# A quantum leap in benchmarking P&C reserve ranges

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No single liability is quite as important to insurers as a best estimate of unpaid claims. It drives earnings reports, shapes financial statements, and influences a host of other management decisions. But aberrations in data and model risk often cast a shadow over the reliability of reserve ranges from which this point is selected. Traditional development pattern benchmarks have provided some support in estimating these fundamental liabilities, but even here, the process has long been a one-dimensional exercise, at least until now.

In determining a central or "best" estimate for property and casualty (P&C) reserves, the goal has never been to zero in on the exact final outcome for an insurer's ultimate losses but to arrive at an estimate that is as likely to be high as it is to be low. Rather than trying to pinpoint one elusive number, the unpaid claim analysis process has focused on understanding or illustrating the variability around the estimate by identifying a range of reasonable estimates using different methods and assumptions. By producing other reasonable estimates, actuaries moved somewhat closer to the goal of understanding the full breadth of the possible outcomes, but this approach still lacks specificity and provides little more certainty around an unpaid claim estimate.

And commonly used "static" loss development pattern benchmarks that use industry data have been helpful in assessing some of the actuary's assumptions but not all of them. The lack of specificity in these benchmarks has only marginally improved confidence in the selection of a range and central estimate.

The question is how do you overcome these challenges?

A recently developed dynamic benchmarking tool, which includes percentiles at all stages of development, allows for the calibration of a benchmark that better resembles individual portfolios. As such, this rigorously back-tested tool can provide actuaries an added level of confidence in the reasonableness of any entity's reserve ranges.

This next-generation benchmarking tool, known as claim variability benchmarks (CVB), is derived from extensive testing that involved all long-tail Schedule P lines of business and more than 30,000 data triangle sets. Using such an extensive database both:

- Provides for the development of a more extensive and reliable guideline that is much more surgically focused than traditional industry averages.

- Instills greater credibility in the loss development patterns derived for each line of business.

## Four real-life scenarios

The value of this new benchmarking tool stems from its ability to guide an actuary's decision-making process by providing an interactive means of comparing the assumptions or estimates from a method or model based on real data and results against comparable alternative assumptions or estimates.

To illustrate the potential impact of using such benchmarks, four representative data sets were used from randomly selected companies of four different sizes: A) small, B) regional, C) small national, and D) large national. Minor changes were made to the data in order to protect the identities of each company. For all four companies, the commercial auto line was selected as a common denominator for contrasting the effect of the benchmarks for different exposure sizes. To illustrate how useful the benchmarks are in practice, a unique variety of lines of business was sampled for each carrier.[1] The accident year earned premiums by line of business for each company are illustrated in Figure 1.

Figure 2, which shows the incremental and cumulative loss development patterns for commercial auto for Company A, provides an example of the type of CVB output that actuaries could use to guide their thought processes. In this case, the incremental loss development from the user's model shows a pattern that initially might seem to be relatively smooth, but when compared with output from an industry average or the benchmarks its irregularities become apparent. For this company whose loss development pattern is somewhat volatile, using a benchmark pattern other than the average (shown in the "CVB Average Pattern" row) seems appropriate. But which one?

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[1] The variety of business lines will also help illustrate other tools that are part of the benchmarks in future articles. While the commercial auto data is the focus of the tables and graphs in the article, the results for all lines are available in the Appendix for the interested reader.

**FIGURE 1: EARNED PREMIUMS BY COMPANY**

### SAMPLE COMPANY EARNED PREMIUMS BY ACCIDENT YEAR (in 000s)

| ACC YR | COMPANY A: SMALL | | | | COMPANY B: REGIONAL | | | | COMPANY C: SMALL NATIONAL | | | COMPANY D: LARGE NATIONAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CA | MPL-O | PL-O | WC | CA | CMP | OL-O | SL | CA | RE-LIAB | RE-PROP | CA | PPA | HO |
| 2009 | 906 | 273 | 1,002 | 318 | 4,525 | 5,480 | 5,594 | 8,261 | 83,943 | 52,504 | 61,462 | 2,218,794 | 2,275,508 | 4,150,175 |
| 2010 | 805 | 341 | 1,225 | 289 | 4,607 | 5,393 | 4,517 | 12,013 | 94,343 | 64,851 | 73,974 | 2,344,849 | 2,318,847 | 4,206,474 |
| 2011 | 795 | 236 | 1,078 | 155 | 4,207 | 5,035 | 4,396 | 13,032 | 115,098 | 71,077 | 85,588 | 2,515,410 | 2,432,797 | 3,996,013 |
| 2012 | 687 | 218 | 858 | 118 | 4,481 | 5,440 | 4,998 | 14,020 | 126,714 | 95,902 | 95,373 | 2,677,976 | 2,910,405 | 4,280,958 |
| 2013 | 503 | 200 | 1,665 | 368 | 5,047 | 6,987 | 4,797 | 22,985 | 138,148 | 132,154 | 132,513 | 2,931,740 | 2,987,043 | 4,115,180 |
| 2014 | 552 | 154 | 346 | 857 | 5,721 | 8,494 | 6,832 | 27,357 | 156,046 | 139,093 | 129,474 | 3,225,060 | 3,342,062 | 4,299,333 |
| 2015 | 534 | 1,399 | 698 | 769 | 6,599 | 12,041 | 7,921 | 9,007 | 173,621 | 168,574 | 153,255 | 3,614,016 | 3,768,270 | 4,518,551 |
| 2016 | 635 | 1,009 | 840 | 454 | 11,050 | 14,368 | 11,585 | 28,934 | 181,416 | 225,112 | 171,099 | 4,016,178 | 4,085,245 | 4,668,673 |
| 2017 | 735 | 1,227 | 861 | 585 | 14,229 | 15,704 | 15,712 | 7,861 | 184,422 | 208,432 | 171,978 | 4,131,562 | 4,470,514 | 4,750,173 |
| **TOTAL** | **6,907** | **5,957** | **9,335** | **4,723** | **76,319** | **94,476** | **82,508** | **159,004** | **1,440,195** | **1,337,921** | **1,254,230** | **31,722,954** | **33,099,004** | **43,765,738** |

While the benchmarks indicate that the 46th percentile (shown in the "Best Fit" row)[2] is the best fit overall, the 46th percentile is less than ideal at different periods, where "best fits" vary from the 13th percentile in development periods 0 to 12 to the 99th percentile in development periods 72 to 108. In fact there is considerable variability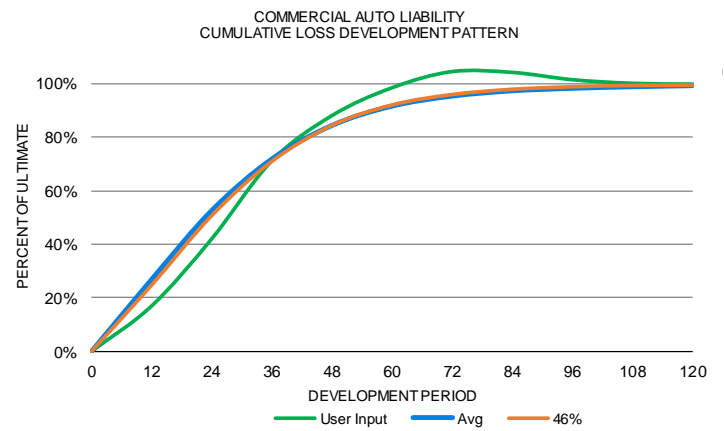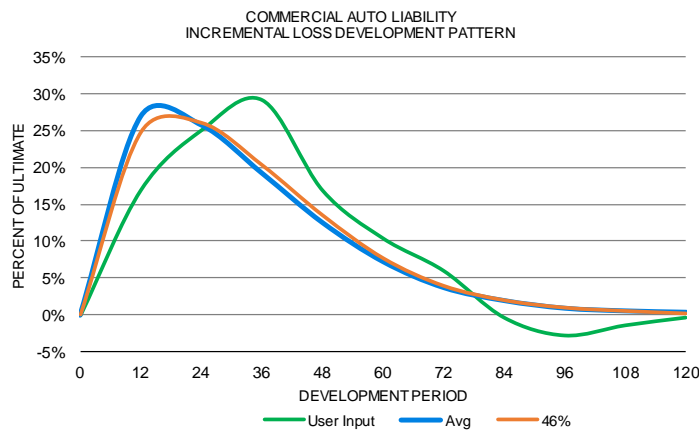 in the recommended fits—a situation that might be expected, considering the data limitations that a small company often encounters. But does the user's calculated loss development pattern (shown as "User Input ATA Factors" in Figure 2) reflect the company's uniqueness or contain random noise that could be smoothed by the benchmarks?

**FIGURE 2: COMMERCIAL AUTO PATTERNS FOR COMPANY A**

**User Input Paid Development Pattern:**

| Development Periods: | 12-24 | 24-36 | 36-48 | 48-60 | 60-72 | 72-84 | 84-96 | 96-108 | 108-120 | 120+ |
|---|---|---|---|---|---|---|---|---|---|---|
| User Input ATA Factors: | 2.476 | 1.693 | 1.237 | 1.118 | 1.061 | 0.997 | 0.974 | 0.987 | 0.997 | 1.002 |
| Development Age: | 12 | 24 | 36 | 48 | 60 | 72 | 84 | 96 | 108 | 120 |
| User Input Pattern: | 17.0% | 42.0% | 71.2% | 88.1% | 98.5% | 104.5% | 104.2% | 101.5% | 100.1% | 99.8% |
| CVB Average Pattern: | 26.9% | 52.6% | 71.8% | 84.3% | 91.5% | 95.2% | 97.2% | 98.1% | 98.7% | 99.1% |
| Best Fit: 46% | 13% | 18% | 46% | 63% | 92% | 99% | 99% | 99% | 97% | 59% |
| CVB: 46% | 24.8% | 50.8% | 71.1% | 84.5% | 92.2% | 96.1% | 98.0% | 99.0% | 99.5% | 99.6% |
| CVB ATA Factors: | 2.050 | 1.399 | 1.190 | 1.090 | 1.042 | 1.020 | 1.010 | 1.005 | 1.002 | 1.004 |

**Comparison of User Input vs CVB Patterns**



COMMERCIAL AUTO LIABILITY
INCREMENTAL LOSS DEVELOPMENT PATTERN



COMMERCIAL AUTO LIABILITY
CUMULATIVE LOSS DEVELOPMENT PATTERN

Using the cells in the CVB line, actuaries can select different assumptions and see the impact on their results. Is a dip or bulge in the User Input pattern due to noise or does it reflect reality? Perhaps the company consistently pays claims faster than the

[2] For each development age, the "best fit" is the percentile that is closest to the User Input pattern. For the overall "best fit," the smallest sum of the absolute deviations between the best fit in each development age is used.

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industry average? How different is the mix of business compared to the industry average? Are the User Input Age-to-Age (ATA) factors from 72 to 120 months indicative of salvage and subrogation recoveries that should be included?

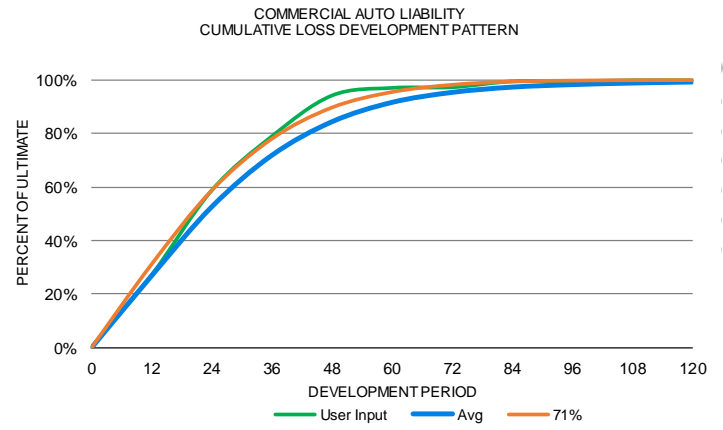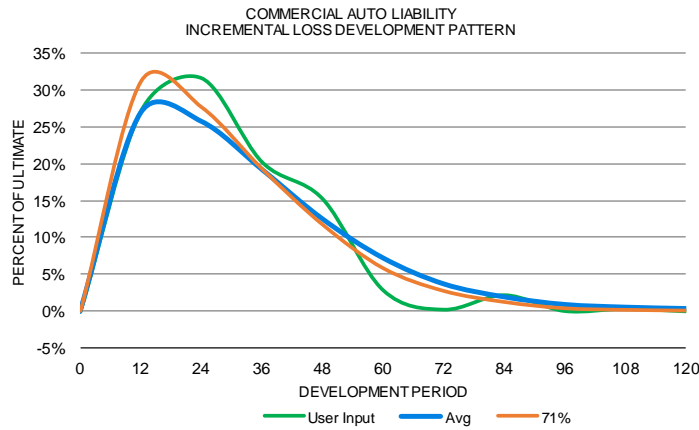At any point along the pattern, actuaries can adjust the pattern—using the User Input pattern, the selected benchmarks pattern, or an alternative—to reflect their understanding of a company's data.[3] This guided sensitivity testing provides actuaries a way of systematically exploring loss development patterns and deciding how much smoothing is necessary and/or which pattern is most appropriate.

**FIGURE 3: COMMERCIAL AUTO PATTERNS FOR COMPANY B**

**User Input Paid Development Pattern:**

| Development Periods: | 12-24 | 24-36 | 36-48 | 48-60 | 60-72 | 72-84 | 84-96 | 96-108 | 108-120 | 120+ |
|---|---|---|---|---|---|---|---|---|---|---|
| User Input ATA Factors: | 2.164 | 1.344 | 1.193 | 1.030 | 1.002 | 1.023 | 1.000 | 1.004 | 1.000 | 1.000 |
| Development Age: | 12 | 24 | 36 | 48 | 60 | 72 | 84 | 96 | 108 | 120 |
| User Input Pattern: | 27.2% | 58.8% | 79.0% | 94.3% | 97.1% | 97.4% | 99.6% | 99.6% | 100.0% | 100.0% |
| CVB Average Pattern: | 26.9% | 52.6% | 71.8% | 84.3% | 91.5% | 95.2% | 97.2% | 98.1% | 98.7% | 99.1% |
| Best Fit: 71% | 56% | 71% | 74% | 90% | 84% | 60% | 74% | 66% | 78% | 76% |
| CVB: | 71% | 31.1% | 58.8% | 78.0% | 89.7% | 95.5% | 98.2% | 99.4% | 99.8% | 99.9% | 100.0% |
| CVB ATA Factors: | 1.887 | 1.328 | 1.150 | 1.065 | 1.028 | 1.012 | 1.004 | 1.001 | 1.000 | 1.000 |

**Comparison of User Input vs CVB Patterns**



COMMERCIAL AUTO LIABILITY
INCREMENTAL LOSS DEVELOPMENT PATTERN

COMMERCIAL AUTO LIABILITY
CUMULATIVE LOSS DEVELOPMENT PATTERN

As the exposures increase, the volatility of the calculated loss patterns decreases. For example, the commercial auto loss pattern for Company B in Figure 3 now meanders closer to the best-fit pattern, a situation that is reflected in the increased consistency among the best-fit percentiles ("Best Fit" row). In this case, the best fit is at the 71st percentile. As the patterns calculated from the user's method and the benchmarks move closer together, as is the case for this regional company, the justification for selecting a pattern other than the average increases.

By comparing the development pattern graphs in Figures 2 to 5, the difference between the loss patterns calculated from the data and the benchmarks merge ever closer for the small national company, as seen in Figure 4, and for the large national company the loss patterns nearly overlay the average, in Figure 5.

This convergence of the loss development patterns on the average, interestingly enough, also illustrates how the static average-based benchmarks are most relevant for large national companies, how the various percentiles around the average become more valuable as the exposure size decreases, and how both large and small companies benefit from the additional information available in a dynamic benchmark.

Once an actuary decides on a loss pattern, a range of reasonable estimates can be established by, for example, using patterns 20 points on either side of the selected loss pattern, as illustrated in Figure 6 below (assuming our best fit is at the 46th percentile and the table sets' lower and upper benchmarks are at the 26th and 66th percentiles).[4]

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[3] The user's selected pattern is illustrated in Figure 6 below, which shows the choice between the CVB and User Input patterns, as well as a row to include a manually selected override pattern.

[4] The selected pattern can also include User Input patterns and manual adjustments.

**FIGURE 4: COMMERCIAL AUTO PATTERNS FOR COMPANY C**

**User Input Paid Development Pattern:**

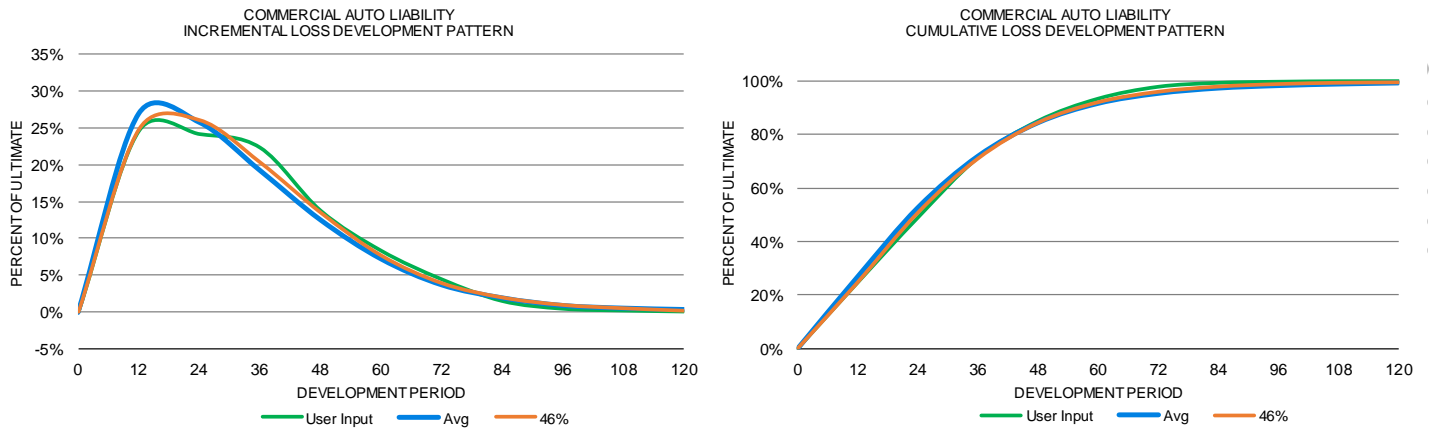| Development Periods: | | 12-24 | 24-36 | 36-48 | 48-60 | 60-72 | 72-84 | 84-96 | 96-108 | 108-120 | 120+ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| User Input ATA Factors: | | 1.982 | 1.458 | 1.193 | 1.098 | 1.048 | 1.015 | 1.004 | 1.002 | 1.000 | 1.001 |
| Development Age: | | 12 | 24 | 36 | 48 | 60 | 72 | 84 | 96 | 108 | 120 |
| User Input Pattern: | | 24.7% | 48.9% | 71.2% | 85.0% | 93.4% | 97.8% | 99.3% | 99.7% | 99.9% | 99.9% |
| CVB Average Pattern: | | 26.9% | 52.6% | 71.8% | 84.3% | 91.5% | 95.2% | 97.2% | 98.1% | 98.7% | 99.1% |
| Best Fit: | 46% | 45% | 39% | 47% | 48% | 55% | 66% | 68% | 68% | 67% | 65% |
| CVB: | 46% | 24.8% | 50.8% | 71.1% | 84.5% | 92.2% | 96.1% | 98.0% | 99.0% | 99.5% | 99.6% |
| CVB ATA Factors: | | 2.050 | 1.399 | 1.190 | 1.090 | 1.042 | 1.020 | 1.010 | 1.005 | 1.002 | 1.004 |

