key concepts underlying the Wendy Johnson technique
- Use commonly available and reliable aggregate payment and unpaid claims data
- Allow for alternatives to the 50/50 rule.

Two issues in dollar-based techniques that are addressed by count-based techniques

Two issues in dollar-based techniques that are addressed by count-based techniques

1. That ULAE is not directly proportional to claims (e.g., the ULAE for a single $10,000 claim would be less than the ULAE for ten $1,000 claims.)

2. That using ULAE-to-claims ratios results in volatile ULAE when claims are volatile.

Key assumption of and challenge with count-based techniques

Key assumption of and challenge with count-based techniques

A key assumption of count-based techniques is that the same kind of transaction costs the same ULAE regardless of claim size.

A challenge with count-based techniques is obtaining accurate and consistent claim count data.

Briefly discuss the Brian technique

Briefly discuss the Brian technique

Brian assumed that ULAE would be split into 5 types of transactions: opening claims, maintaining open claims, making payments, closing claims, and reopening claims. Brian then assumed that the ULAE costs for each of these types of transactions was similar, and could be estimated using historical ratios of ULAE to number of transactions.

One weakness of this technique is the assumption that all transaction types require similar ULAE. A second more important weakness is the difficulty in estimating the number of future transactions as well as the average cost per transaction.

Briefly discuss the Johnson technique

Briefly discuss the Johnson technique

Wendy Johnson assumed ULAE could be split into 2 types of transactions: opening claims and maintaining claims. Johnson then assumed that the ULAE costs for each of these types of transactions could be estimated using historical ratios of ULAE to number of transactions. However, unlike Brian, Johnson allowed the costs per transactions to vary for the different transaction types.

One benefit of Johnson's approach was that only the relative ULAE per transaction type was needed instead of the actual ULAE.

Briefly discuss the Mango-Allen Claim Staffing Technique

Briefly discuss the Mango-Allen Claim Staffing Technique

Mango-Allen first calculated a new count base as Opened claim counts + Closed claim counts plus Pending (ending) open claim counts (OCP). They calculated the workload for claims adjusters as OCP counts per adjuster, and projected OCP counts and divided by this workload (with any anticipated adjustments) to get the projected number of claims adjusters. Finally, they multiplied the projected number of adjusters by the trended historical ULAE per claims adjuster to get the ULAE reserve.

One concern with this approach is that the ULAE reserve estimates are sensitive to the magnitude of the selected parameters.

Briefly discuss the Spalla approach

Briefly discuss the Spalla approach

Spalla suggests that modern computer systems can now track the time spent on individual claims by each claims employee. This can be used to calculate the average ULAE per type of transaction at different stages in a claim's duration, and these can be loaded for other ULAE costs (e.g., overhead). Alternatively, instead of calculating the absolute cost per transaction, a relative cost per transaction could also be calculated.

Formulas for the Generalized Approach for counts

Formulas for the Generalized Approach for counts

$$M = w \times b = w \times [(v_1 \times r) + (v_2 \times o) + (v_3 \times c)]$$

$$\text{Unpaid ULAE} = \sum_i w_i^* \times [(v_1 \times r_i) + (v_2 \times o_i) + (v_3 \times c_i)]$$