Seasonal averages

Arius®

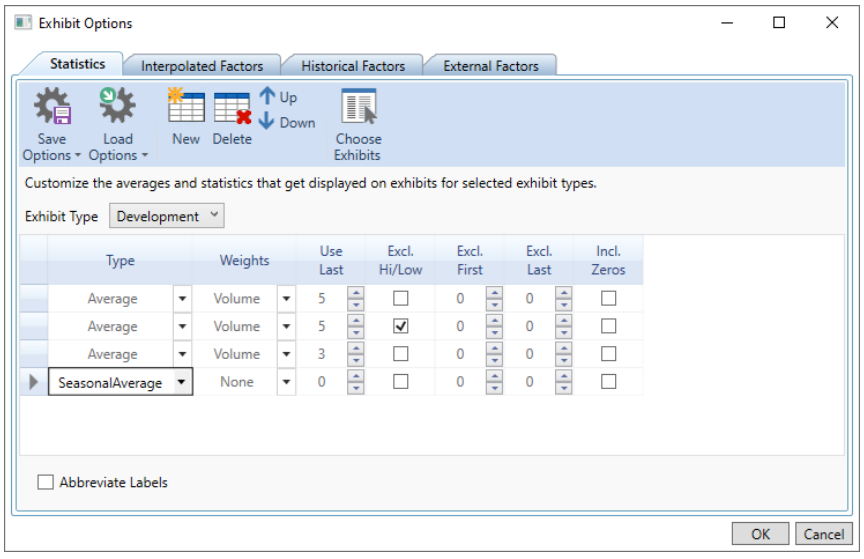
OVERVIEW

Adjustments for seasonality can reduce fluctuations due to normal seasonal trends to reflect the real non-seasonal trend. For example, where automobile property damage liability claims increase during the winter or where most of the premiums are earned disproportionally during a portion of the year, seasonal averages allow you to group these periods together to analyze your loss ratios or review trends for each quarter or half-year. Or, perhaps new reinsurance treaties are introduced in the first quarter of each year where the ability to review quarterly trends provides insights.

Seasonal average statistics are available for display in your exhibits in Arius project files with quarterly or half-year exposure periods. In a file with quarterly exposure, four statistics rows will be created where each row is limited to include only those factors related to a particular quarter of exposure. In a file with half-year exposure two statistics rows will be created where each row is limited to include only those factors related to exposure periods in the first half of the year or the last half of the year.

ADDING SEASONAL AVERAGES TO YOUR EXHIBITS

1. From the Arius **Home** ribbon click on **Exhibit Options** and select the **Statistics** tab.
2. Choose the desired **Exhibit Type**.
3. Click **New** to add a statistics row.
4. Click the drop down arrow in the Type column in your new statistic row and choose **SeasonalAverage**, then select any desired additional options in this row



NOTE: **Exclude Hi/Low** and **Exclude First/Last** rows are applied to the entire column of factors and are not confined to just the **Use Last** number of exposure periods selected in the row. For example, if your Seasonal Average is defined to include the last 20 of 60 quarters of exposure and you check the box to **Exclude Hi/Low,** then high and low factors in the column are selected from all 60 and will be excluded from your Seasonal Average only if they appear in the last 20 quarters of exposure in that column.

5. Click **OK** to apply these changes to exhibits in your file and close the **Exhibit Options** window.

6. **SeasonalAverage** statistics will display on exhibits as defined, four rows for each quarterly average and two rows for each half-year average.

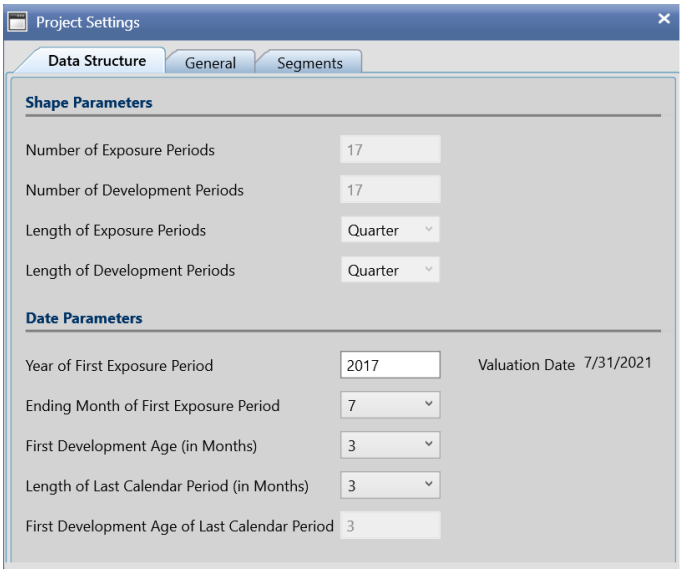
   Example of **SeasonalAverage** in a quarterly file:

Vol Wtd Avg	7.588	4.393	1.405	1.369	1.219	1.310	1.324	1.167	1.120	1.058	1.088	1.226
5 Qrtr Vol Wtd Avg Exc Hi/Lo	6.218	5.557	1.521	1.388	1.163	1.265	1.267	1.140	1.100	1.047	1.090	1.155
3 Qrtr Vol Wtd Avg	6.009	3.763	1.234	1.494	1.216	1.314	1.543	1.141	1.059	1.047	1.143	1.338
15 Qrtr Vol Wtd S1 Avg	8.164	3.299	1.723	1.690	1.161	1.101	1.088	1.418	1.008	1.043	1.032	1.701
15 Qrtr Vol Wtd S2 Avg	8.998	6.811	1.264	1.094	1.244	1.336	1.284	1.138	1.130	1.127	1.130	1.040
15 Qrtr Vol Wtd S3 Avg	10.102	3.628	1.360	1.412	1.089	1.414	1.631	1.171	1.266	1.098	1.093	1.216
15 Qrtr Vol Wtd S4 Avg	4.630	4.932	1.421	1.346	1.425	1.388	1.107	1.068	1.082	1.016	1.089	1.066

WORKING WITH NON-CALENDAR YEAR DATA STRUCTURES

In the illustration above you see rows labeled S1, S2, S3, and S4 for quarterly exposure. These translate to Season 1, Season 2, etc. Note that Season 1 (S1) represents the first season ending in the year of exposure, even if that first quarter begins in the previous year. S2 represents the second season occurring in the year of exposure, etc. Similarly, in a file with half-year exposures, Season 1 (S1) represents the first half-year period occurring in the year of exposure and S2 represents the second half-year period occurring in the year of exposure, even if your **Project Settings** indicate that your exposure year begins after June.

Example: An Arius project file with the following **Project Settings** where the first exposure quarter ends in July, produces the loss development factor triangle and **Seasonal Averages** shown (partial).



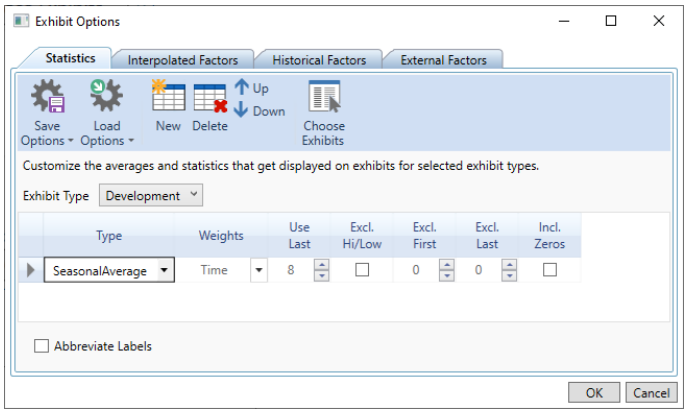
Paid Loss Development

Accident Quarter	3-6	6-9	9-12	12-15
07-2017	24.951	2.009	1.850	1.503
10-2017	5.080	6.066	1.431	1.436
01-2018	10.575	2.074	1.848	1.142
04-2018	5.271	2.621	2.008	1.186
07-2018	9.338	3.023	2.007	1.612
10-2018	6.267	10.389	1.277	1.134
01-2019	19.436	1.834	2.171	1.306
04-2019	21.233	2.202	1.879	1.193
07-2019	2.205	23.462	1.139	1.308
10-2019	4.583	2.869	1.642	1.564
01-2020	3.058	7.132	1.503	2.482
04-2020	10.005	13.006	1.088	1.050
07-2020	3.367	3.646	1.791	1.566
10-2020	4.002	3.239	1.475	
01-2021	17.531	5.444		
04-2021	8.475			
07-2021				
Vol Wtd Avg	6.376	5.315	1.405	1.369
5 Qrtr Vol Wtd Avg Exc Hi/Lo	6.218	5.557	1.521	1.388
3 Qrtr Vol Wtd Avg	6.009	3.763	1.234	1.494
15 Qrtr Vol Wtd S1 Avg	8.164	3.299	1.723	1.690
15 Qrtr Vol Wtd S2 Avg	8.998	6.811	1.264	1.094
15 Qrtr Vol Wtd S3 Avg	3.606	7.129	1.360	1.412
15 Qrtr Vol Wtd S4 Avg	4.630	4.932	1.421	1.346

Note that S1 does not represent the average of the quarter ending in month 7, which is the first quarter as defined in **Project Settings**, and S2 does not represent the average of the quarter ending in month 10, etc. Rather, S1 represents the first season occurring in the year (ending January) and S2 represents the second season occurring in the year (ending April), etc.

