

OVERVIEW

Having access to prior selected factors for the purpose of comparisons and performing actual vs expected analyses is an important part of the actuarial reserving process. The **Historical Factor Library** in Arius® allows you to store and access development factor selections for future analyses.

There are three ways to save data into the Historical Factor Library:

1. Automatically, when a new diagonal is appended via the **MODIFY STRUCTURE | APPEND NEW EVALUATION PERIOD** command.
2. Manually, when you select the **Save Current SDFs** button in the **EXHIBIT OPTIONS | HISTORICAL FACTORS** dialog.
3. Manually, when you use the **Import Historical SDFs** button in the **EXHIBIT OPTIONS | HISTORICAL FACTORS** dialog.

Once factors are saved to the Historical Factor Library, they can be displayed as a row on your exhibits and accessed in system or user-defined tables via the `GetPriorSDF()` and `GetPriorSDFX()` functions.

You can also share Historical Factor Libraries among Arius files with the system's Import and Export capabilities.

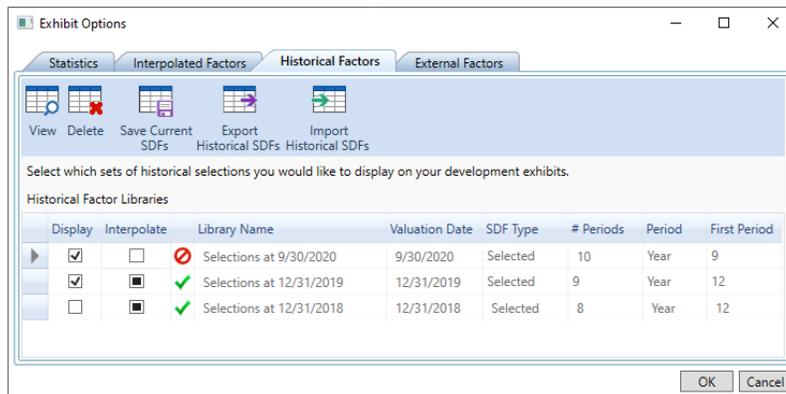
DETAILED STEPS

1. Save your current factor selections to the Historical Factor Library.

There are two ways you can save selected factors to the Historical Factor Library.

- One way is to simply open your Arius file from your prior period evaluation and append new diagonals by selecting **MODIFY STRUCTURE | APPEND NEW EVALUATION PERIOD** from the main Arius ribbon. When Arius appends new diagonals to your triangles, it will also automatically save all selected development factors from your prior period analysis to the Historical Factor Library with the label **Selections at [Valuation Date]** (seen on the **EXHIBIT OPTIONS | HISTORICAL FACTORS** tab). This is common if performing an analysis on Year x Quarter triangles, where a new evaluation period is appended at each quarter-end.
- If, however, you are rolling forward a project when *not* appending a new evaluation period, you must click the **Save Current SDFs** button on the **EXHIBIT OPTIONS | HISTORICAL FACTORS** tab to manually save your selected factors to the Historical Factor Library. This is common after performing an interim period analysis (for example, after an interim quarterly analysis in an Arius file with yearly development where the project is rolled forward by modifying the **First Development Age** parameter under **PROJECT SETTINGS | DATA STRUCTURE**).

2. Go to **EXHIBIT OPTIONS | HISTORICAL FACTORS** to view a list of these factors.

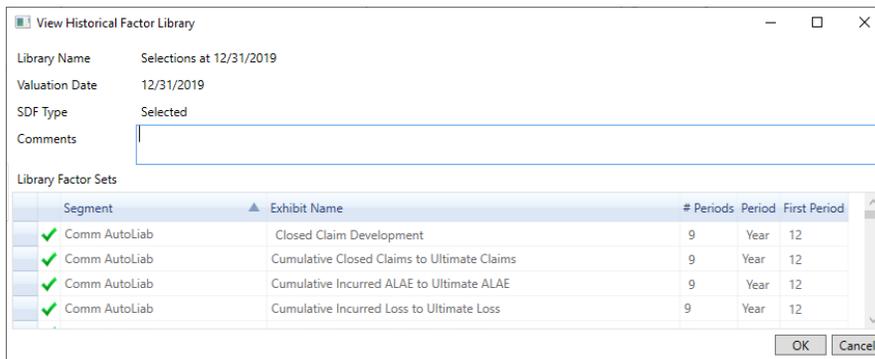


Historical factor libraries are stored in an Arius file with the following set of properties:

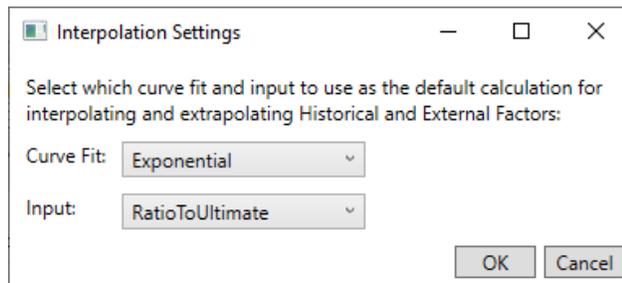
- **Display checkbox** – select this if you would like to display factors within this library onto its corresponding exhibits.
- **Interpolate checkbox** – this checkbox becomes enabled if Arius recognizes that the data structure of the historical factor library is not compatible with that of the Arius file (as indicated by the icon to the right). When checked, Arius will apply an interpolation algorithm to interpolate and/or extrapolate the factors so that they are compatible with the development factors in the exhibits (as indicated by the to the right).

For example, in the dialog above, you can interpolate your **Selections at 9/30/2020** which are 9,21,33... months factors to 12,24,36... factors, and these will now be displayed on your exhibit with the label **Interpolated from 9/30/2020**.

- **Library Name:** Arius will automatically provide the label *Selections at [Valuation Date]*, when saving factors back to the library. This is the label that gets displayed on the exhibits and cannot be changed.
 - **Valuation Date:** Valuation date of the factor set
 - **SDF Type:** Selected or Interpolated
 - **# Periods:** Number of development periods in the factor set
 - **Period:** Length of the development period in the factor set
 - **First Period:** First development age of the factor set
3. Click on the arrow to the left of a selected library and click the **View** button in the above ribbon to view the factors by segment and exhibit name.



- Once you click **OK**, you can move to **EXHIBIT OPTIONS | INTERPOLATED FACTORS** where you will find the **Set Default** button to select which interpolation curve fit (Linear, Exponential, Weibull, or Inverse Power) and input (Cumulative factors or Ratio to Ultimates) to use in the interpolation algorithms for interpolating Historical and External Factor libraries.



For more information on the details behind the interpolation calculations, refer to the “Interpolation and Extrapolation” document found in Arius under **HELP | USER DOCUMENTATION**.

- Review the historical factors in your exhibits.
 - In Arius, open the exhibits included in the historical factor library you selected to display. You will see the historical factors listed below the statistics.
 - Note that historical factors can be **Set as Default**, similar to statistics, external factors, and tail factor cells/rows.