**Comparison of User Input vs CVB Patterns**



**FIGURE 5: COMMERCIAL AUTO PATTERNS FOR COMPANY D**

**User Input Paid Development Pattern:**

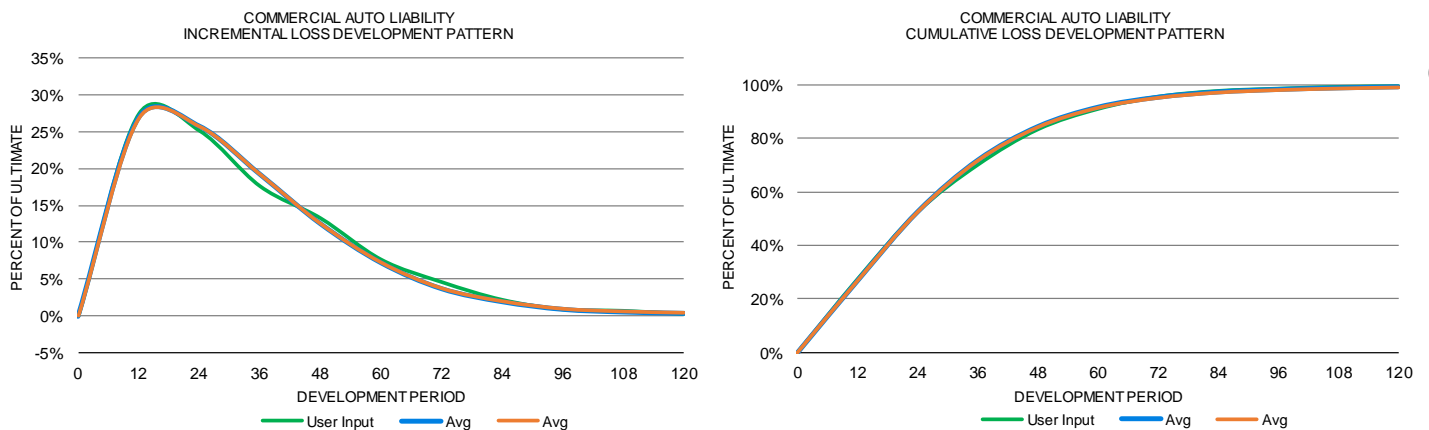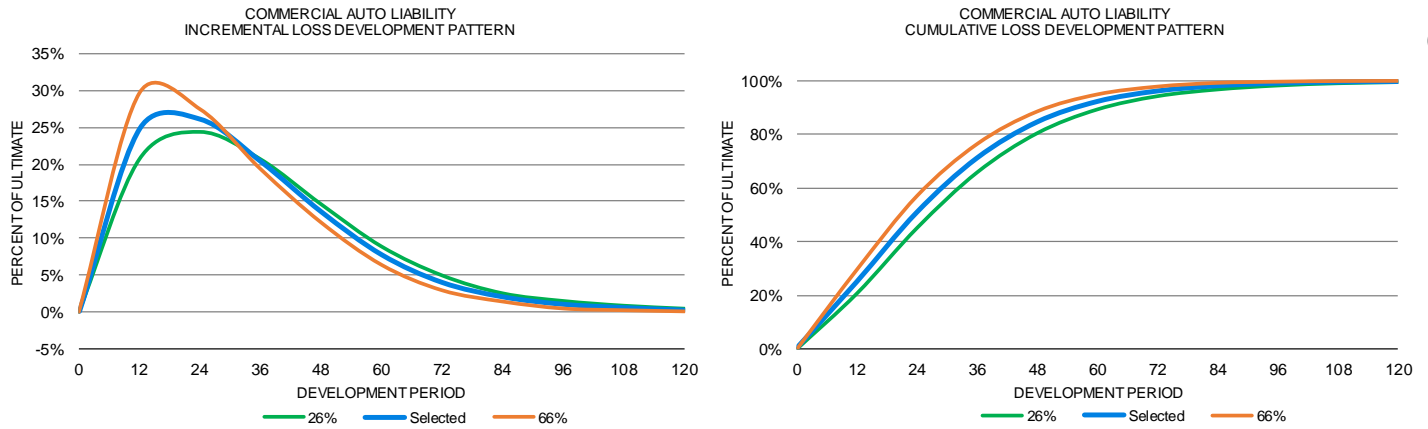| Development Periods: | | 12-24 | 24-36 | 36-48 | 48-60 | 60-72 | 72-84 | 84-96 | 96-108 | 108-120 | 120+ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| User Input ATA Factors: | | 1.915 | 1.335 | 1.189 | 1.091 | 1.050 | 1.023 | 1.009 | 1.007 | 1.002 | 1.004 |
| Development Age: | | 12 | 24 | 36 | 48 | 60 | 72 | 84 | 96 | 108 | 120 |
| User Input Pattern: | | 27.5% | 52.6% | 70.2% | 83.4% | 91.1% | 95.6% | 97.8% | 98.7% | 99.3% | 99.6% |
| CVB Average Pattern: | | 26.9% | 52.6% | 71.8% | 84.3% | 91.5% | 95.2% | 97.2% | 98.1% | 98.7% | 99.1% |
| Best Fit: | Avg | 57% | Avg | 42% | 39% | 38% | 41% | 42% | 38% | 41% | 43% |
| CVB: | Avg | 26.9% | 52.6% | 71.8% | 84.3% | 91.5% | 95.2% | 97.2% | 98.1% | 98.7% | 99.1% |
| CVB ATA Factors: | | 1.957 | 1.365 | 1.174 | 1.086 | 1.041 | 1.021 | 1.010 | 1.006 | 1.004 | 1.009 |

**Comparison of User Input vs CVB Patterns**

**FIGURE 6: COMMERCIAL AUTO PATTERN RANGE FOR COMPANY A**

**Selected Paid Development Pattern:**

| Selection Criteria: | CVB | CVB | CVB | CVB | CVB | CVB | CVB | CVB | CVB | User Input |
|---|---|---|---|---|---|---|---|---|---|---|
| Default ATA Factors: | 2.050 | 1.399 | 1.190 | 1.090 | 1.042 | 1.020 | 1.010 | 1.005 | 1.002 | 1.002 |
| User Override: | | | | | | | | | | |
| Selected ATA Factors: | 2.050 | 1.399 | 1.190 | 1.090 | 1.042 | 1.020 | 1.010 | 1.005 | 1.002 | 1.002 |
| Selected Pattern: | 24.8% | 50.9% | 71.2% | 84.7% | 92.4% | 96.3% | 98.2% | 99.2% | 99.7% | 99.8% |
| Range: | 20% | | | | | | | | | |
| Lower: | 26% | 20.7% | 45.1% | 65.7% | 80.3% | 89.1% | 94.0% | 96.5% | 98.0% | 98.8% | 99.3% |
| Upper: | 66% | 29.7% | 57.1% | 76.4% | 88.5% | 94.9% | 97.8% | 99.2% | 99.6% | 99.9% | 99.9% |

**Comparison of Selected Pattern vs Range Patterns**



COMMERCIAL AUTO LIABILITY
INCREMENTAL LOSS DEVELOPMENT PATTERN



COMMERCIAL AUTO LIABILITY
CUMULATIVE LOSS DEVELOPMENT PATTERN

In each of these examples of this next-generation benchmarking process, the estimates for the "normal" weighted results (in Figures 7 and 8 below and those in the appendices) were done mechanically using common methods and assumptions in order to prevent personal biases from masking the potential impact of this process. In practice, this step would be an interactive process, with the benchmarks influencing the selection of assumptions and methods and vice versa.

For the small company illustrated in Figure 7, the benchmarks patterns from Figure 6 are used to estimate unpaid claims to be between 850 and 1,210. This result can be compared with the range and weighted average for the five methods used by the actuary, who now has a supplemental process for deciding on a best estimate. That process includes a new tool for deciding whether any of the estimates in the normal range are unreasonable, e.g., is the lowest estimate in the weighted range reasonable?

**FIGURE 7: COMMERCIAL AUTO RESERVE RANGE FOR COMPANY A**



COMPANY A - COMMERCIAL AUTO LIABILITY
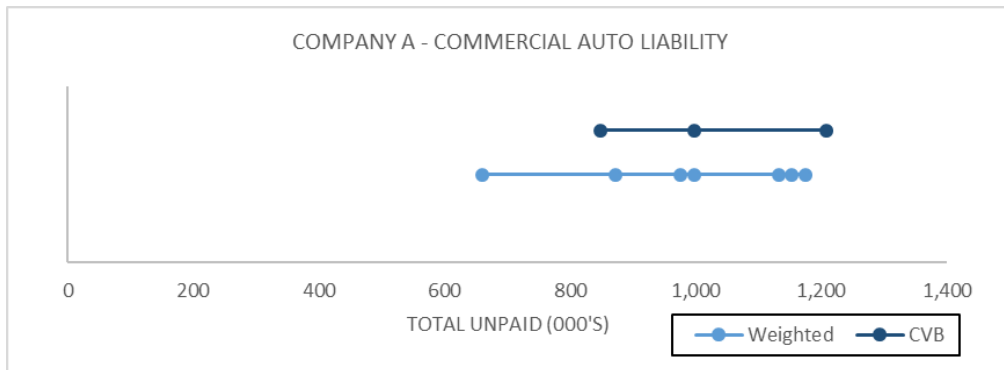
For even the most volatile lines, this process provides a guided method for inquiry and analysis that can lead to greater confidence in the end results. As each line of business is reviewed, they can also be added together to get a view of the overall range for the company, as illustrated in Figure 8.

Determining a range of reasonable estimates and a best estimate are fundamental building blocks for assessing the financial health of a company, but they are only a small part of a claim variability process. From benchmarking unpaid claim distributions to setting risk-based capital requirements—topics of subsequent articles in this series—the next generation of benchmarks can help actuaries retool their methods of inquiry and build confidence in the numbers shared with management.

**FIGURE 8: OVERALL AND LOB RANGES FOR COMPANY A**
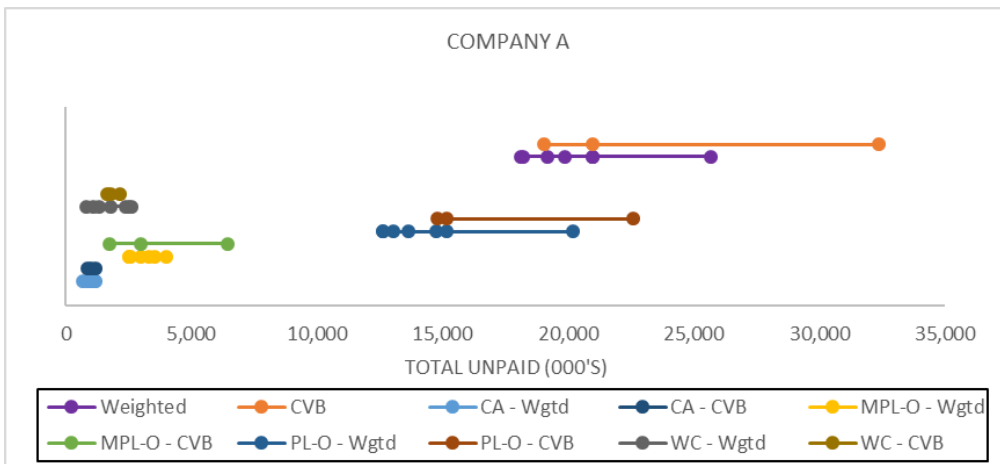


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**FIGURE 9: COMMERCIAL AUTO**

**User Input Paid Development Pattern:**

| Development Periods: | 12-24 | 24-36 | 36-48 | 48-60 | 60-72 | 72-84 | 84-96 | 96-108 | 108-120 | 120+ |
|---|---|---|---|---|---|---|---|---|---|---|
| User Input ATA Factors: | 2.476 | 1.693 | 1.237 | 1.118 | 1.061 | 0.997 | 0.974 | 0.987 | 0.997 | 1.002 |
| Development Age: | 12 | 24 | 36 | 48 | 60 | 72 | 84 | 96 | 108 | 120 |
| User Input Pattern: | 17.0% | 42.0% | 71.2% | 88.1% | 98.5% | 104.5% | 104.2% | 101.5% | 100.1% | 99.8% |
| CVB Average Pattern: | 26.9% | 52.6% | 71.8% | 84.3% | 91.5% | 95.2% | 97.2% | 98.1% | 98.7% | 99.1% |
| Best Fit: 46% | 13% | 18% | 46% | 63% | 92% | 99% | 99% | 99% | 97% | 59% |
| CVB: 46% | 24.8% | 50.8% | 71.1% | 84.5% | 92.2% | 96.1% | 98.0% | 99.0% | 99.5% | 99.6% |
| CVB ATA Factors: | 2.050 | 1.399 | 1.190 | 1.090 | 1.042 | 1.020 | 1.010 | 1.005 | 1.002 | 1.004 |

**Comparison of User Input vs CVB Patterns**



COMMERCIAL AUTO LIABILITY
INCREMENTAL LOSS DEVELOPMENT PATTERN

COMMERCIAL AUTO LIABILITY
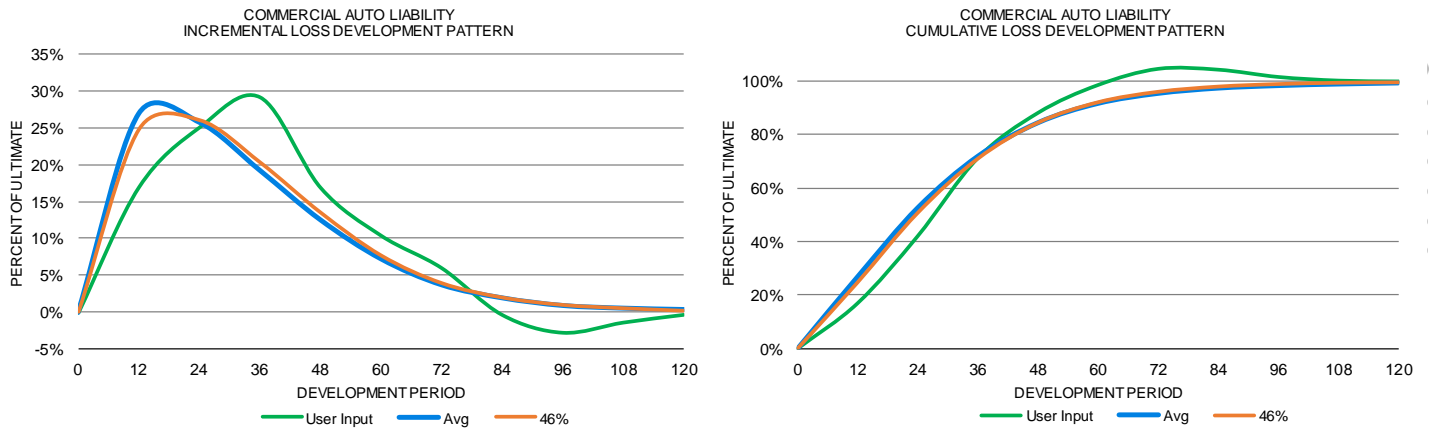CUMULATIVE LOSS DEVELOPMENT PATTERN

**FIGURE 10: MEDICAL PROFESSIONAL LIABILITY: OCCURRENCE**

**User Input Paid Development Pattern:**

| Development Periods: | 12-24 | 24-36 | 36-48 | 48-60 | 60-72 | 72-84 | 84-96 | 96-108 | 108-120 | 120+ |
|---|---|---|---|---|---|---|---|---|---|---|
| User Input ATA Factors: | 7.745 | 3.139 | 1.947 | 1.525 | 1.110 | 0.991 | 1.015 | 1.068 | 1.084 | 1.021 |
| Development Age: | 12 | 24 | 36 | 48 | 60 | 72 | 84 | 96 | 108 | 120 |
| User Input Pattern: | 1.0% | 8.1% | 25.5% | 49.6% | 75.7% | 84.1% | 83.3% | 84.6% | 90.3% | 97.9% |
| CVB Average Pattern: | 2.5% | 12.3% | 31.2% | 48.6% | 63.7% | 75.1% | 82.4% | 87.7% | 91.2% | 93.8% |
| Best Fit: 45% | 47% | 45% | 44% | 52% | 77% | 72% | 43% | 30% | 33% | 78% |
| CVB: 45% | 1.0% | 8.1% | 25.7% | 47.5% | 63.7% | 75.2% | 83.8% | 88.5% | 92.9% | 94.7% |
| CVB ATA Factors: | 7.874 | 3.167 | 1.851 | 1.342 | 1.180 | 1.114 | 1.057 | 1.050 | 1.019 | 1.056 |

**Comparison of User Input vs CVB Patterns**



MEDICAL PROFESSIONAL LIABILITY - OCCURRENCE
INCREMENTAL LOSS DEVELOPMENT PATTERN

MEDICAL PROFESSIONAL LIABILITY - OCCURRENCE
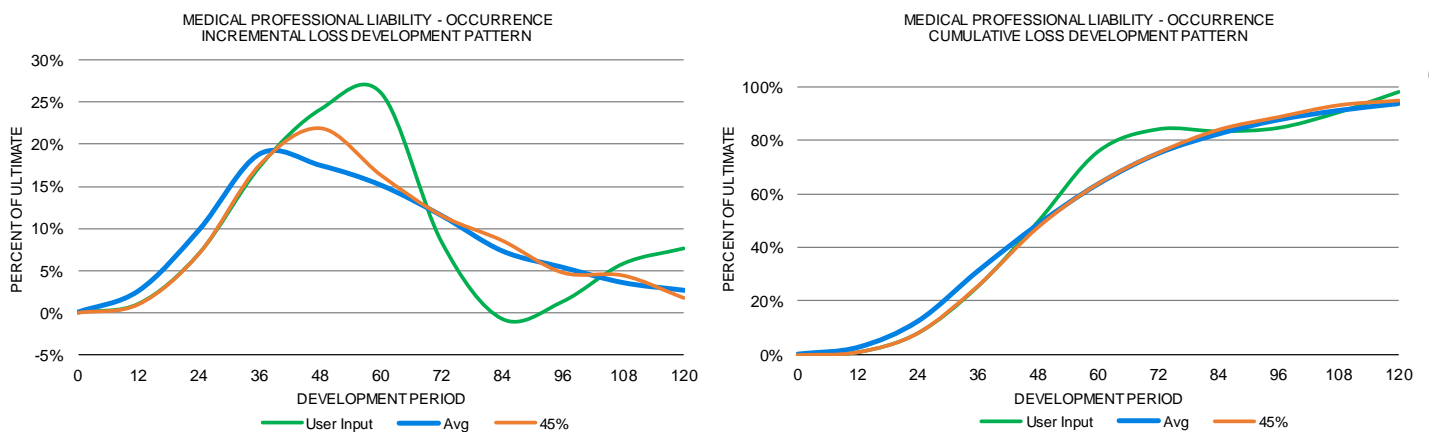CUMULATIVE LOSS DEVELOPMENT PATTERN

## FIGURE 11: PRODUCTS LIABILITY: OCCURRENCE

**User Input Paid Development Pattern:**

| Development Periods: | | 12-24 | 24-36 | 36-48 | 48-60 | 60-72 | 72-84 | 84-96 | 96-108 | 108-120 | 120+ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| User Input ATA Factors: | | 79.250 | 1.978 | 1.781 | 2.238 | 1.390 | 1.064 | 1.322 | 1.165 | 1.162 | 1.023 |
| Development Age: | | 12 | 24 | 36 | 48 | 60 | 72 | 84 | 96 | 108 | 120 |
| User Input Pattern: | | 0.1% | 4.7% | 9.3% | 16.5% | 36.9% | 51.3% | 54.6% | 72.2% | 84.1% | 97.7% |
| CVB Average Pattern: | | 10.2% | 22.1% | 36.8% | 53.0% | 65.7% | 75.8% | 82.5% | 87.4% | 90.5% | 93.1% |
| Best Fit: | 6% | 0% | 4% | 3% | 3% | 5% | 8% | 5% | 11% | 21% | 72% |
| CVB: | 25% | 3.0% | 11.1% | 23.5% | 39.9% | 53.0% | 65.5% | 74.2% | 80.8% | 85.6% | 89.0% |
| CVB ATA Factors: | | 3.677 | 2.111 | 1.696 | 1.329 | 1.235 | 1.133 | 1.089 | 1.060 | 1.040 | 1.123 |

