

# Arius Stochastic

## More information means better decisions

Our Arius® stochastic toolset is an approachable solution that uses a number of simulation models to provide realistic distributions of the possible ways your unpaid claims could settle.

Some reserving solutions only provide one or two models that may or may not fit your data. They can be unnecessarily sophisticated, very expensive, and understood by only your most technical team members.

Arius is different. You get the information you need to make important decisions about your reserve levels and the variance around your estimates. You also get tools to help you understand and explain the potential variability.

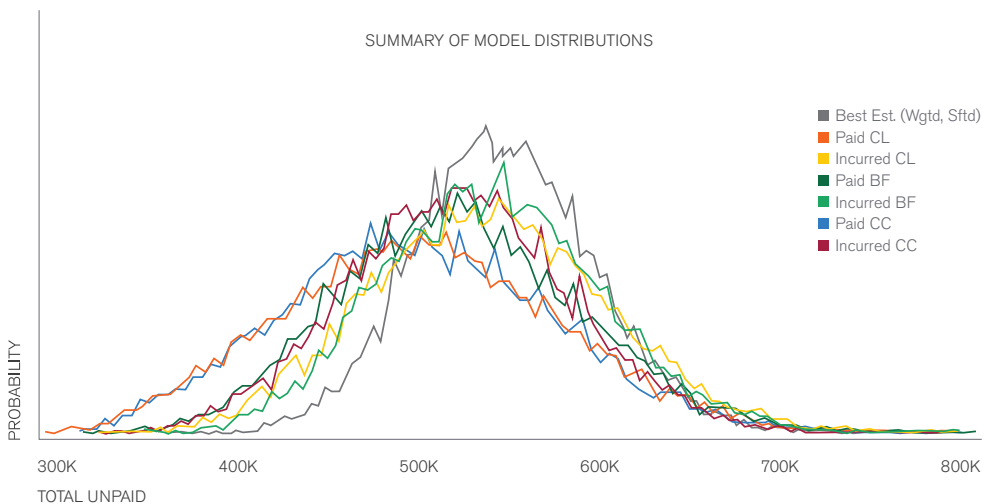
### Advanced modeling

The system includes three different families of models for estimating reserve risk on an ultimate or one-year time horizon:

- Six overdispersed Poisson bootstrap approaches
- A generalized linear model (GLM)
- A Thomas Mack bootstrap model
- Four maximum likelihood estimator models

Output from each of these models includes:

- Distributions of unpaid amounts at user-specified percentiles
- Distributions of future cash flows, ultimate loss ratios, and tail value at risk by percentile
- Discounted results based on a constant rate or a term structure
- Means, standard errors, and coefficients of variation
- Diagnostic plots to test model assumptions and to help adjust parameters



## Compare results from multiple models

Arius gives you a number of statistically based ways to look at your potential unpaid estimates. Once you have modeled your data with several different approaches, you can easily compare the various estimates to determine your “best” fit.

## Not your basic bootstrap

We started our research with the widely studied bootstrap model and added a number of unique enhancements that help your models more closely reflect the nuances of your particular business. For each reserve segment, you can:

- Make statistical adjustments to better fit your specific data.
- Create simulations based on traditional paid and incurred chain ladder models, as well as Bornhuetter-Ferguson and Cape Cod approaches.
- Develop a weighted distribution that incorporates your judgments about the quality of each model.

Arius also provides a GLM, a Thomas Mack bootstrap model, and a series of maximum likelihood estimator models. These models offer alternative fits to your data to help you arrive at an overall best estimate. The goal with Arius is to help you find a model that best fits—and thus best projects—your data.

## Bring it all together

After analyzing individual business segments, you can combine the segment results into an aggregate distribution reflecting the effect of correlation. You get a more realistic look at your overall company-wide risk profile, and an understanding of your reserve and capital positions that is rarely available from spreadsheet analysis or from most reserve modeling solutions.

### ESTIMATED UNPAID

Accident Year	Mean Unpaid	Standard Error	Coefficient of Variation	Percentiles								
				Minimum	Maximum	50.0%	75.0%	85.0%	90.0%	95.0%	99.5%	99.9%
2011	23,039	12,654	54.9%	-27,566	72,761	22,768	31,486	36,212	39,374	44,117	53,714	64,079
2012	28,715	12,513	43.6%	-18,264	79,332	28,457	37,034	41,777	44,930	49,851	58,451	68,487
2013	34,416	12,862	37.4%	-16,459	83,151	34,250	42,957	47,893	51,023	55,914	65,134	73,918
2014	41,280	12,968	31.4%	-11,148	92,342	40,938	49,922	54,885	58,025	62,836	72,605	82,751
2015	56,059	13,536	24.1%	3,935	106,483	55,930	65,064	70,057	73,276	79,030	88,384	100,030
2016	91,964	15,371	16.7%	34,016	149,267	91,569	102,341	108,017	112,046	117,937	128,486	141,001
2017	176,320	20,311	11.5%	108,781	248,735	176,010	189,840	197,156	202,591	210,301	225,866	240,316
2018	323,622	25,587	7.9%	235,602	420,070	322,661	341,095	350,541	357,128	366,872	384,982	400,715
2019	508,740	30,132	5.9%	394,211	646,053	508,268	528,906	540,272	548,019	558,848	579,610	602,766
2020	718,250	35,973	5.0%	589,530	839,364	717,029	742,653	756,523	765,814	779,388	802,776	827,651
Total	2,002,404	149,889	7.5%	1,443,934	2,505,219	2,000,758	2,101,612	2,158,691	2,198,273	2,252,151	2,351,735	2,453,647
TVaR	-	-	-	-	-	2,122,172	2,194,299	2,237,850	2,268,018	2,313,476	2,394,815	2,477,779
Log-normal TVaR	-	-	-	-	-	2,121,720	2,197,357	2,244,085	2,277,820	2,330,618	2,437,696	2,568,793
Gamma TVaR	-	-	-	-	-	2,121,905	2,196,000	2,241,271	2,273,727	2,324,155	2,425,089	2,546,331