PP AutoLiab > Exhibits > Paid Loss Development										
Paid Loss Development										
Accident Year	12-24	24-36	36-48	48-60	60-72	72-84	84-96	96-108	108-120	120-Ult
12-2011	1.6801	1.2483	1.1703	1.0795	1.0422	1.0097	1.0073	1.0049	1.0024	
12-2012	1.7434	1.2008	1.1460	1.0651	1.0462	1.0079	1.0023	1.0021		
12-2013	1.7978	1.2046	1.1915	1.0914	1.0244	1.0114	1.0308			
12-2014	1.9256	1.2576	1.1415	1.0216	1.0426	1.0220				
12-2015	2.1042	1.1819	1.1230	1.0790	1.0431					
12-2016	1.5942	1.2529	1.1602	1.0661						
12-2017	1.6089	1.2256	1.1363							
12-2018	1.8307	1.2217								
12-2019	1.8334									
12-2020										
Volume Weighted Average	1.7762	1.2242	1.1567	1.0702	1.0397	1.0115	1.0121	1.0037	1.0024	
7 Year Volume Weighted Average	1.8120	1.2174	1.1567	1.0702	1.0397	1.0115	1.0121	1.0037	1.0024	
5 Year Volume Weighted Average	1.7971	1.2267	1.1539	1.0664	1.0397	1.0115	1.0121	1.0037	1.0024	
5 Year Volume Weighted Average Excluding High/Low	1.7776	1.2310	1.1453	1.0692	1.0425	1.0104	1.0073			
3 Year Volume Weighted Average	1.7776	1.2310	1.1387	1.0539	1.0348	1.0125	1.0121	1.0037	1.0024	
Interpolated from 9/30/2020	1.3478	1.2073	1.1169	1.0491	1.0292	1.0124	1.0100	1.0041	1.0050	1.0179
Selections at 12/31/2019	1.6950	1.2175	1.1405	1.0671	1.0374	1.0145	1.0016	1.0021	1.0014	1.0000
Selections at 12/31/2018	1.7573	1.2294	1.1571	1.0636	1.0386	1.0156	1.0012	1.0012	1.0012	1.0032
Sample P&C Industry - PP_Auto_Liab	1.6995	1.1816	1.0870	1.0411	1.0179	1.0074	1.0042	1.0022	1.0015	1.0038
Inverse Power Curve	2.3635	1.2263	1.0791	1.0376	1.0211	1.0131	1.0088	1.0062	1.0046	1.0163
Exponential Curve	1.5546	1.2764	1.1377	1.0686	1.0342	1.0170	1.0085	1.0042	1.0021	1.0021
Weibull Curve	1.7575	1.2655	1.1189	1.0584	1.0300	1.0159	1.0085	1.0046	1.0026	1.0032
Default	1.7776	1.2310	1.1387	1.0539	1.0348	1.0125	1.0121	1.0037	1.0046	1.0163
Manual Selected										
Selected	1.7776	1.2310	1.1387	1.0539	1.0348	1.0125	1.0121	1.0037	1.0046	1.0163
Cumulative	2.8537	1.6054	1.3041	1.1452	1.0867	1.0502	1.0372	1.0248	1.0210	1.0163
Ratio to Ultimate	0.3504	0.6229	0.7668	0.8732	0.9202	0.9522	0.9642	0.9758	0.9794	0.9839

EXPORTING AND IMPORTING HISTORICAL FACTORS

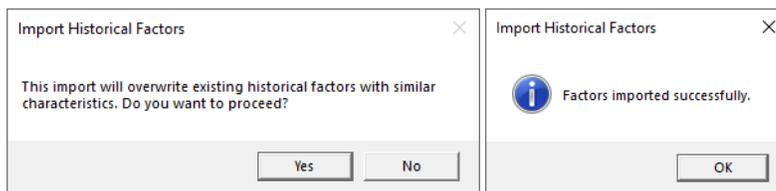
You can export the historical factors in an Arius project file to easily share them with other Arius projects. You can also import historical factors into your current Arius project file from another Arius project or from other data sources.

- To export the historical factors from an Arius project file:
 - Select the **Export Historical SDFs** button on the EXHIBIT OPTIONS | HISTORICAL FACTORS dialog.
 - Provide a name to the resulting CSV file and click **SAVE**.
 - Browse** to your external factors file and click **Open**. You will see a file format similar to the one below:

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	
1	Library Name	Segment	Exhibit Name	Valuation Date	SDF Type	Number Periods	Period Len	First Period	1	2	3	4	5	6	7	8	9	10
2	Selections at 9/30/2020	Comm AutoLiab	Incurred Loss Development	9/30/2020	Interpolated	10 Year		9	1.6991	1.2088	1.0876	1.0227	1.0066	0.9964	0.9947	1.0001	1.0009	1.0001
3	Selections at 9/30/2020	Comm AutoLiab	Paid Loss Development	9/30/2020	Interpolated	10 Year		9	2.204	1.4574	1.3019	1.1724	1.0688	1.0367	1.0128	1.0068	1.0071	1.003
4	Selections at 9/30/2020	GL	Incurred Loss Development	9/30/2020	Interpolated	10 Year		9	1.8053	1.3999	1.0701	1.0351	1.034	1.0222	1.0364	1.0154	1.0048	1.001
5	Selections at 9/30/2020	GL	Paid Loss Development	9/30/2020	Interpolated	10 Year		9	2.2716	2.2922	1.9032	1.424	1.1222	1.0598	1.028	1.0147	1.0088	1.0018
6	Selections at 9/30/2020	HO	Incurred Loss Development	9/30/2020	Interpolated	10 Year		9	1.3805	1.0202	1.0065	1.002	1.0006	1.0002	1.0001	1	1	1
7	Selections at 9/30/2020	HO	Paid Loss Development	9/30/2020	Interpolated	10 Year		9	1.8819	1.144	1.0387	1.0126	1.0072	1.0055	1.0048	1.0025	1.0012	1.0003
8	Selections at 9/30/2020	PP AutoLiab	Incurred Loss Development	9/30/2020	Interpolated	10 Year		9	2.0997	1.3069	1.1483	1.0769	1.0395	1.0173	1.0077	1.0037	1.0018	1.0003
9	Selections at 9/30/2020	PP AutoLiab	Paid Loss Development	9/30/2020	Interpolated	10 Year		9	2.1158	1.3225	1.1593	1.085	1.0448	1.0202	1.0048	1.002	1.0016	1.0004
10	Selections at 9/30/2020	WC	Incurred Loss Development	9/30/2020	Interpolated	10 Year		9	1.7071	1.1821	1.0901	1.0454	1.0451	1.0359	1.0244	1.0153	1.0114	1.0027
11	Selections at 9/30/2020	WC	Paid Loss Development	9/30/2020	Interpolated	10 Year		9	2.6752	1.5307	1.2144	1.1228	1.0688	1.0534	1.0421	1.029	1.0195	1.0043

2. To import prior factor selections or historical factors into the Historical Factor Library.

- Create a new historical factor file by following the steps above for **Exporting Historical SDFs** from an existing Arius file that contains historical factors or from the Arius_Sample.apj found in ... Documents\Milliman\Arius\DemoFiles as a starting point. The required fields include:
 - **Library Name:** The label used for identifying the library in your CSV file; Arius will default to the system label *Selected at [Valuation Date]*
 - **Segment:** The segment name as it appears in your Arius project file
 - **Exhibit Name:** The exhibit name as it appears in your Arius project file (e.g., Paid Loss Development)
 - **Valuation Date:** The Valuation Date of the corresponding development factors
 - **SDF Type:** The label identifying whether these are Selected or Interpolated factors
 - **Number Periods:** Number of development periods in the factor set
 - **Period Length:** Length of the development periods of the factor set (e.g., Year, Half-Year, Quarter, Month)
 - **First Period:** First development age of the factor set
 - **1,2,3....:** The incremental development factors
- Click the **Import Historical SDFs** button on the EXHIBIT OPTIONS | HISTORICAL FACTORS dialog.
- **Browse** to your historical factors CSV file and click **Open**. You will be prompted with the message below where you will need to click **Yes** to proceed with overwriting existing historical factors with similar characteristics, and then finally a success message.



- You should now see any additional rows of historical factors in your Historical Factor library and be able to click on **View** to see the Library Factor Sets.

Exhibit Options

Statistics Interpolated Factors **Historical Factors** External Factors

View Delete Save Current SDFs Export Historical SDFs Import Historical SDFs

Select which sets of historical selections you would like to display on your development exhibits.

Historical Factor Libraries

Display	Interpolate	Library Name	Valuation Date	SDF Type	# Periods	Period	First Period
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	✓ Selections at 9/30/2020	9/30/2020	Selected	10	Year	9
<input checked="" type="checkbox"/>	<input type="checkbox"/>	✓ Selections at 12/31/2019	12/31/2019	Selected	9	Year	12
<input type="checkbox"/>	<input type="checkbox"/>	✓ Selections at 12/31/2018	12/31/2018	Selected	8	Year	12

OK Cancel