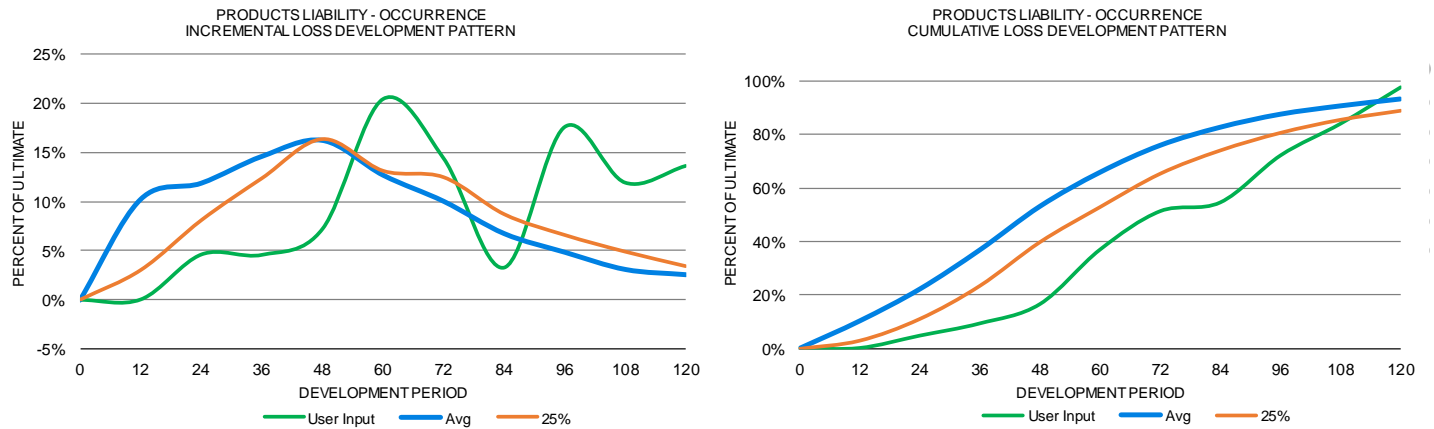**Comparison of User Input vs CVB Patterns**



## FIGURE 12: WORKERS' COMPENSATION

**User Input Paid Development Pattern:**

| Development Periods: | | 12-24 | 24-36 | 36-48 | 48-60 | 60-72 | 72-84 | 84-96 | 96-108 | 108-120 | 120+ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| User Input ATA Factors: | | 2.612 | 1.349 | 1.181 | 1.198 | 1.067 | 1.020 | 1.009 | 1.014 | 1.000 | 1.005 |
| Development Age: | | 12 | 24 | 36 | 48 | 60 | 72 | 84 | 96 | 108 | 120 |
| User Input Pattern: | | 17.9% | 46.9% | 63.2% | 74.7% | 89.5% | 95.5% | 97.3% | 98.2% | 99.5% | 99.5% |
| CVB Average Pattern: | | 23.9% | 52.1% | 67.5% | 76.3% | 81.8% | 85.2% | 87.4% | 89.1% | 90.4% | 91.5% |
| Best Fit: | 69% | 21% | 36% | 36% | 41% | 75% | 89% | 91% | 93% | 96% | 95% |
| CVB: | 69% | 26.7% | 57.0% | 73.5% | 82.8% | 87.9% | 91.1% | 93.1% | 94.2% | 95.2% | 96.1% |
| CVB ATA Factors: | | 2.133 | 1.290 | 1.127 | 1.062 | 1.036 | 1.022 | 1.013 | 1.010 | 1.009 | 1.041 |

**Comparison of User Input vs CVB Patterns**
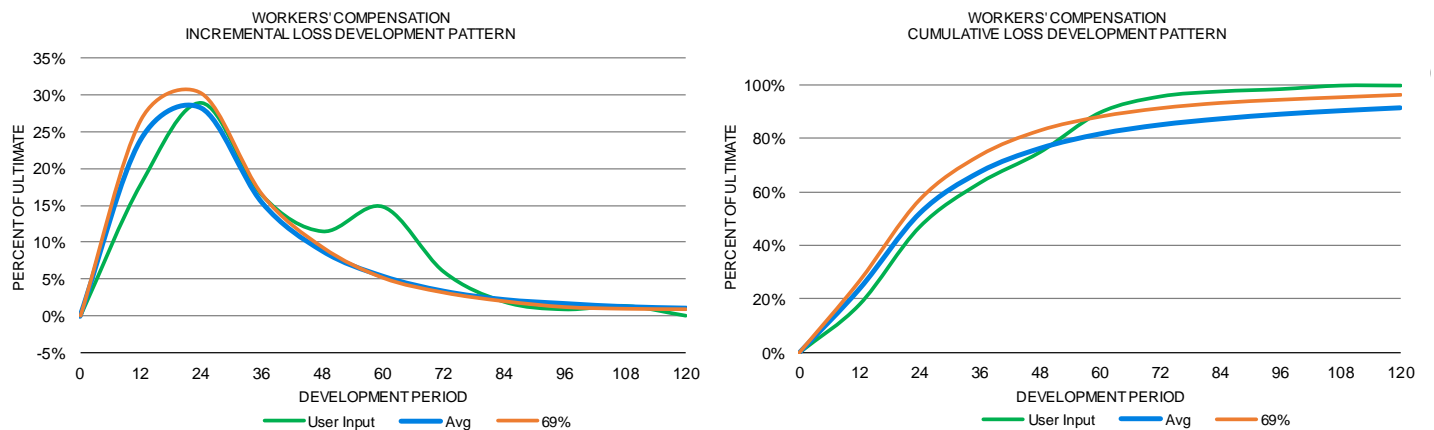
## FIGURE 13: COMMERCIAL AUTO

**Selected Paid Development Pattern:**

| Selection Criteria: | CVB | CVB | CVB | CVB | CVB | CVB | CVB | CVB | CVB | User Input |
|---|---|---|---|---|---|---|---|---|---|---|
| Default ATA Factors: | 2.050 | 1.399 | 1.190 | 1.090 | 1.042 | 1.020 | 1.010 | 1.005 | 1.002 | 1.002 |
| User Override: | | | | | | | | | | |
| Selected ATA Factors: | 2.050 | 1.399 | 1.190 | 1.090 | 1.042 | 1.020 | 1.010 | 1.005 | 1.002 | 1.002 |
| Selected Pattern: | 24.8% | 50.9% | 71.2% | 84.7% | 92.4% | 96.3% | 98.2% | 99.2% | 99.7% | 99.8% |
| Range: | 20% | | | | | | | | | |
| Lower: | 26% | 20.7% | 45.1% | 65.7% | 80.3% | 89.1% | 94.0% | 96.5% | 98.0% | 98.8% | 99.3% |
| Upper: | 66% | 29.7% | 57.1% | 76.4% | 88.5% | 94.9% | 97.8% | 99.2% | 99.6% | 99.9% | 99.9% |

**Comparison of Selected Pattern vs Range Patterns**



COMMERCIAL AUTO LIABILITY
INCREMENTAL LOSS DEVELOPMENT PATTERN



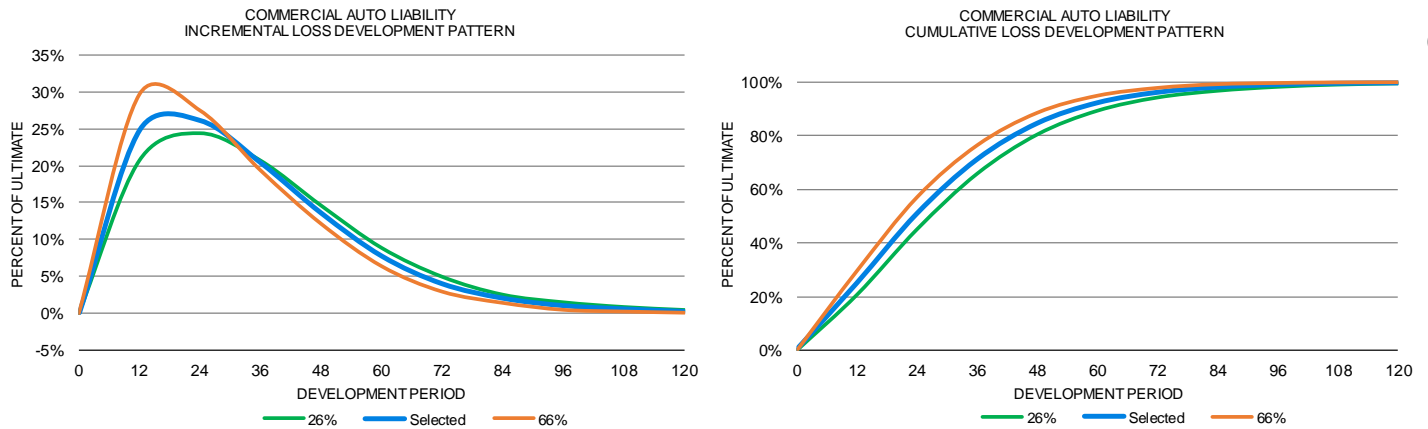COMMERCIAL AUTO LIABILITY
CUMULATIVE LOSS DEVELOPMENT PATTERN

## FIGURE 14: MEDICAL PROFESSIONAL LIABILITY: OCCURRENCE

**Selected Paid Development Pattern:**

| Selection Criteria: | CVB | CVB | CVB | CVB | CVB | CVB | CVB | CVB | CVB | User Input |
|---|---|---|---|---|---|---|---|---|---|---|
| Default ATA Factors: | 7.874 | 3.167 | 1.851 | 1.342 | 1.180 | 1.114 | 1.057 | 1.050 | 1.019 | 1.021 |
| User Override: | | | | | | | | | | |
| Selected ATA Factors: | 7.874 | 3.167 | 1.851 | 1.342 | 1.180 | 1.114 | 1.057 | 1.050 | 1.019 | 1.021 |
| Selected Pattern: | 1.1% | 8.4% | 26.5% | 49.1% | 65.9% | 77.8% | 86.7% | 91.6% | 96.1% | 97.9% |
| Range: | 20% | | | | | | | | | |
| Lower: | 25% | 0.5% | 5.8% | 21.7% | 39.3% | 56.2% | 68.8% | 76.6% | 82.7% | 87.7% | 91.0% |
| Upper: | 65% | 1.7% | 12.1% | 33.5% | 55.3% | 70.9% | 82.2% | 89.9% | 93.0% | 95.1% | 97.4% |

**Comparison of Selected Pattern vs Range Patterns**



MEDICAL PROFESSIONAL LIABILITY - OCCURRENCE
INCREMENTAL LOSS DEVELOPMENT PATTERN



MEDICAL PROFESSIONAL LIABILITY - OCCURRENCE
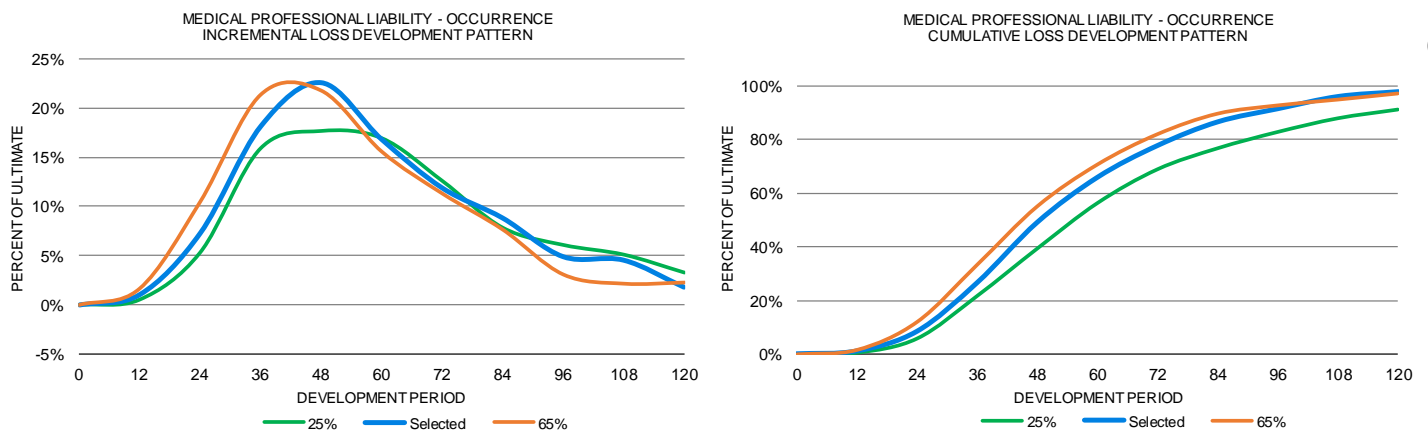CUMULATIVE LOSS DEVELOPMENT PATTERN

## FIGURE 15: PRODUCTS LIABILITY: OCCURRENCE

**Selected Paid Development Pattern:**

| Selection Criteria: | | CVB | CVB | CVB | CVB | CVB | CVB | CVB | CVB | CVB | User Input |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Default ATA Factors: | | 3.677 | 2.111 | 1.696 | 1.329 | 1.235 | 1.133 | 1.089 | 1.060 | 1.040 | 1.023 |
| User Override: | | | | | | | | | | | |
| Selected ATA Factors: | | 3.677 | 2.111 | 1.696 | 1.329 | 1.235 | 1.133 | 1.089 | 1.060 | 1.040 | 1.023 |
| Selected Pattern: | | 3.3% | 12.2% | 25.8% | 43.8% | 58.2% | 71.9% | 81.4% | 88.6% | 94.0% | 97.7% |
| Range: | 20% | | | | | | | | | | |
| Lower: | 5% | 0.9% | 4.9% | 12.6% | 25.4% | 35.6% | 47.1% | 54.9% | 64.3% | 70.5% | 74.6% |
| Upper: | 45% | 5.8% | 15.3% | 30.0% | 47.5% | 63.4% | 74.5% | 83.1% | 88.2% | 91.4% | 93.3% |

**Comparison of Selected Pattern vs Range Patterns**



PRODUCTS LIABILITY - OCCURRENCE
INCREMENTAL LOSS DEVELOPMENT PATTERN

PRODUCTS LIABILITY - OCCURRENCE
CUMULATIVE LOSS DEVELOPMENT PATTERN
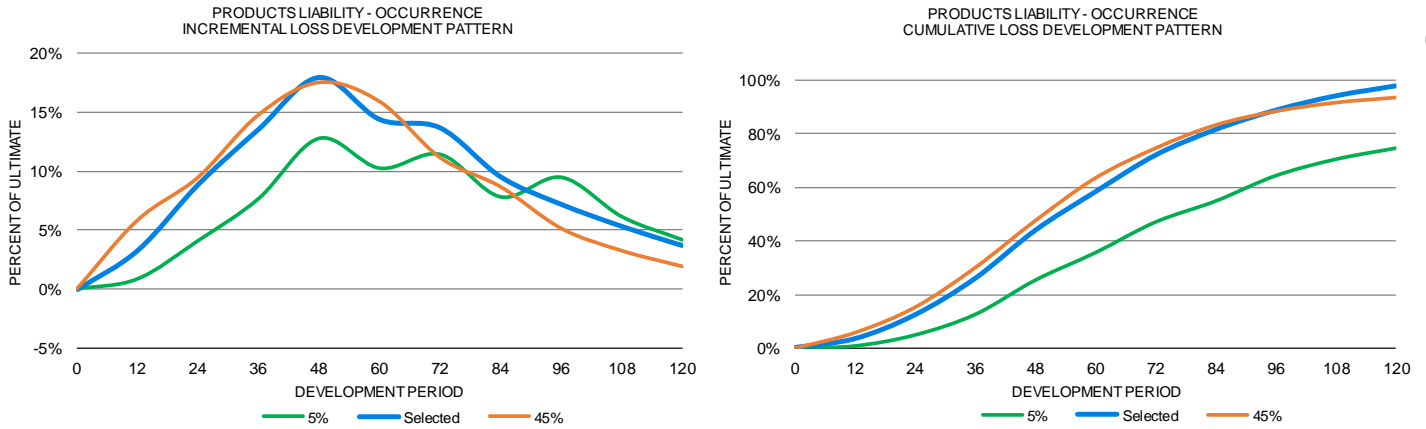
## FIGURE 16: WORKERS' COMPENSATION

**Selected Paid Development Pattern:**

| Selection Criteria: | | CVB | CVB | CVB | CVB | CVB | CVB | CVB | CVB | CVB | User Input |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Default ATA Factors: | | 2.133 | 1.290 | 1.127 | 1.062 | 1.036 | 1.022 | 1.013 | 1.010 | 1.009 | 1.005 |
| User Override: | | | | | | | | | | | |
| Selected ATA Factors: | | 2.133 | 1.290 | 1.127 | 1.062 | 1.036 | 1.022 | 1.013 | 1.010 | 1.009 | 1.005 |
| Selected Pattern: | | 27.7% | 59.0% | 76.1% | 85.8% | 91.1% | 94.4% | 96.4% | 97.6% | 98.6% | 99.5% |
| Range: | 20% | | | | | | | | | | |
| Lower: | 49% | 22.2% | 50.7% | 67.1% | 77.0% | 82.7% | 86.4% | 88.8% | 90.5% | 91.7% | 92.7% |
| Upper: | 89% | 33.1% | 66.4% | 81.5% | 89.0% | 93.2% | 95.5% | 96.8% | 97.6% | 98.0% | 98.3% |

**Comparison of Selected Pattern vs Range Patterns**



WORKERS' COMPENSATION
INCREMENTAL LOSS DEVELOPMENT PATTERN

WORKERS' COMPENSATION
CUMULATIVE LOSS DEVELOPMENT PATTERN
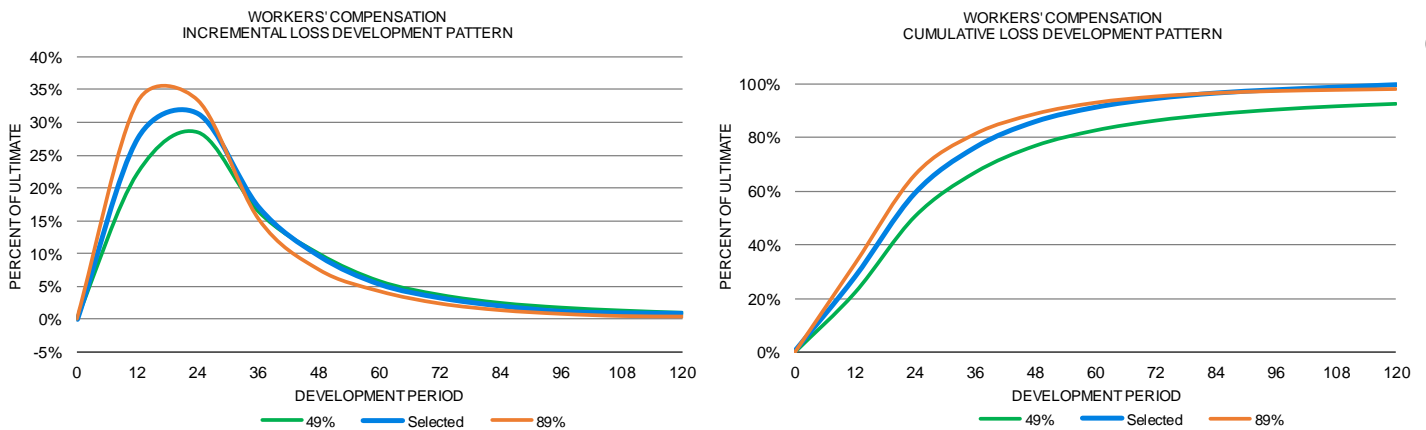
**FIGURE 17: COMMERCIAL AUTO**