WORKING WITH TIME WEIGHTED SEASONAL AVERAGES

When working with **Time Weighted Seasonal Averages,** factors will be weighted based on the number of last diagonals specified. For example, given a column of 10 development factors, where your **Time Weighted Seasonal Average Statistics** specify using the last 8 diagonals, you will see weighting applied as shown here:



AQ	SEASON	LDF	TIME WEIGHT
Mar 2019	S1	1.841	
Jun 2019	S2	1.776	
Sep 2019	S3	1.774	1
Dec 2019	S4	1.764	2
Mar 2020	S1	1.955	3
Jun 2020	S2	1.782	4
Sep 2020	S3	1.868	5
Dec 2020	S4	1.924	6
Mar 2021	S1	1.881	7
Jun 2021	S2	1.812	8

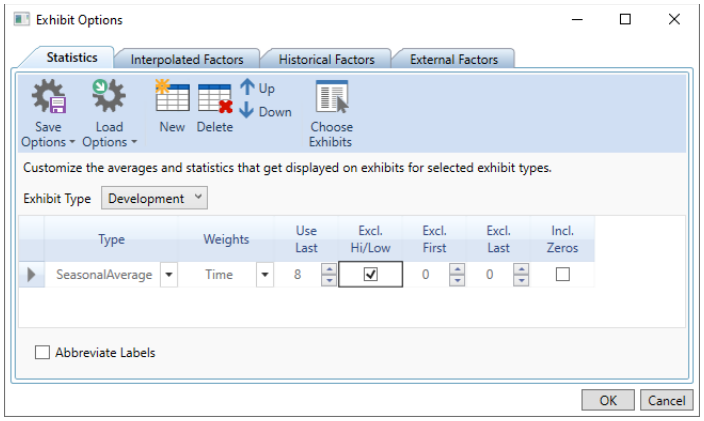
$$S1 = \frac{(3 \times 1.955) + (7 \times 1.881)}{3 + 7} = 1.903$$

$$S2 = \frac{(4 \times 1.782) + (8 \times 1.812)}{4 + 8} = 1.802$$

$$S3 = \frac{(1 \times 1.774) + (5 \times 1.868)}{1 + 5} = 1.852$$

$$S4 = \frac{(2 \times 1.764) + (6 \times 1.924)}{2 + 6} = 1.884$$

Note that, in a scenario where high and low factors are excluded from **Time Weighted Seasonal Average Statistics**, the time weighting for included factors is *not* adjusted based on the excluded high and low factors, as illustrated below:



AQ	SEASON	LDF	TIME WEIGHT
Mar 2019	S1	1.841	
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Mar 2020	S1	~~1.955~~	3
Jun 2020	S2	1.782	4
Sep 2020	S3	1.868	5
Dec 2020	S4	1.924	6
Mar 2021	S1	1.881	7
Jun 2021	S2	1.812	8

$$S1 = \frac{7 \times 1.881}{7} = 1.881$$

$$S2 = \frac{(4 \times 1.782) + (8 \times 1.812)}{4 + 8} = 1.802$$

$$S3 = \frac{(1 \times 1.774) + (5 \times 1.868)}{1 + 5} = 1.852$$

$$S4 = \frac{6 \times 1.924}{6} = 1.924$$

USER-DEFINED APPLICATIONS

Through the creative use of user-defined objects in Arius, you can create a development method to project seasonal ultimate loss. For example, a quarterly seasonal method would include the following objects (tables):

- Four input column objects to use for weighing.
- Four exhibits, including seasonal average statistics, with default selections of S1, S2, S3, and S4 statistics (one selected in each exhibit).
- Four methods to reference the selections from the four exhibits and calculate ultimates for each "season."
- One summary method that brings together the other four seasonal method results and their corresponding weights to calculate a final ultimate.

Please contact the Arius support team at ActuarialSoftware@Milliman.com if you would like to learn more.