COMPANY A - COMMERCIAL AUTO LIABILITY



TOTAL UNPAID (000'S)

●—— Weighted ●—— CVB
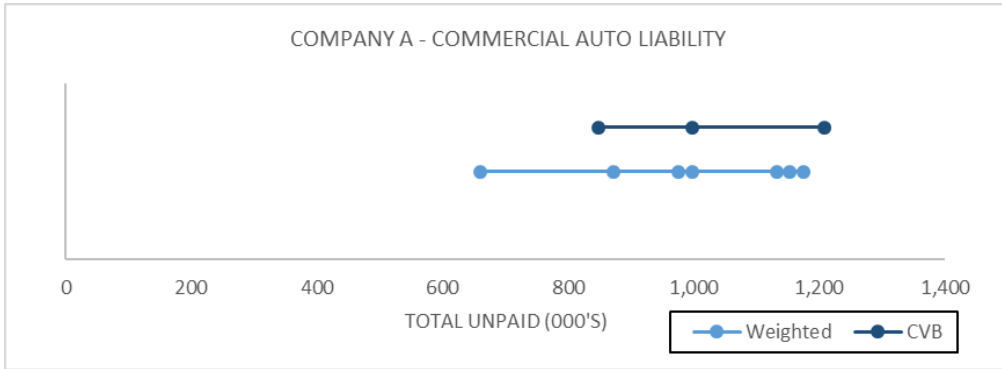
**FIGURE 18: MEDICAL PROFESSIONAL LIABILITY: OCCURRENCE**

COMPANY A - MEDICAL PROFESSIONAL LIABILITY - OCCURRENCE



TOTAL UNPAID (000'S)

●—— Weighted ●—— CVB
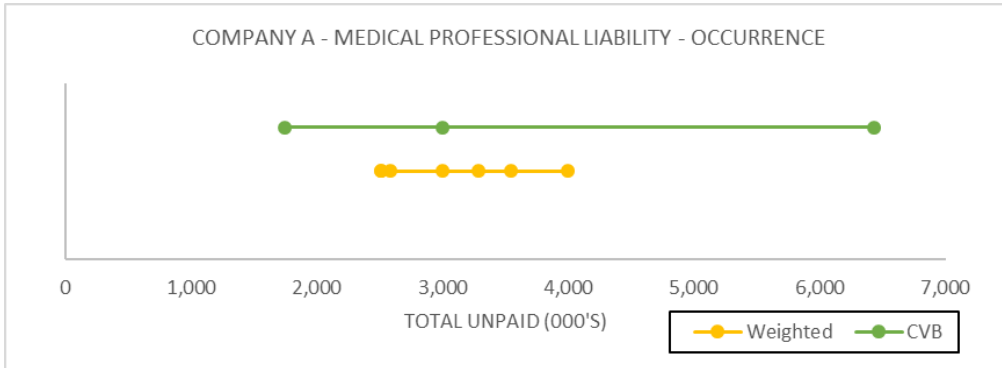
**FIGURE 19: PRODUCTS LIABILITY: OCCURRENCE**

COMPANY A - PRODUCTS LIABILITY - OCCURRENCE



TOTAL UNPAID (000'S)

●—— Weighted ●—— CVB
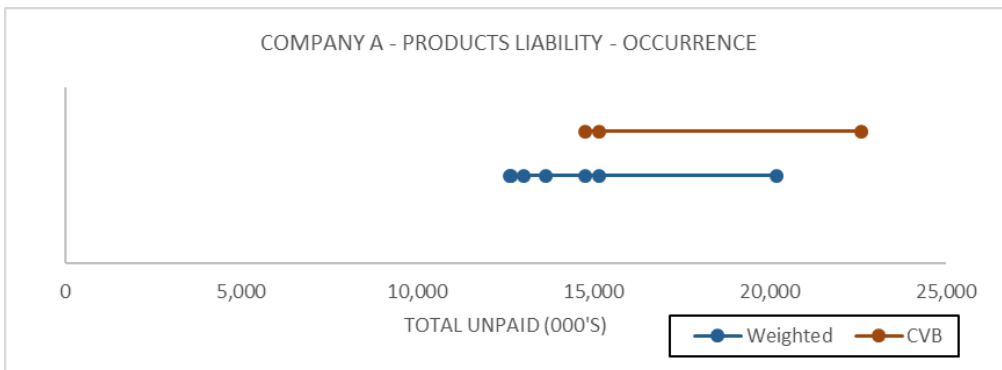
**FIGURE 20: WORKERS' COMPENSATION**



COMPANY A - WORKERS' COMPENSATION

TOTAL UNPAID (000'S)
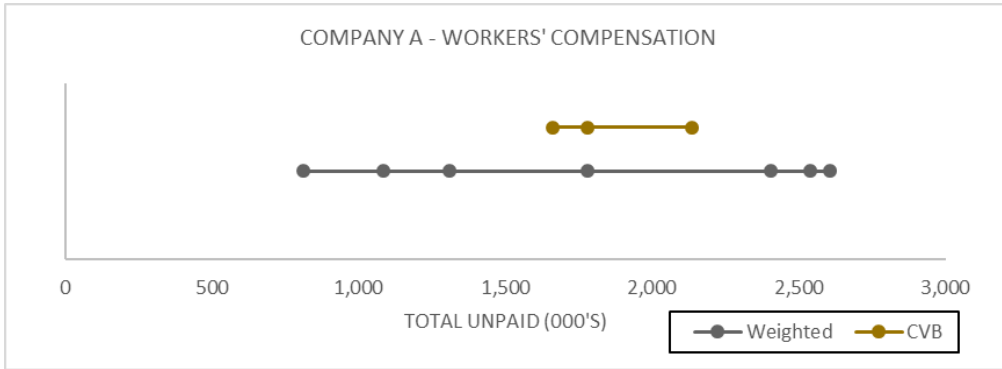
**FIGURE 21: OVERALL AND LOB RANGES FOR COMPANY A**



COMPANY A

TOTAL UNPAID (000'S)
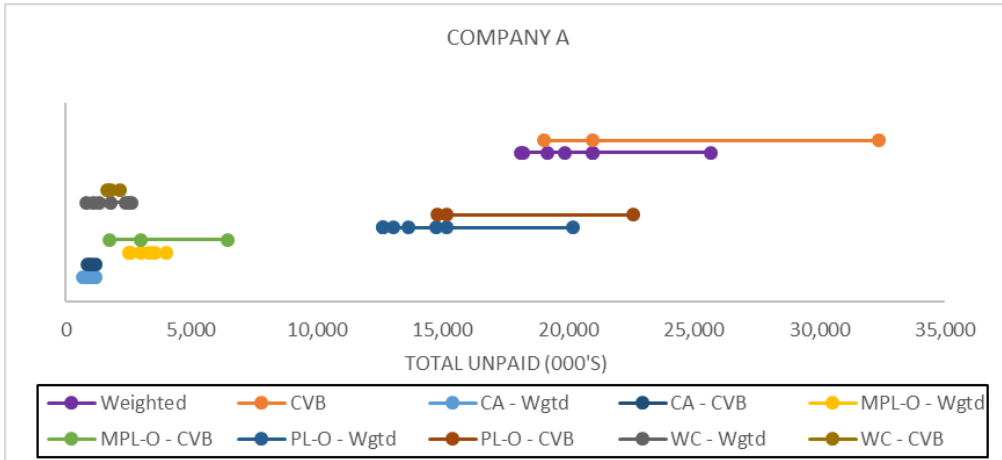
**FIGURE 22: COMMERCIAL AUTO**

**User Input Paid Development Pattern:**

| Development Periods: | 12-24 | 24-36 | 36-48 | 48-60 | 60-72 | 72-84 | 84-96 | 96-108 | 108-120 | 120+ |
|---|---|---|---|---|---|---|---|---|---|---|
| User Input ATA Factors: | 2.164 | 1.344 | 1.193 | 1.030 | 1.002 | 1.023 | 1.000 | 1.004 | 1.000 | 1.000 |
| Development Age: | 12 | 24 | 36 | 48 | 60 | 72 | 84 | 96 | 108 | 120 |
| User Input Pattern: | 27.2% | 58.8% | 79.0% | 94.3% | 97.1% | 97.4% | 99.6% | 99.6% | 100.0% | 100.0% |
| CVB Average Pattern: | 26.9% | 52.6% | 71.8% | 84.3% | 91.5% | 95.2% | 97.2% | 98.1% | 98.7% | 99.1% |
| Best Fit: 71% | 56% | 71% | 74% | 90% | 84% | 60% | 74% | 66% | 78% | 76% |
| CVB: | 71% | 31.1% | 58.8% | 78.0% | 89.7% | 95.5% | 98.2% | 99.4% | 99.8% | 99.9% | 100.0% |
| CVB ATA Factors: | 1.887 | 1.328 | 1.150 | 1.065 | 1.028 | 1.012 | 1.004 | 1.001 | 1.000 | 1.000 |

**Comparison of User Input vs CVB Patterns**



FIGURE 22 charts: COMMERCIAL AUTO LIABILITY INCREMENTAL LOSS DEVELOPMENT PATTERN and COMMERCIAL AUTO LIABILITY CUMULATIVE LOSS DEVELOPMENT PATTERN (User Input, Avg, 71%)
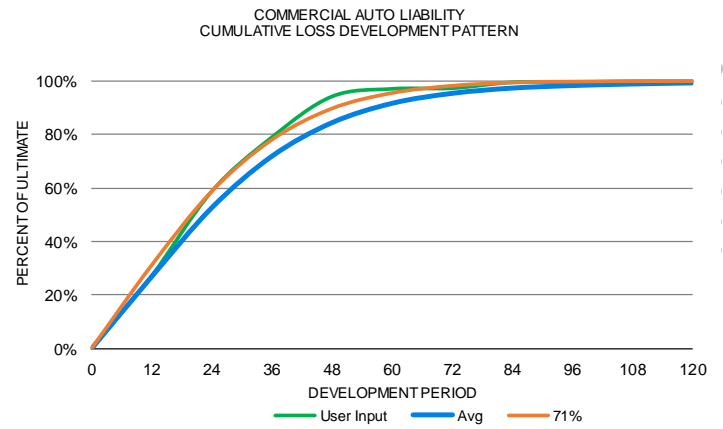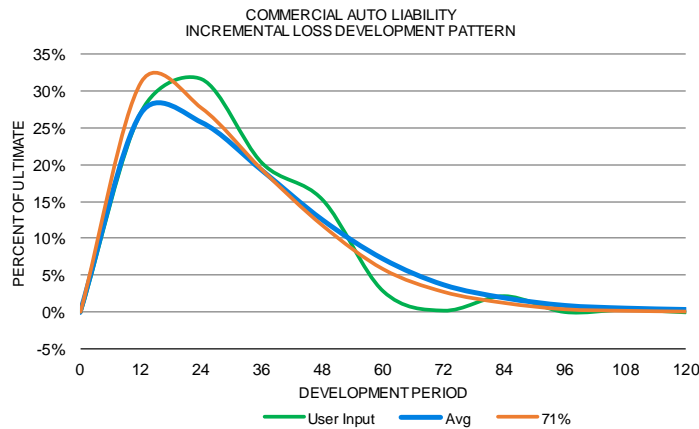
**FIGURE 23: COMMERCIAL MULTI-PERIL**

**User Input Paid Development Pattern:**

| Development Periods: | 12-24 | 24-36 | 36-48 | 48-60 | 60-72 | 72-84 | 84-96 | 96-108 | 108-120 | 120+ |
|---|---|---|---|---|---|---|---|---|---|---|
| User Input ATA Factors: | 1.799 | 1.316 | 1.138 | 1.051 | 1.062 | 0.955 | 1.003 | 1.000 | 1.068 | 1.007 |
| Development Age: | 12 | 24 | 36 | 48 | 60 | 72 | 84 | 96 | 108 | 120 |
| User Input Pattern: | 32.3% | 58.1% | 76.4% | 87.0% | 91.4% | 97.1% | 92.7% | 93.0% | 93.0% | 99.3% |
| CVB Average Pattern: | 44.3% | 66.7% | 77.2% | 85.1% | 90.4% | 93.7% | 95.7% | 96.9% | 97.7% | 98.3% |
| Best Fit: 40% | 23% | 29% | 44% | 52% | 48% | 66% | 19% | 11% | 6% | 59% |
| CVB: | 40% | 38.4% | 62.6% | 74.7% | 83.8% | 89.6% | 93.5% | 95.8% | 97.3% | 98.1% | 98.6% |
| CVB ATA Factors: | 1.631 | 1.193 | 1.122 | 1.070 | 1.044 | 1.025 | 1.015 | 1.009 | 1.005 | 1.014 |

**Comparison of User Input vs CVB Patterns**



FIGURE 23 charts: COMMERCIAL MULTI-PERIL INCREMENTAL LOSS DEVELOPMENT PATTERN and COMMERCIAL MULTI-PERIL CUMULATIVE LOSS DEVELOPMENT PATTERN (User Input, Avg, 40%)
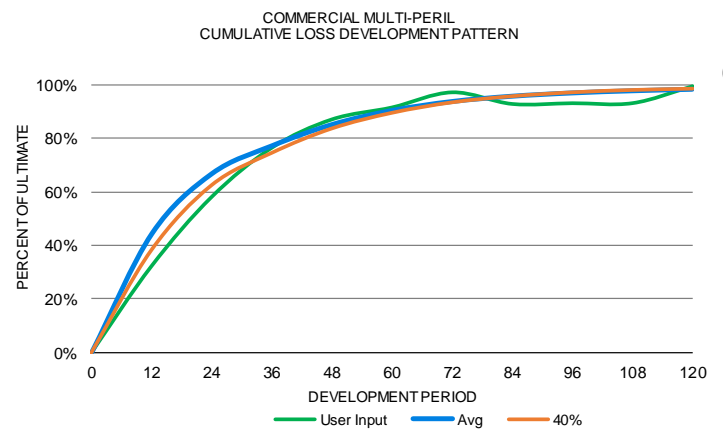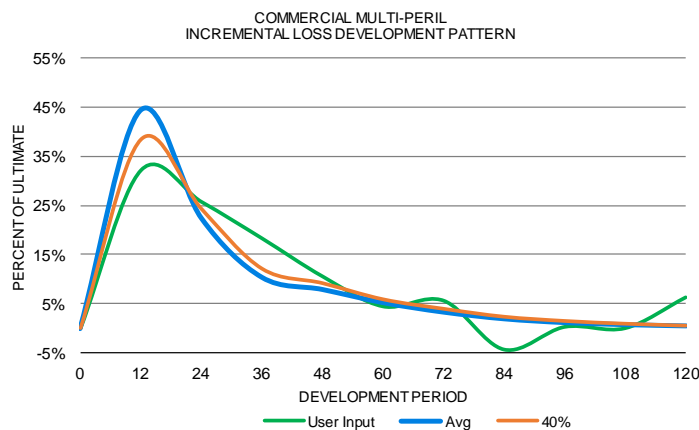
## FIGURE 24: OTHER LIABILITY: OCCURRENCE

**User Input Paid Development Pattern:**

| Development Periods: | | 12-24 | 24-36 | 36-48 | 48-60 | 60-72 | 72-84 | 84-96 | 96-108 | 108-120 | 120+ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| User Input ATA Factors: | | 3.742 | 1.955 | 1.410 | 1.235 | 1.097 | 1.029 | 1.016 | 1.000 | 1.000 | 1.001 |
| Development Age: | | 12 | 24 | 36 | 48 | 60 | 72 | 84 | 96 | 108 | 120 |
| User Input Pattern: | | 6.8% | 25.6% | 50.0% | 70.5% | 87.1% | 95.6% | 98.4% | 99.9% | 99.9% | 99.9% |
| CVB Average Pattern: | | 17.5% | 36.4% | 53.9% | 68.6% | 78.8% | 85.4% | 89.5% | 92.1% | 93.8% | 95.0% |
| Best Fit: | 54% | 29% | 36% | 47% | 54% | 65% | 73% | 75% | 85% | 84% | 82% |
| CVB: | 54% | 13.0% | 34.2% | 54.0% | 70.5% | 82.1% | 89.5% | 93.3% | 96.1% | 97.4% | 98.2% |
| CVB ATA Factors: | | 2.635 | 1.576 | 1.307 | 1.164 | 1.090 | 1.043 | 1.029 | 1.014 | 1.009 | 1.018 |

**Comparison of User Input vs CVB Patterns**
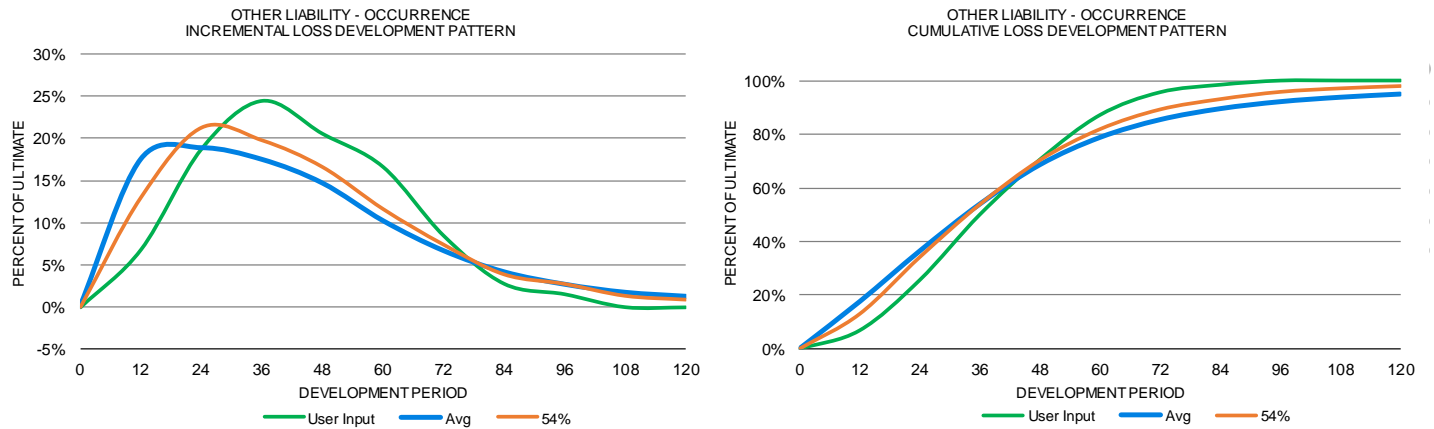


## FIGURE 25: SPECIAL LINES

**User Input Paid Development Pattern:**

| Development Periods: | | 12-24 | 24-36 | 36-48 | 48-60 | 60-72 | 72-84 | 84-96 | 96-108 | 108-120 | 120+ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| User Input ATA Factors: | | 2.788 | 1.882 | 1.495 | 1.078 | 1.001 | 1.008 | 1.000 | 1.000 | 1.000 | 1.000 |
| Development Age: | | 12 | 24 | 36 | 48 | 60 | 72 | 84 | 96 | 108 | 120 |
| User Input Pattern: | | 11.7% | 32.7% | 61.5% | 91.9% | 99.0% | 99.2% | 100.0% | 100.0% | 100.0% | 100.0% |
| CVB Average Pattern: | | 39.2% | 68.5% | 80.3% | 87.2% | 91.4% | 93.8% | 95.5% | 96.6% | 97.3% | 97.9% |
| Best Fit: | 25% | 4% | 3% | 10% | 61% | 80% | 73% | 80% | 79% | 77% | 77% |
| CVB: | 25% | 24.6% | 54.4% | 70.9% | 82.0% | 88.3% | 92.0% | 93.8% | 95.4% | 96.5% | 97.2% |
| CVB ATA Factors: | | 2.210 | 1.302 | 1.158 | 1.077 | 1.042 | 1.020 | 1.017 | 1.011 | 1.007 | 1.029 |

**Comparison of User Input vs CVB Patterns**
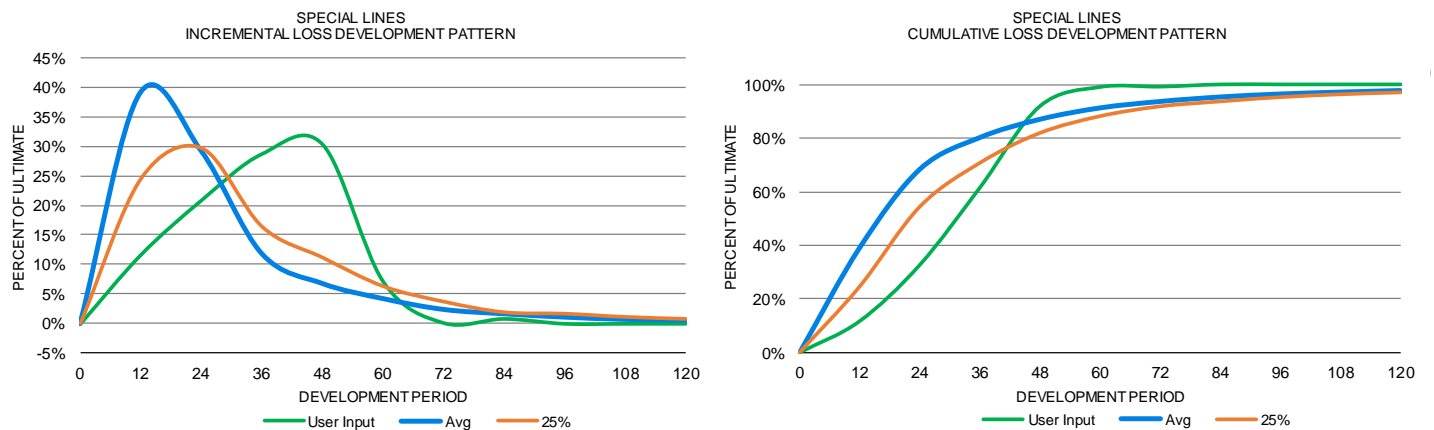
### FIGURE 26: COMMERCIAL AUTO

**Selected Paid Development Pattern:**

| Selection Criteria: | CVB | CVB | CVB | CVB | CVB | CVB | CVB | CVB | CVB | User Input |
|---|---|---|---|---|---|---|---|---|---|---|
| Default ATA Factors: | 1.887 | 1.328 | 1.150 | 1.065 | 1.028 | 1.012 | 1.004 | 1.001 | 1.000 | 1.000 |
| User Override: | | | | | | | | | | |
| Selected ATA Factors: | 1.887 | 1.328 | 1.150 | 1.065 | 1.028 | 1.012 | 1.004 | 1.001 | 1.000 | 1.000 |
| Selected Pattern: | 31.1% | 58.8% | 78.0% | 89.7% | 95.5% | 98.2% | 99.5% | 99.8% | 99.9% | 100.0% |
| Range: | 20% | | | | | | | | | |
| Lower: | 51% | 26.0% | 52.2% | 72.4% | 85.6% | 92.9% | 96.6% | 98.3% | 99.2% | 99.6% | 99.7% |
| Upper: | 91% | 40.2% | 69.5% | 86.6% | 94.6% | 98.3% | 99.8% | 100.0% | 100.0% | 100.0% | 100.0% |

**Comparison of Selected Pattern vs Range Patterns**



COMMERCIAL AUTO LIABILITY
INCREMENTAL LOSS DEVELOPMENT PATTERN

COMMERCIAL AUTO LIABILITY
CUMULATIVE LOSS DEVELOPMENT PATTERN
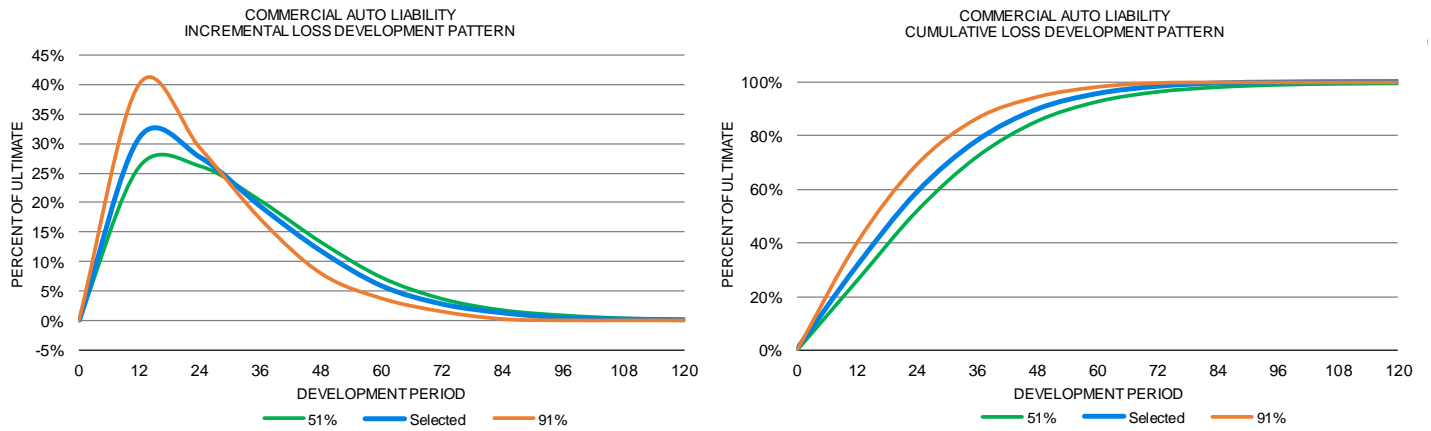
### FIGURE 27: COMMERCIAL MULTI-PERIL

**Selected Paid Development Pattern:**

| Selection Criteria: | CVB | CVB | CVB | CVB | CVB | CVB | CVB | CVB | CVB | User Input |
|---|---|---|---|---|---|---|---|---|---|---|
| Default ATA Factors: | 1.631 | 1.193 | 1.122 | 1.070 | 1.044 | 1.025 | 1.015 | 1.009 | 1.005 | 1.007 |
| User Override: | | | | | | | | | | |
| Selected ATA Factors: | 1.631 | 1.193 | 1.122 | 1.070 | 1.044 | 1.025 | 1.015 | 1.009 | 1.005 | 1.007 |
| Selected Pattern: | 38.7% | 63.1% | 75.2% | 84.4% | 90.3% | 94.2% | 96.5% | 98.0% | 98.9% | 99.3% |
| Range: | 20% | | | | | | | | | |
| Lower: | 20% | 30.7% | 54.4% | 67.0% | 77.4% | 84.7% | 89.7% | 92.9% | 94.9% | 96.2% | 97.3% |
| Upper: | 60% | 48.0% | 71.4% | 81.9% | 89.1% | 93.7% | 96.4% | 97.9% | 98.7% | 99.2% | 99.4% |

**Comparison of Selected Pattern vs Range Patterns**



COMMERCIAL MULTI-PERIL
INCREMENTAL LOSS DEVELOPMENT PATTERN

COMMERCIAL MULTI-PERIL
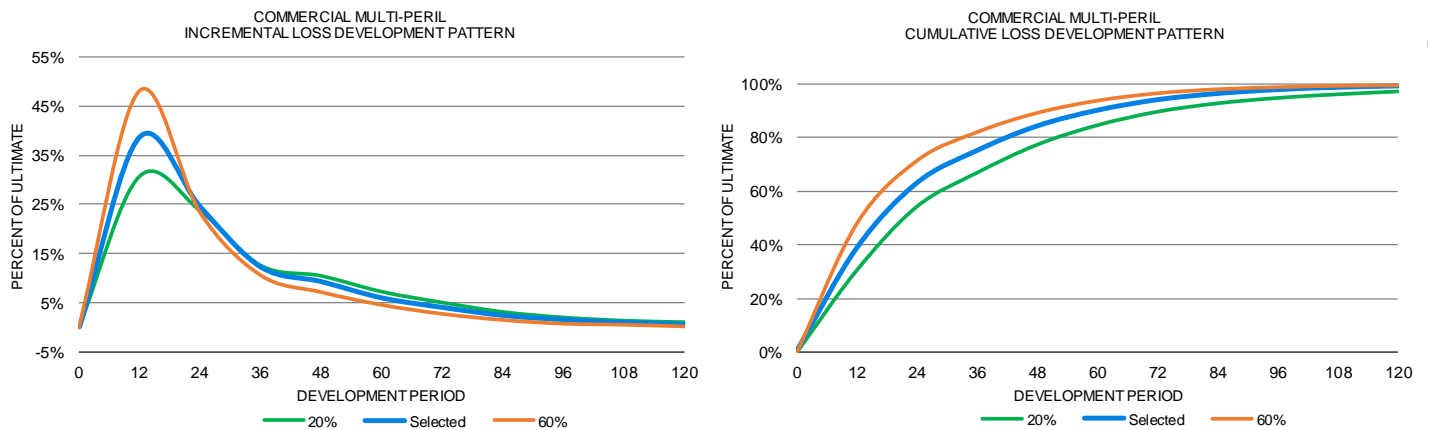CUMULATIVE LOSS DEVELOPMENT PATTERN

## FIGURE 28: OTHER LIABILITY: OCCURRENCE

**Selected Paid Development Pattern:**

| Selection Criteria: | CVB | CVB | CVB | CVB | CVB | CVB | CVB | CVB | CVB | User Input |
|---|---|---|---|---|---|---|---|---|---|---|
| Default ATA Factors: | 2.635 | 1.576 | 1.307 | 1.164 | 1.090 | 1.043 | 1.029 | 1.014 | 1.009 | 1.001 |
| User Override: | | | | | | | | | | |
| Selected ATA Factors: | 2.635 | 1.576 | 1.307 | 1.164 | 1.090 | 1.043 | 1.029 | 1.014 | 1.009 | 1.001 |
| Selected Pattern: | 13.2% | 34.8% | 54.9% | 71.8% | 83.5% | 91.0% | 95.0% | 97.7% | 99.1% | 99.9% |
| Range: | 20% | | | | | | | | | |
| Lower: | 34% | 8.0% | 24.6% | 43.2% | 60.3% | 73.2% | 82.1% | 87.8% | 91.3% | 93.6% | 95.3% |
| Upper: | 74% | 22.2% | 47.3% | 67.7% | 81.8% | 90.8% | 96.0% | 98.1% | 99.1% | 99.4% | 99.6% |

**Comparison of Selected Pattern vs Range Patterns**



OTHER LIABILITY - OCCURRENCE
INCREMENTAL LOSS DEVELOPMENT PATTERN

OTHER LIABILITY - OCCURRENCE
CUMULATIVE LOSS DEVELOPMENT PATTERN
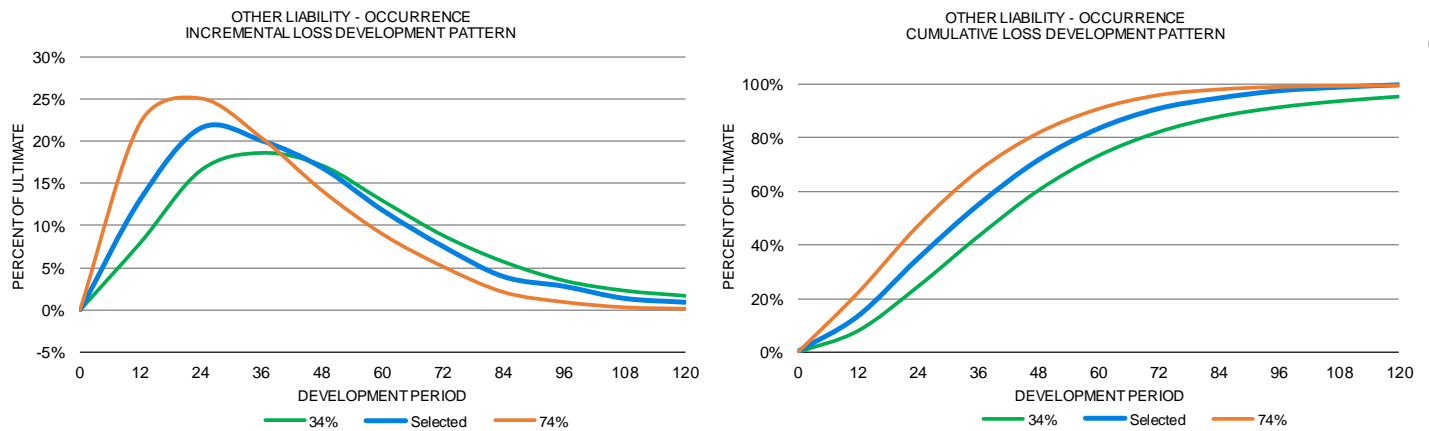
## FIGURE 29: SPECIAL LINES

**Selected Paid Development Pattern:**

| Selection Criteria: | CVB | CVB | CVB | CVB | CVB | CVB | CVB | CVB | CVB | User Input |
|---|---|---|---|---|---|---|---|---|---|---|
| Default ATA Factors: | 2.210 | 1.302 | 1.158 | 1.077 | 1.042 | 1.020 | 1.017 | 1.011 | 1.007 | 1.000 |
| User Override: | | | | | | | | | | |
| Selected ATA Factors: | 2.210 | 1.302 | 1.158 | 1.077 | 1.042 | 1.020 | 1.017 | 1.011 | 1.007 | 1.000 |
| Selected Pattern: | 25.3% | 56.0% | 72.9% | 84.4% | 90.9% | 94.6% | 96.5% | 98.2% | 99.3% | 100.0% |
| Range: | 20% | | | | | | | | | |
| Lower: | 5% | 13.5% | 38.1% | 54.3% | 66.5% | 74.9% | 81.3% | 84.5% | 86.8% | 88.9% | 90.3% |
| Upper: | 45% | 33.9% | 67.9% | 81.9% | 89.5% | 93.1% | 95.4% | 96.7% | 97.6% | 98.2% | 98.6% |

**Comparison of Selected Pattern vs Range Patterns**



SPECIAL LINES
INCREMENTAL LOSS DEVELOPMENT PATTERN

SPECIAL LINES
CUMULATIVE LOSS DEVELOPMENT PATTERN
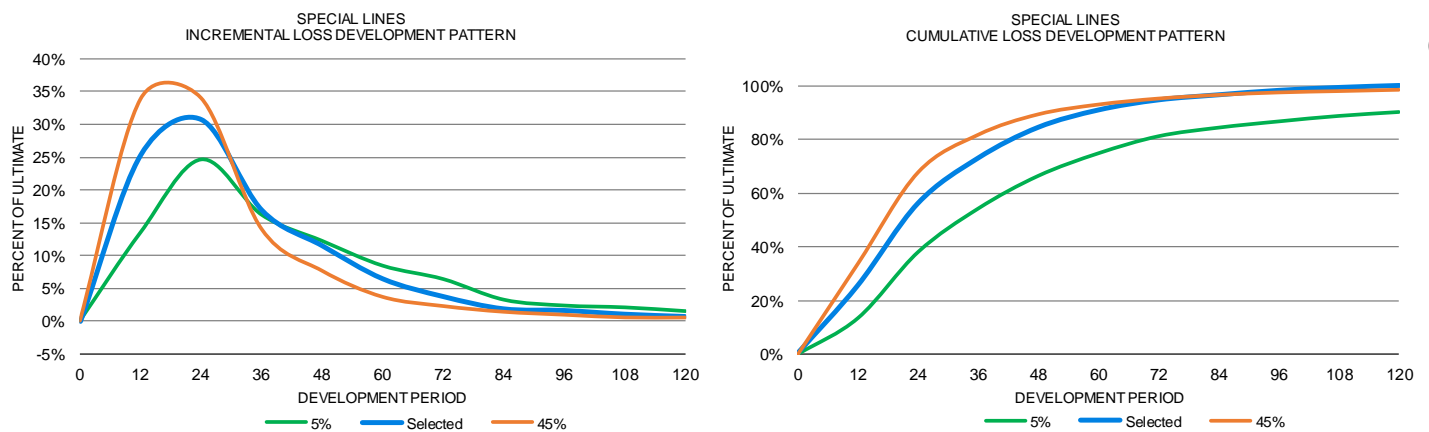
**FIGURE 30: COMMERCIAL AUTO**

COMPANY B - COMMERCIAL AUTO LIABILITY

TOTAL UNPAID (000'S)

— Weighted    — CVB
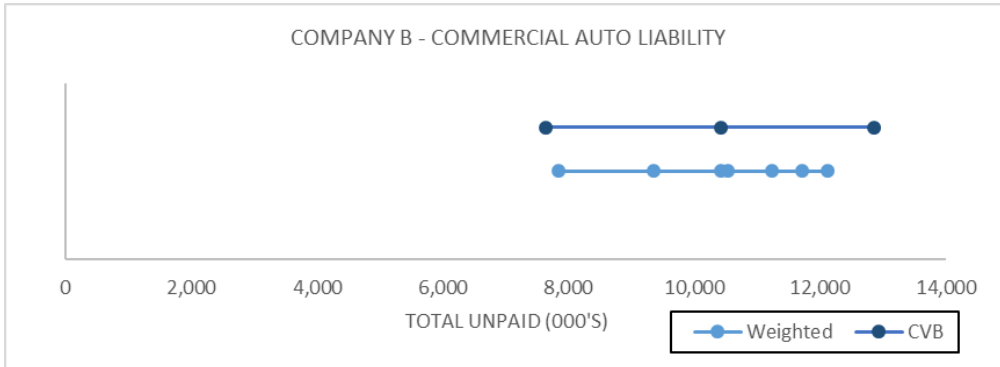
**FIGURE 31: COMMERCIAL MULTI-PERIL**

COMPANY B - COMMERCIAL MULTI-PERIL

TOTAL UNPAID (000'S)

— Weighted    — CVB
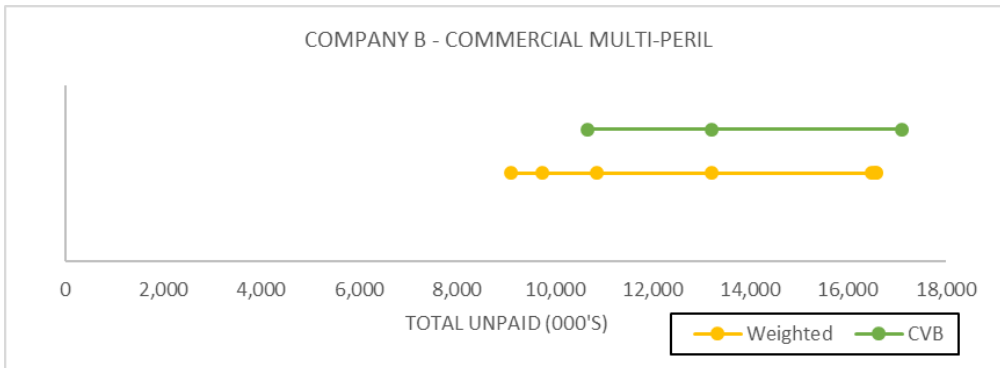
**FIGURE 32: OTHER LIABILITY: OCCURRENCE**

COMPANY B - OTHER LIABILITY - OCCURRENCE
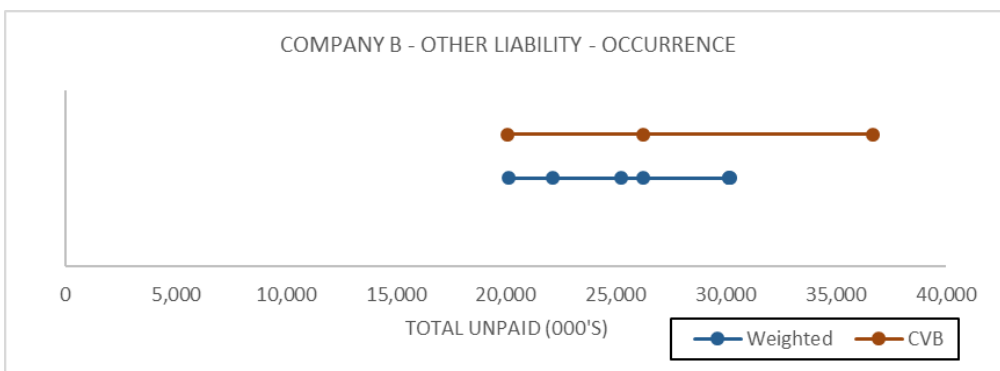
TOTAL UNPAID (000'S)

— Weighted    — CVB
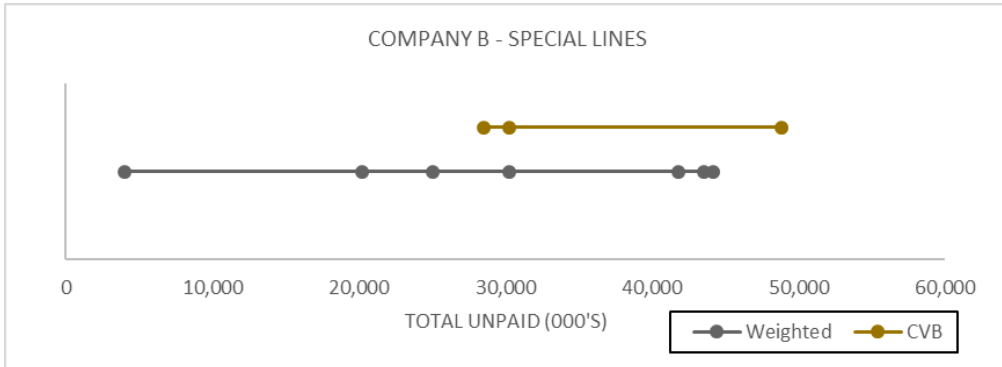
**FIGURE 33: SPECIAL LINES**



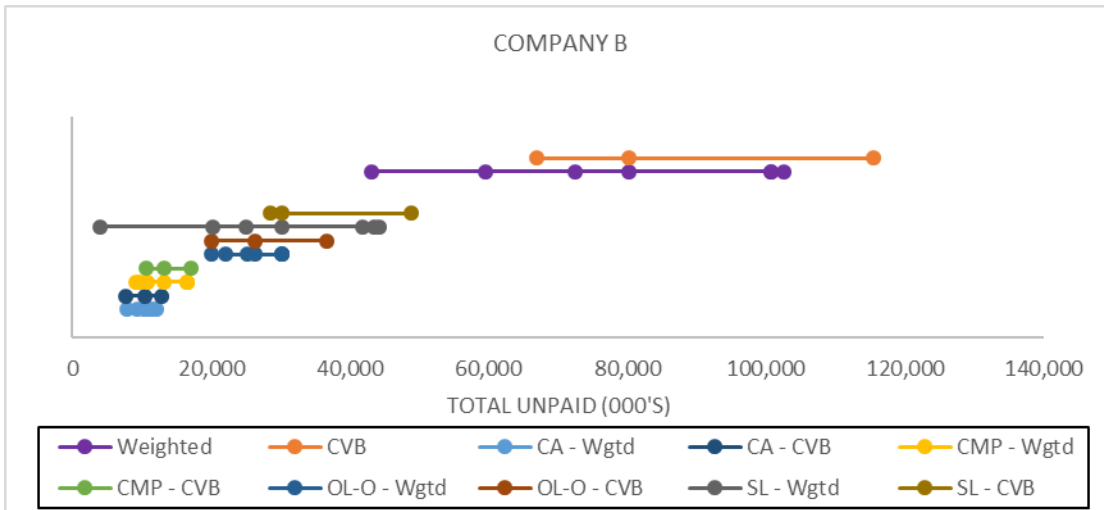**FIGURE 34: OVERALL AND LOB RANGES FOR COMPANY B**

## FIGURE 35: COMMERCIAL AUTO

**User Input Paid Development Pattern:**

| Development Periods: | 12-24 | 24-36 | 36-48 | 48-60 | 60-72 | 72-84 | 84-96 | 96-108 | 108-120 | 120+ |
|---|---|---|---|---|---|---|---|---|---|---|
| User Input ATA Factors: | 1.982 | 1.458 | 1.193 | 1.098 | 1.048 | 1.015 | 1.004 | 1.002 | 1.000 | 1.001 |
| Development Age: | 12 | 24 | 36 | 48 | 60 | 72 | 84 | 96 | 108 | 120 |
| User Input Pattern: | 24.7% | 48.9% | 71.2% | 85.0% | 93.4% | 97.8% | 99.3% | 99.7% | 99.9% | 99.9% |
| CVB Average Pattern: | 26.9% | 52.6% | 71.8% | 84.3% | 91.5% | 95.2% | 97.2% | 98.1% | 98.7% | 99.1% |
| Best Fit: 46% | 45% | 39% | 47% | 48% | 55% | 66% | 68% | 68% | 67% | 65% |
| CVB: 46% | 24.8% | 50.8% | 71.1% | 84.5% | 92.2% | 96.1% | 98.0% | 99.0% | 99.5% | 99.6% |
| CVB ATA Factors: | 2.050 | 1.399 | 1.190 | 1.090 | 1.042 | 1.020 | 1.010 | 1.005 | 1.002 | 1.004 |

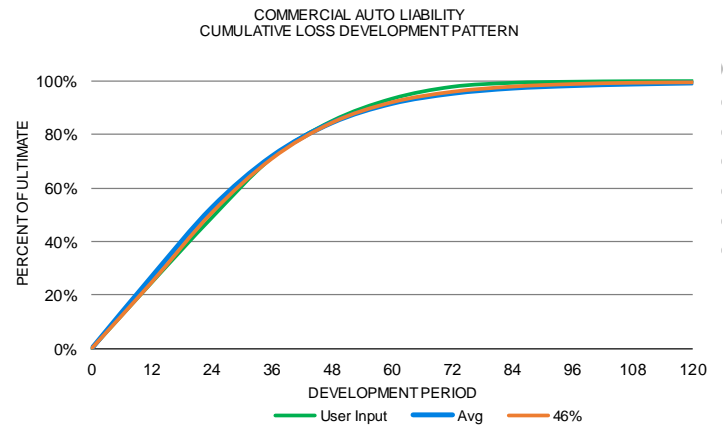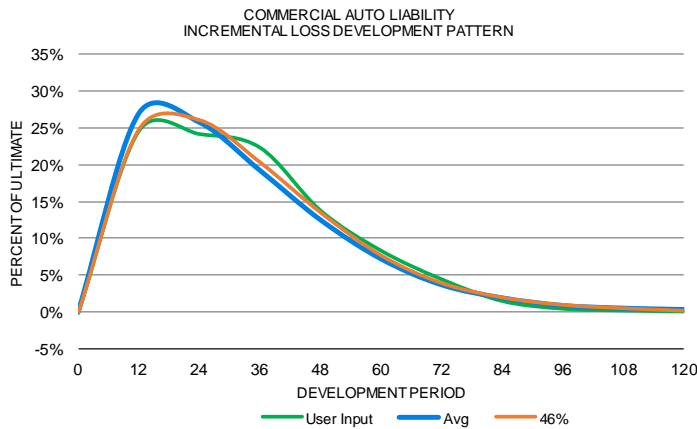**Comparison of User Input vs CVB Patterns**



## FIGURE 36: REINSURANCE: NON-PROPORTIONAL ASSUMED LIABILITY

**User Input Paid Development Pattern:**

| Development Periods: | 12-24 | 24-36 | 36-48 | 48-60 | 60-72 | 72-84 | 84-96 | 96-108 | 108-120 | 120+ |
|---|---|---|---|---|---|---|---|---|---|---|
| User Input ATA Factors: | 6.556 | 2.087 | 1.664 | 1.267 | 1.167 | 1.127 | 1.042 | 1.041 | 1.064 | 1.033 |
| Development Age: | 12 | 24 | 36 | 48 | 60 | 72 | 84 | 96 | 108 | 120 |
| User Input Pattern: | 2.2% | 14.5% | 30.3% | 50.4% | 63.8% | 74.5% | 83.9% | 87.4% | 91.0% | 96.8% |
| CVB Average Pattern: | 17.8% | 36.9% | 50.6% | 62.0% | 71.1% | 77.0% | 81.2% | 84.2% | 86.8% | 88.3% |
| Best Fit: 44% | 16% | 26% | 28% | 36% | 42% | 46% | 51% | 51% | 53% | 65% |
| CVB: 44% | 5.7% | 22.2% | 39.5% | 54.7% | 64.8% | 72.9% | 78.7% | 83.0% | 87.0% | 89.4% |
| CVB ATA Factors: | 3.871 | 1.782 | 1.384 | 1.185 | 1.125 | 1.080 | 1.054 | 1.048 | 1.027 | 1.119 |

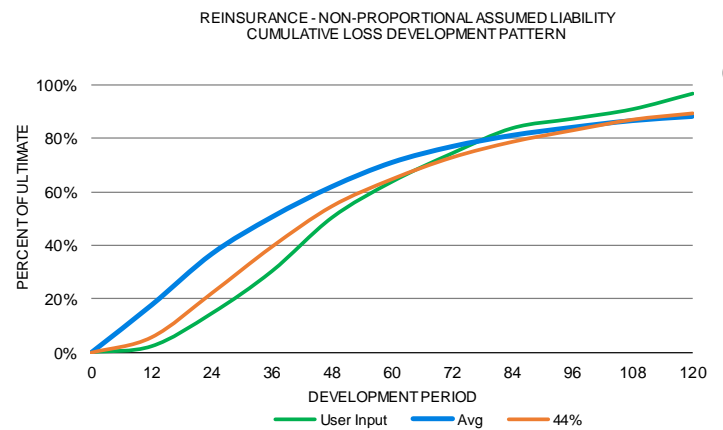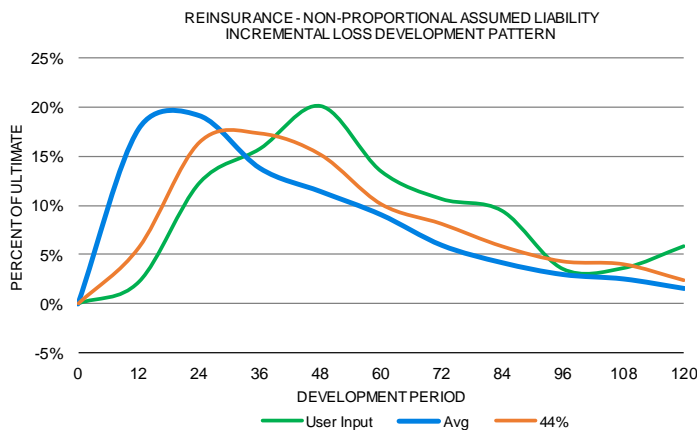**Comparison of User Input vs CVB Patterns**

**FIGURE 37: REINSURANCE: NON-PROPORTIONAL ASSUMED PROPERTY**

**User Input Paid Development Pattern:**

| Development Periods: | 12-24 | 24-36 | 36-48 | 48-60 | 60-72 | 72-84 | 84-96 | 96-108 | 108-120 | 120+ |
|---|---|---|---|---|---|---|---|---|---|---|
| User Input ATA Factors: | 2.511 | 1.141 | 1.054 | 1.029 | 1.025 | 1.021 | 1.004 | 1.002 | 1.002 | 1.001 |
| Development Age: | 12 | 24 | 36 | 48 | 60 | 72 | 84 | 96 | 108 | 120 |
| User Input Pattern: | 30.4% | 76.4% | 87.2% | 91.9% | 94.6% | 97.0% | 99.0% | 99.5% | 99.7% | 99.9% |
| CVB Average Pattern: | 38.5% | 71.8% | 84.5% | 89.6% | 92.9% | 94.7% | 95.9% | 96.8% | 97.6% | 98.4% |
| Best Fit: 53% | 44% | 60% | 56% | 53% | 50% | 58% | 75% | 79% | 78% | 83% |
| CVB: 53% | 34.9% | 72.9% | 86.5% | 91.9% | 95.0% | 96.4% | 97.4% | 98.0% | 98.7% | 99.1% |
| CVB ATA Factors: | 2.086 | 1.187 | 1.062 | 1.034 | 1.015 | 1.010 | 1.007 | 1.006 | 1.005 | 1.009 |

**Comparison of User Input vs CVB Patterns**



REINSURANCE - NON-PROPORTIONAL ASSUMED PROPERTY
INCREMENTAL LOSS DEVELOPMENT PATTERN

REINSURANCE - NON-PROPORTIONAL ASSUMED PROPERTY
CUMULATIVE LOSS DEVELOPMENT PATTERN
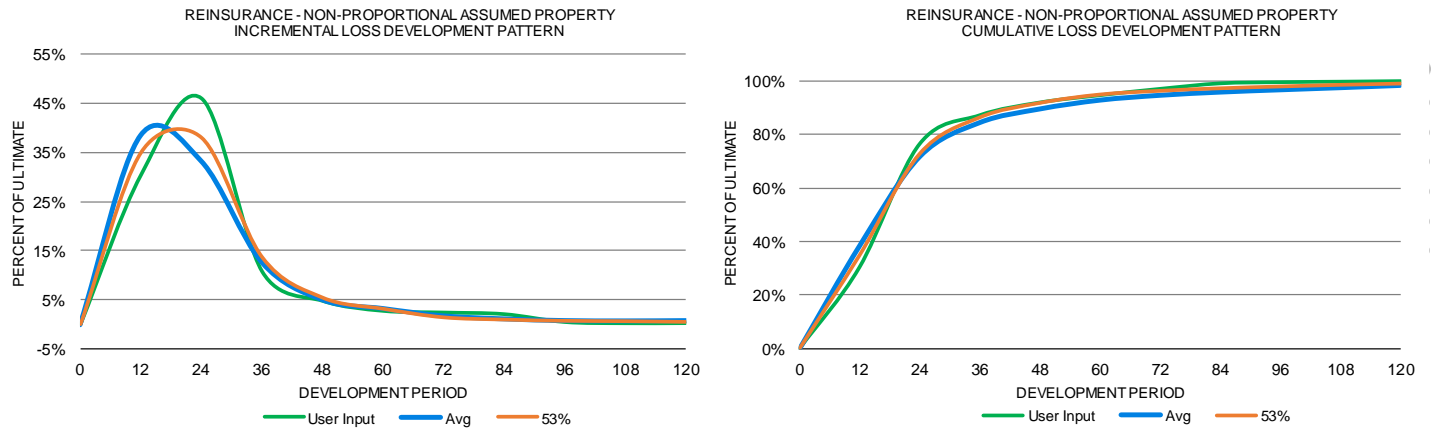
**FIGURE 38: COMMERCIAL AUTO**

**Selected Paid Development Pattern:**

| Selection Criteria: | CVB | CVB | CVB | CVB | CVB | CVB | CVB | CVB | CVB | User Input |
|---|---|---|---|---|---|---|---|---|---|---|
| Default ATA Factors: | 2.050 | 1.399 | 1.190 | 1.090 | 1.042 | 1.020 | 1.010 | 1.005 | 1.002 | 1.001 |
| User Override: | | | | | | | | | | |
| Selected ATA Factors: | 2.050 | 1.399 | 1.190 | 1.090 | 1.042 | 1.020 | 1.010 | 1.005 | 1.002 | 1.001 |
| Selected Pattern: | 24.9% | 50.9% | 71.3% | 84.8% | 92.5% | 96.4% | 98.3% | 99.3% | 99.8% | 99.9% |
| Range: 20% | | | | | | | | | | |
| Lower: 26% | 20.7% | 45.1% | 65.7% | 80.3% | 89.1% | 94.0% | 96.5% | 98.0% | 98.8% | 99.3% |
| Upper: 66% | 29.7% | 57.1% | 76.4% | 88.5% | 94.9% | 97.8% | 99.2% | 99.6% | 99.9% | 99.9% |

**Comparison of Selected Pattern vs Range Patterns**



COMMERCIAL AUTO LIABILITY
INCREMENTAL LOSS DEVELOPMENT PATTERN

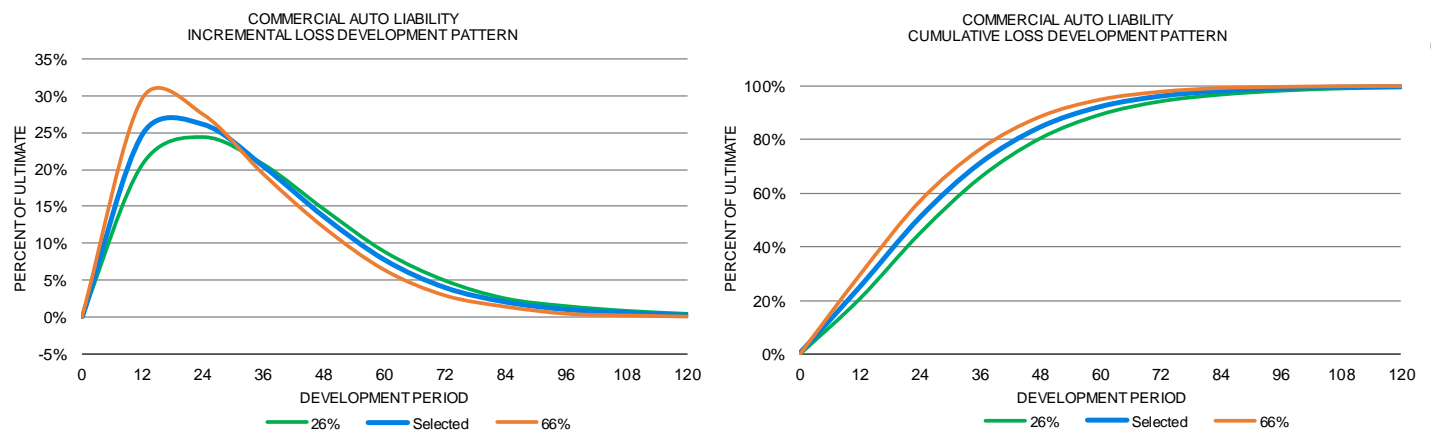COMMERCIAL AUTO LIABILITY
CUMULATIVE LOSS DEVELOPMENT PATTERN

### FIGURE 39: REINSURANCE: NON-PROPORTIONAL ASSUMED LIABILITY

**Selected Paid Development Pattern:**

| Selection Criteria: | | CVB | CVB | CVB | CVB | CVB | CVB | CVB | CVB | CVB | User Input |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Default ATA Factors: | | 3.871 | 1.782 | 1.384 | 1.185 | 1.125 | 1.080 | 1.054 | 1.048 | 1.027 | 1.033 |
| User Override: | | | | | | | | | | | |
| Selected ATA Factors: | | 3.871 | 1.782 | 1.384 | 1.185 | 1.125 | 1.080 | 1.054 | 1.048 | 1.027 | 1.033 |
| Selected Pattern: | | 6.2% | 24.0% | 42.8% | 59.2% | 70.2% | 79.0% | 85.3% | 89.9% | 94.3% | 96.8% |
| Range: | 20% | | | | | | | | | | |
| Lower: | 24% | 3.1% | 13.9% | 28.8% | 44.6% | 55.6% | 63.7% | 70.6% | 74.9% | 79.0% | 81.2% |
| Upper: | 64% | 16.7% | 40.5% | 61.5% | 76.2% | 83.9% | 88.6% | 91.2% | 93.8% | 95.9% | 96.7% |

**Comparison of Selected Pattern vs Range Patterns**



REINSURANCE - NON-PROPORTIONAL ASSUMED LIABILITY
INCREMENTAL LOSS DEVELOPMENT PATTERN

REINSURANCE - NON-PROPORTIONAL ASSUMED LIABILITY
CUMULATIVE LOSS DEVELOPMENT PATTERN

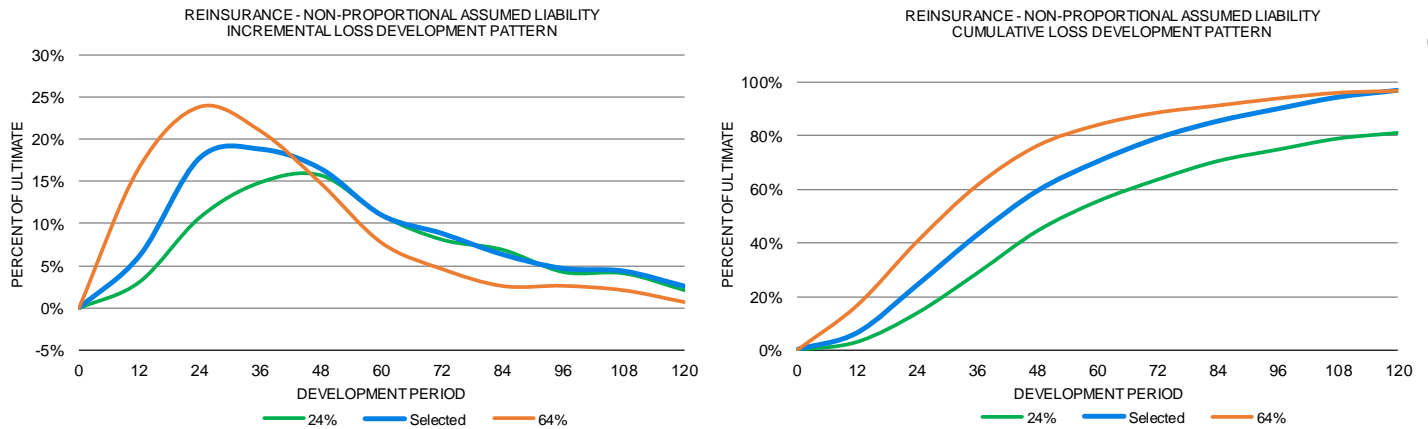### FIGURE 40: REINSURANCE: NON-PROPORTIONAL ASSUMED PROPERTY

**Selected Paid Development Pattern:**

| Selection Criteria: | | CVB | CVB | CVB | CVB | CVB | CVB | CVB | CVB | CVB | User Input |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Default ATA Factors: | | 2.086 | 1.187 | 1.062 | 1.034 | 1.015 | 1.010 | 1.007 | 1.006 | 1.005 | 1.001 |
| User Override: | | | | | | | | | | | |
| Selected ATA Factors: | | 2.086 | 1.187 | 1.062 | 1.034 | 1.015 | 1.010 | 1.007 | 1.006 | 1.005 | 1.001 |
| Selected Pattern: | | 35.2% | 73.4% | 87.2% | 92.6% | 95.8% | 97.2% | 98.1% | 98.8% | 99.4% | 99.9% |
| Range: | 20% | | | | | | | | | | |
| Lower: | 33% | 24.2% | 64.4% | 81.7% | 88.4% | 92.4% | 94.3% | 95.6% | 96.7% | 97.4% | 98.2% |
| Upper: | 73% | 53.9% | 84.3% | 92.7% | 95.7% | 97.8% | 98.6% | 98.9% | 99.3% | 99.5% | 99.7% |

**Comparison of Selected Pattern vs Range Patterns**



REINSURANCE - NON-PROPORTIONAL ASSUMED PROPERTY
INCREMENTAL LOSS DEVELOPMENT PATTERN

REINSURANCE - NON-PROPORTIONAL ASSUMED PROPERTY
CUMULATIVE LOSS DEVELOPMENT PATTERN
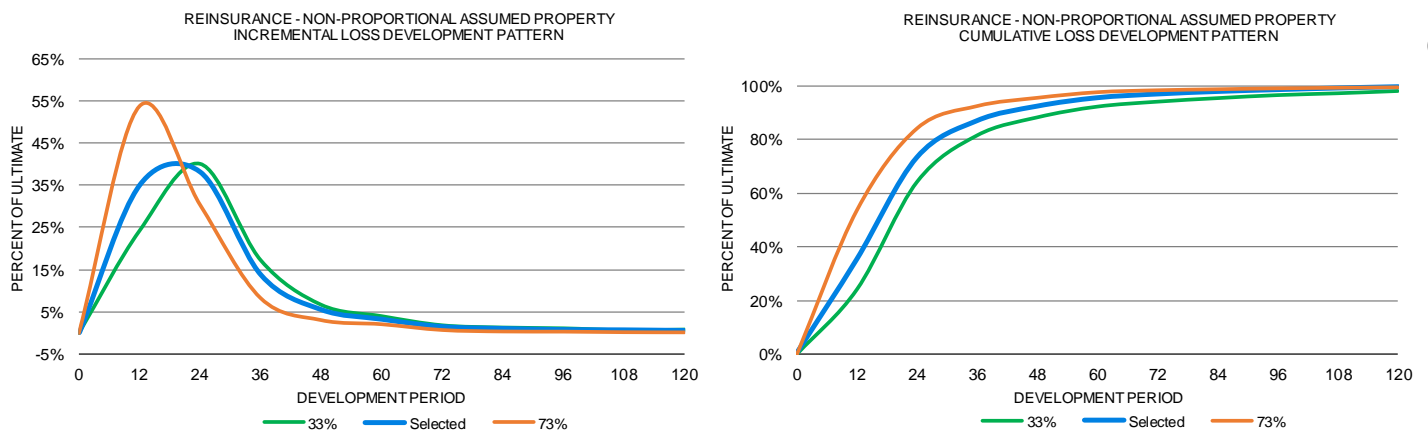
**FIGURE 41: COMMERCIAL AUTO**



COMPANY C - COMMERCIAL AUTO LIABILITY

TOTAL UNPAID (000'S)
Weighted  CVB
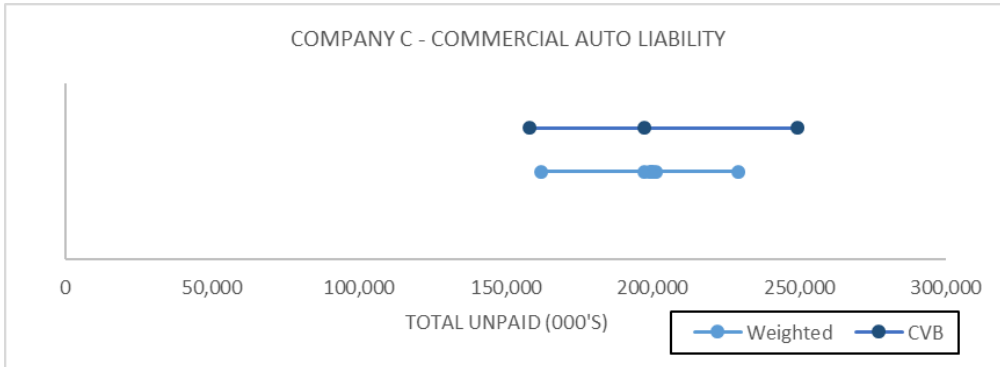
**FIGURE 42: REINSURANCE: NON-PROPORTIONAL ASSUMED LIABILITY**



COMPANY C - REINSURANCE - NON-PROPORTIONAL ASSUMED LIABILITY

TOTAL UNPAID (000'S)
Weighted  CVB
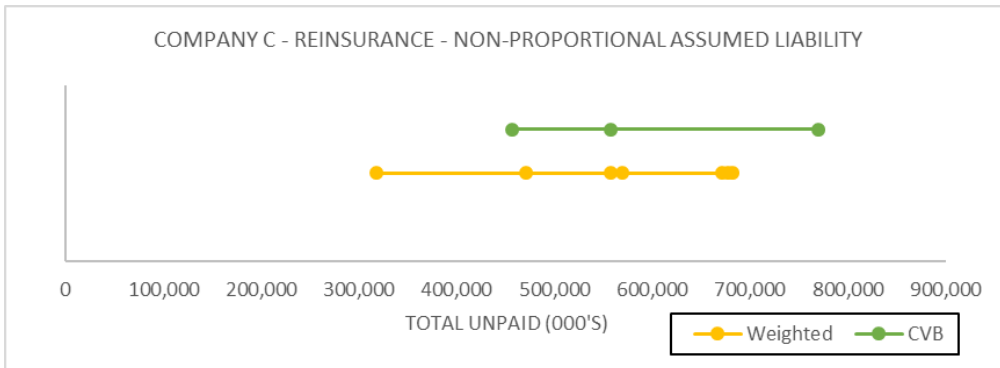
**FIGURE 43: REINSURANCE: NON-PROPORTIONAL ASSUMED PROPERTY**



COMPANY C - REINSURANCE - NON-PROPORTIONAL ASSUMED PROPERTY
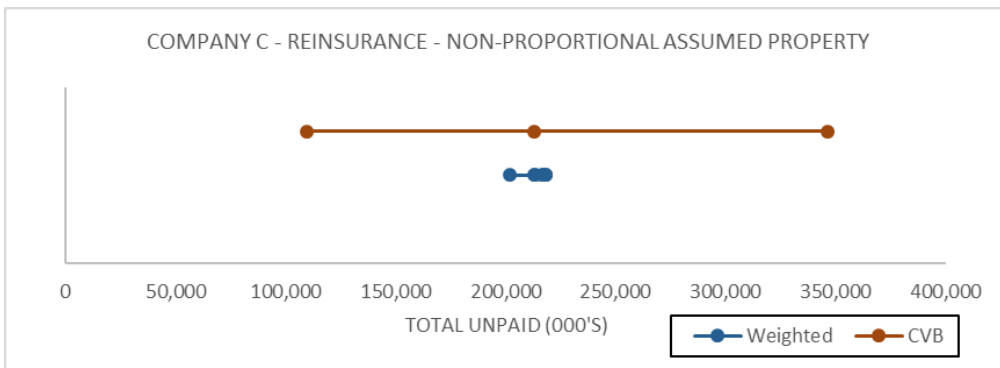
TOTAL UNPAID (000'S)
Weighted  CVB

**FIGURE 44: OVERALL AND LOB RANGES FOR COMPANY C**
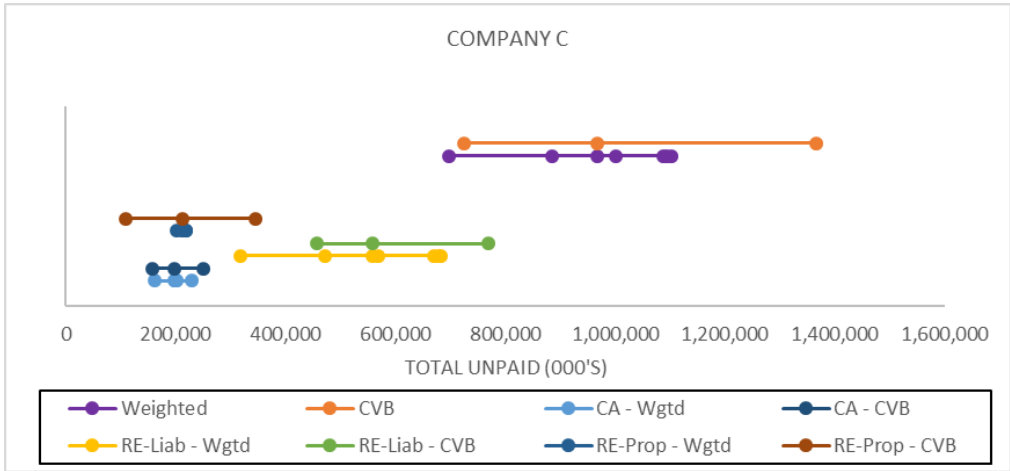
**FIGURE 45: COMMERCIAL AUTO**

**User Input Paid Development Pattern:**

| Development Periods: | 12-24 | 24-36 | 36-48 | 48-60 | 60-72 | 72-84 | 84-96 | 96-108 | 108-120 | 120+ |
|---|---|---|---|---|---|---|---|---|---|---|
| User Input ATA Factors: | 1.915 | 1.335 | 1.189 | 1.091 | 1.050 | 1.023 | 1.009 | 1.007 | 1.002 | 1.004 |
| Development Age: | 12 | 24 | 36 | 48 | 60 | 72 | 84 | 96 | 108 | 120 |
| User Input Pattern: | 27.5% | 52.6% | 70.2% | 83.4% | 91.1% | 95.6% | 97.8% | 98.7% | 99.3% | 99.6% |
| CVB Average Pattern: | 26.9% | 52.6% | 71.8% | 84.3% | 91.5% | 95.2% | 97.2% | 98.1% | 98.7% | 99.1% |
| Best Fit: Avg | 57% | Avg | 42% | 39% | 38% | 41% | 42% | 38% | 41% | 43% |
| CVB: | **Avg** | 26.9% | 52.6% | 71.8% | 84.3% | 91.5% | 95.2% | 97.2% | 98.1% | 98.7% | 99.1% |
| CVB ATA Factors: | 1.957 | 1.365 | 1.174 | 1.086 | 1.041 | 1.021 | 1.010 | 1.006 | 1.004 | 1.009 |

**Comparison of User Input vs CVB Patterns**



COMMERCIAL AUTO LIABILITY
INCREMENTAL LOSS DEVELOPMENT PATTERN

COMMERCIAL AUTO LIABILITY
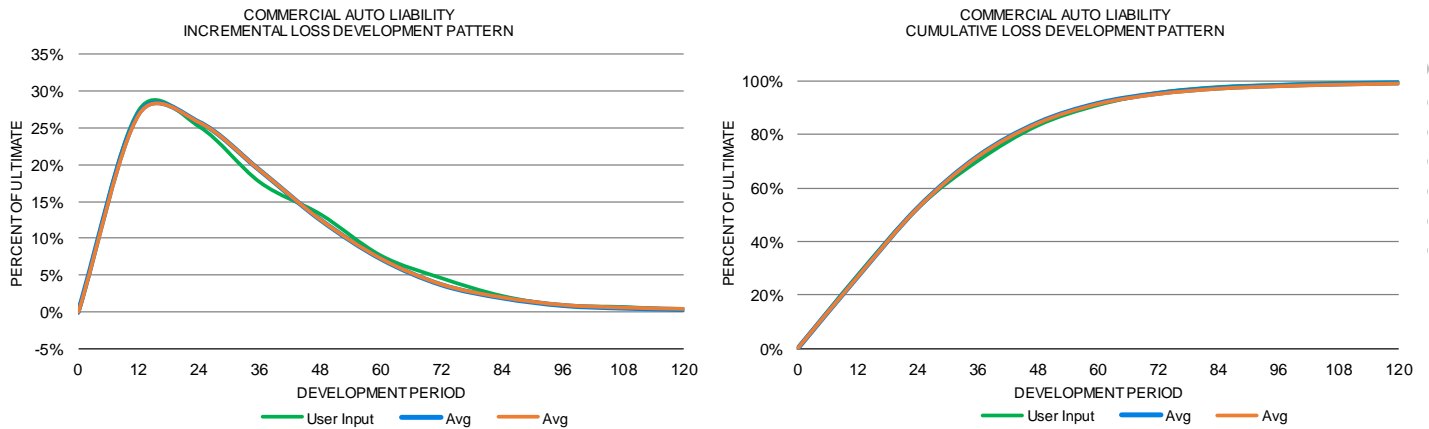CUMULATIVE LOSS DEVELOPMENT PATTERN

**FIGURE 46: HOMEOWNERS AND FARMOWNERS**

**User Input Paid Development Pattern:**

| Development Periods: | 12-24 | 24-36 | 36-48 | 48-60 | 60-72 | 72-84 | 84-96 | 96-108 | 108-120 | 120+ |
|---|---|---|---|---|---|---|---|---|---|---|
| User Input ATA Factors: | 1.345 | 1.041 | 1.020 | 1.012 | 1.006 | 1.004 | 1.002 | 1.001 | 1.001 | 1.001 |
| Development Age: | 12 | 24 | 36 | 48 | 60 | 72 | 84 | 96 | 108 | 120 |
| User Input Pattern: | 68.2% | 91.8% | 95.5% | 97.4% | 98.5% | 99.1% | 99.5% | 99.7% | 99.9% | 99.9% |
| CVB Average Pattern: | 69.7% | 90.3% | 94.3% | 96.7% | 97.9% | 98.7% | 99.1% | 99.4% | 99.6% | 99.8% |
| Best Fit: 45% | 36% | 48% | 48% | 44% | 45% | 43% | 41% | 42% | 51% | 57% |
| CVB: | 45% | 70.2% | 91.3% | 95.3% | 97.4% | 98.5% | 99.2% | 99.6% | 99.8% | 99.8% | 99.9% |
| CVB ATA Factors: | 1.301 | 1.043 | 1.022 | 1.011 | 1.007 | 1.004 | 1.002 | 1.001 | 1.000 | 1.001 |

**Comparison of User Input vs CVB Patterns**



HOMEOWNERS & FARMOWNERS
INCREMENTAL LOSS DEVELOPMENT PATTERN

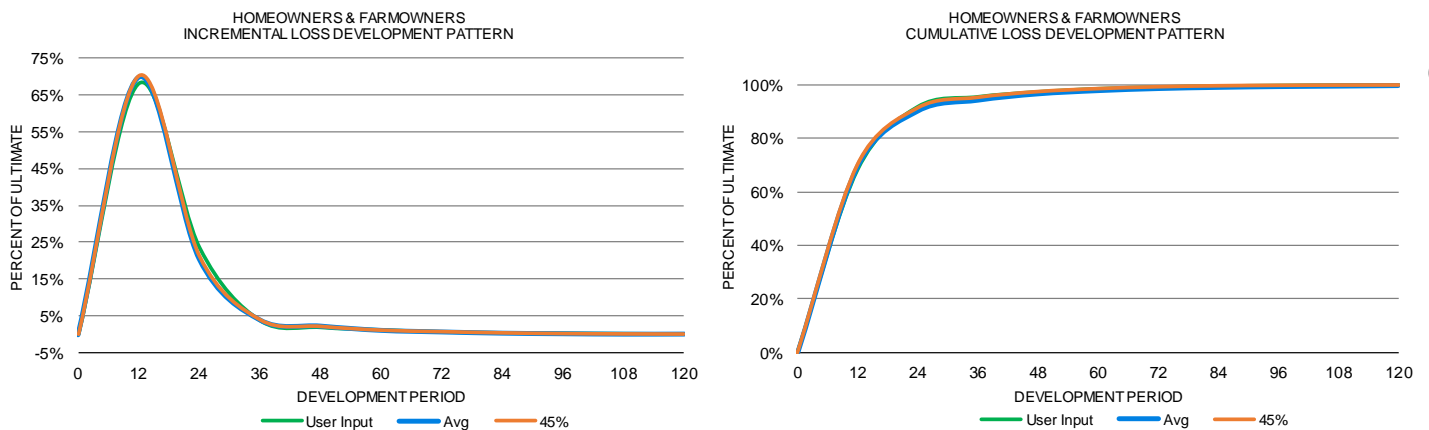HOMEOWNERS & FARMOWNERS
CUMULATIVE LOSS DEVELOPMENT PATTERN

## FIGURE 47: PRIVATE PASSENGER AUTO LIABILITY

**User Input Paid Development Pattern:**

| Development Periods: | | 12-24 | 24-36 | 36-48 | 48-60 | 60-72 | 72-84 | 84-96 | 96-108 | 108-120 | 120+ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| User Input ATA Factors: | | 1.697 | 1.195 | 1.099 | 1.052 | 1.024 | 1.011 | 1.006 | 1.003 | 1.001 | 1.002 |
| Development Age: | | 12 | 24 | 36 | 48 | 60 | 72 | 84 | 96 | 108 | 120 |
| User Input Pattern: | | 40.7% | 69.0% | 82.4% | 90.6% | 95.4% | 97.7% | 98.8% | 99.4% | 99.7% | 99.8% |
| CVB Average Pattern: | | 38.5% | 69.7% | 84.1% | 91.8% | 95.8% | 97.8% | 98.7% | 99.2% | 99.5% | 99.7% |
| Best Fit: | Avg | 62% | 45% | 35% | 30% | 30% | 28% | 28% | 30% | 34% | 41% |
| CVB: | Avg | 38.5% | 69.7% | 84.1% | 91.8% | 95.8% | 97.8% | 98.7% | 99.2% | 99.5% | 99.7% |
| CVB ATA Factors: | | 1.813 | 1.206 | 1.092 | 1.043 | 1.021 | 1.010 | 1.005 | 1.003 | 1.002 | 1.003 |

**Comparison of User Input vs CVB Patterns**



PRIVATE PASSENGER AUTO LIABILITY
INCREMENTAL LOSS DEVELOPMENT PATTERN

PRIVATE PASSENGER AUTO LIABILITY
CUMULATIVE LOSS DEVELOPMENT PATTERN
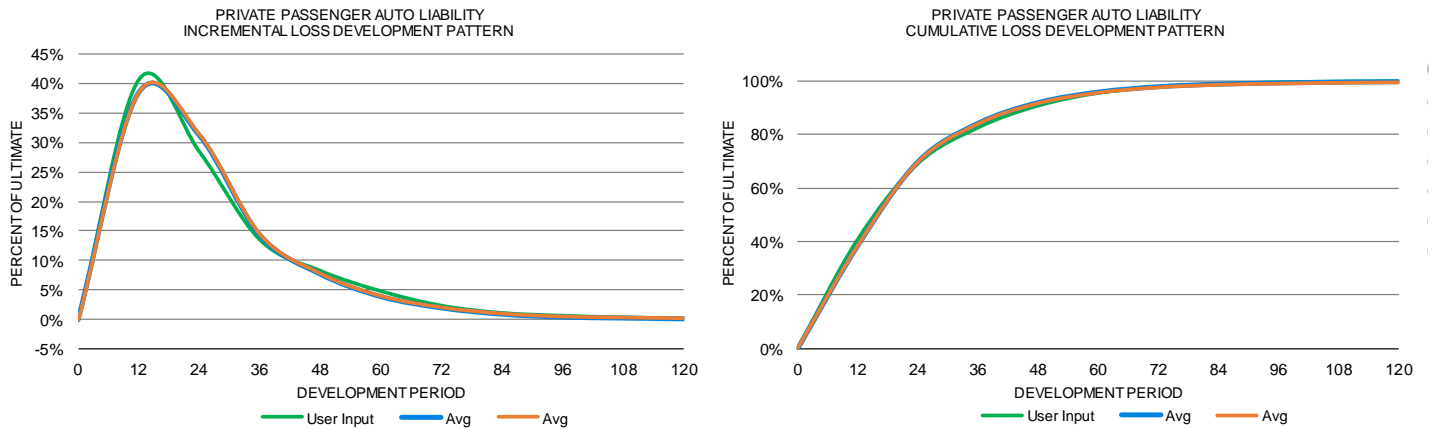
## FIGURE 48: COMMERCIAL AUTO

**Selected Paid Development Pattern:**

| Selection Criteria: | | CVB | CVB | CVB | CVB | CVB | CVB | CVB | CVB | CVB | User Input |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Default ATA Factors: | | 1.957 | 1.365 | 1.174 | 1.086 | 1.041 | 1.021 | 1.010 | 1.006 | 1.004 | 1.004 |
| User Override: | | | | | | | | | | | |
| Selected ATA Factors: | | 1.957 | 1.365 | 1.174 | 1.086 | 1.041 | 1.021 | 1.010 | 1.006 | 1.004 | 1.004 |
| Selected Pattern: | | 27.0% | 52.8% | 72.1% | 84.7% | 91.9% | 95.7% | 97.6% | 98.6% | 99.2% | 99.6% |
| Range: | 20% | | | | | | | | | | |
| Lower: | | 28% | 21.1% | 45.9% | 66.3% | 80.8% | 89.6% | 94.2% | 96.8% | 98.1% | 98.9% | 99.3% |
| Upper: | | 68% | 30.3% | 57.7% | 77.1% | 89.0% | 95.2% | 97.9% | 99.3% | 99.7% | 99.9% | 99.9% |

**Comparison of Selected Pattern vs Range Patterns**



COMMERCIAL AUTO LIABILITY
INCREMENTAL LOSS DEVELOPMENT PATTERN

COMMERCIAL AUTO LIABILITY
CUMULATIVE LOSS DEVELOPMENT PATTERN
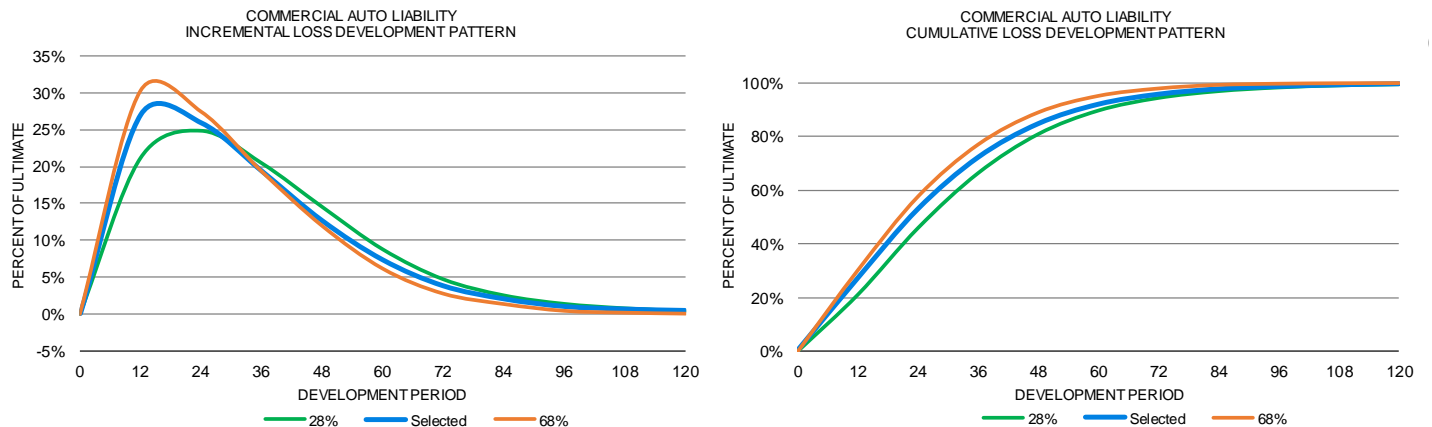
**FIGURE 49: HOMEOWNERS AND FARMOWNERS**

**Selected Paid Development Pattern:**

| Selection Criteria: | | CVB | CVB | CVB | CVB | CVB | CVB | CVB | CVB | CVB | User Input |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Default ATA Factors: | | 1.301 | 1.043 | 1.022 | 1.011 | 1.007 | 1.004 | 1.002 | 1.001 | 1.000 | 1.001 |
| User Override: | | | | | | | | | | | |
| Selected ATA Factors: | | 1.301 | 1.043 | 1.022 | 1.011 | 1.007 | 1.004 | 1.002 | 1.001 | 1.000 | 1.001 |
| Selected Pattern: | | 70.2% | 91.4% | 95.3% | 97.5% | 98.6% | 99.3% | 99.6% | 99.8% | 99.9% | 99.9% |
| Range: | 20% | | | | | | | | | | |
| Lower: | 25% | 64.6% | 88.3% | 93.2% | 96.0% | 97.6% | 98.6% | 99.1% | 99.5% | 99.6% | 99.8% |
| Upper: | 65% | 74.3% | 93.4% | 96.6% | 98.3% | 99.2% | 99.6% | 99.8% | 99.9% | 100.0% | 100.0% |

**Comparison of Selected Pattern vs Range Patterns**



HOMEOWNERS & FARMOWNERS
INCREMENTAL LOSS DEVELOPMENT PATTERN

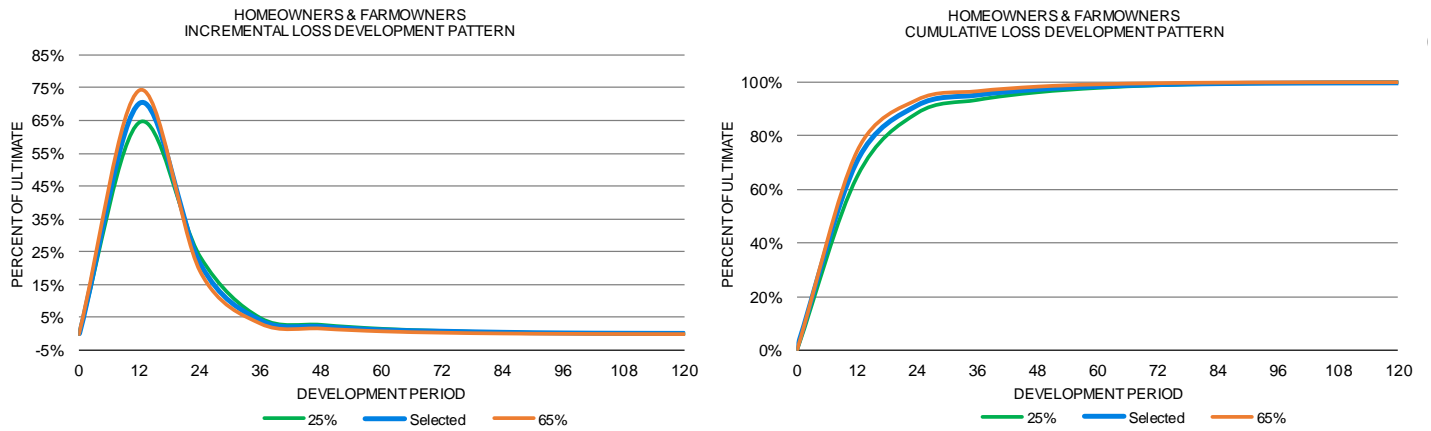HOMEOWNERS & FARMOWNERS
CUMULATIVE LOSS DEVELOPMENT PATTERN

**FIGURE 50: PRIVATE PASSENGER AUTO LIABILITY**

**Selected Paid Development Pattern:**

| Selection Criteria: | | CVB | CVB | CVB | CVB | CVB | CVB | CVB | CVB | CVB | User Input |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Default ATA Factors: | | 1.813 | 1.206 | 1.092 | 1.043 | 1.021 | 1.010 | 1.005 | 1.003 | 1.002 | 1.002 |
| User Override: | | | | | | | | | | | |
| Selected ATA Factors: | | 1.813 | 1.206 | 1.092 | 1.043 | 1.021 | 1.010 | 1.005 | 1.003 | 1.002 | 1.002 |
| Selected Pattern: | | 38.5% | 69.8% | 84.2% | 92.0% | 95.9% | 97.9% | 98.9% | 99.3% | 99.6% | 99.8% |
| Range: | 20% | | | | | | | | | | |
| Lower: | 27% | 33.0% | 64.7% | 80.8% | 90.1% | 95.1% | 97.6% | 98.7% | 99.3% | 99.6% | 99.7% |
| Upper: | 67% | 42.0% | 74.7% | 88.9% | 95.3% | 98.0% | 99.1% | 99.6% | 99.9% | 99.9% | 100.0% |

**Comparison of Selected Pattern vs Range Patterns**



PRIVATE PASSENGER AUTO LIABILITY
INCREMENTAL LOSS DEVELOPMENT PATTERN

PRIVATE PASSENGER AUTO LIABILITY
CUMULATIVE LOSS DEVELOPMENT PATTERN
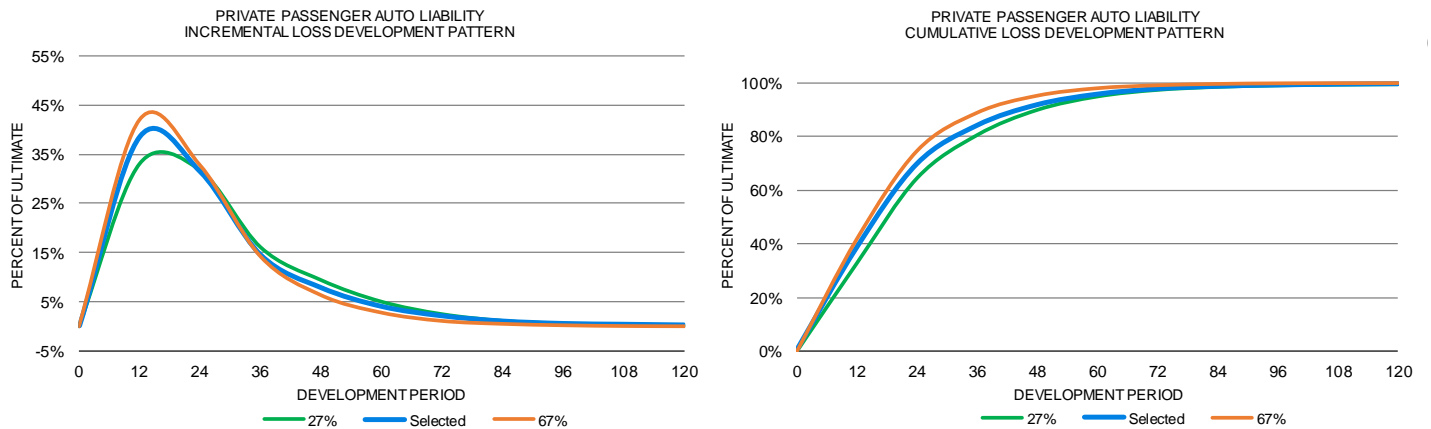
**FIGURE 51: COMMERCIAL AUTO**



COMPANY D - COMMERCIAL AUTO LIABILITY
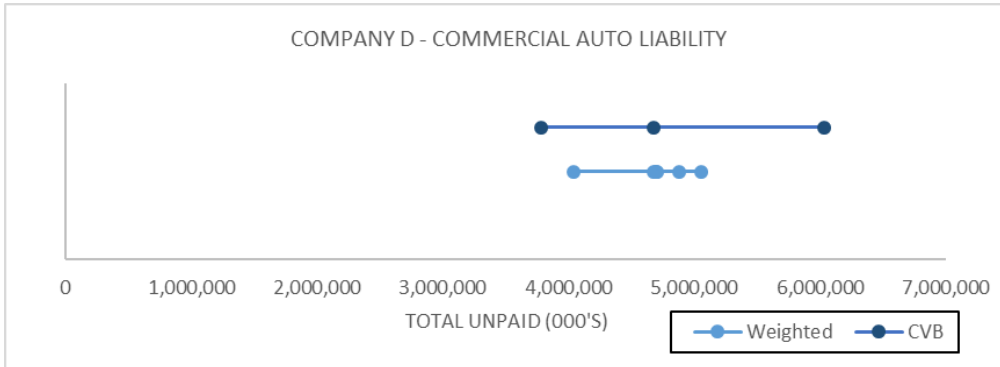
**FIGURE 52: HOMEOWNERS & FARMOWNERS**



COMPANY D - HOMEOWNERS & FARMOWNERS
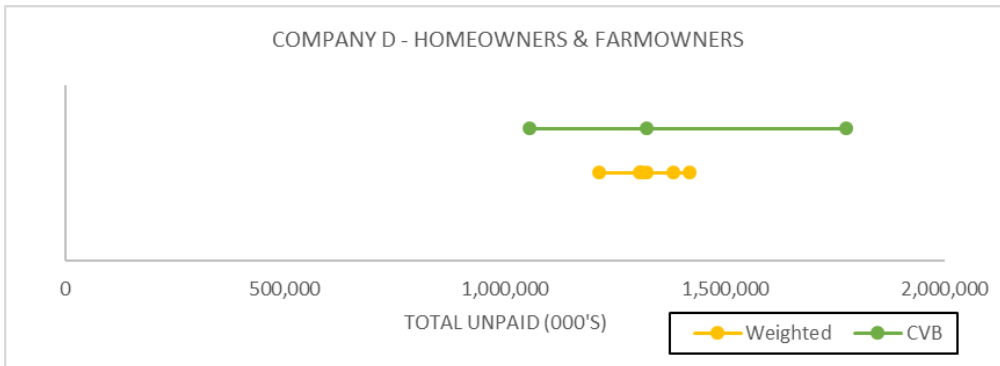
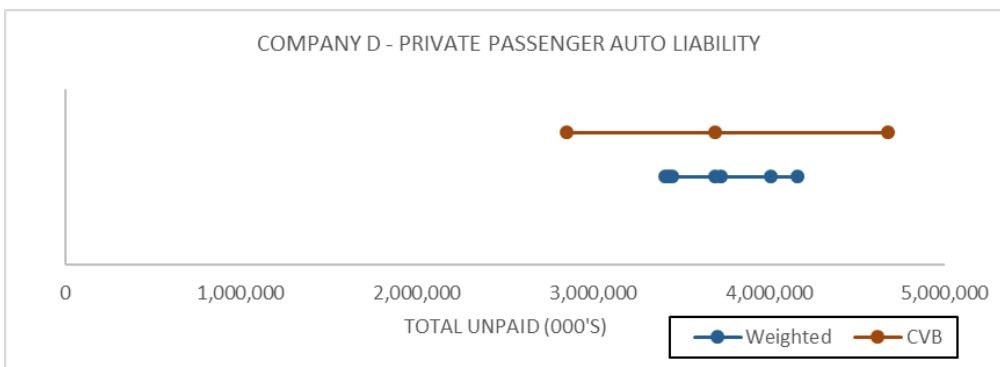**FIGURE 53: PRIVATE PASSENGER AUTO LIABILITY**



COMPANY D - PRIVATE PASSENGER AUTO LIABILITY

**FIGURE 54: OVERALL AND LOB RANGES FOR COMPANY D**