aggregate.Aggregate Cheat Sheet

The `Aggregate` call signature follows the corresponding DecL clauses, using prefixes for exposure (including limit sub-clause), severity, occurrence reinsurance, frequency, aggregate reinsurance, and note. `sev_xs, sev_ps` equal `dsev` outcomes and probabilities, and `(occ|agg)_reins` clauses are lists of (share, limit, attachment) triples.

m `Aggregate(name, exp_el=0, exp_premium=0, exp_lr=0, exp_en=0, exp_attachment=0, exp_limit=np.inf, sev_name='', sev_a=np.nan, sev_b=0, sev_mean=0, sev_cv=0, sev_loc=0, sev_scale=0, sev_xs=None, sev_ps=None, sev_wt=1, sev_conditional=True, occ_reins=None, occ_kind='', freq_name='', freq_a=0, freq_b=0, freq_zm=False, freq_p0=np.nan, agg_reins=None, agg_kind='', note='')`[0]

The following tables show all m `methods`, and fields or properties (used interchangeably). Comments elucidate the meaning of more obscure entries.

1. Specification & creation

`name`, `limit`, `attachment`, `freq_name`, `freq_a`, `freq_b`, `freq_p0`, `freq_zm`, `note`, `sev_pick_attachments`, `sev_pick_losses`, `program` (DecL program), `pprogram` (pretty printed), `spec` (constructor kwarg dictionary; `Aggregate(**spec)` re-creates the object), `spec_ex` (adds meta elements)

2. Update

`log2`, `bs`, `sev_calc` (discrete=round, forward, backwards), `discretization_calc` (distribution, survival, both), `normalize`, `padding`, `tilt_vector`, `approximation` (exact, slognorm, sgamma), `fzapprox` (frozen approximation rv), m `picks`, m `discretize`, m `easy_update`, m `recommend_bucket`, m `rescale` (homogeneous severity or inhomogeneous frequency rescaling), m `update`, m `update_work`

3. Moments

`est` prefix=estimated from FFT approximation

`agg_m`, `agg_cv`, `agg_sd`, `agg_var`, `agg_skew`, `est_m`, `est_cv`, `est_sd`, `est_var`, `est_skew`, `sev_m`, `sev_cv`, `sev_sd`, `sev_var`, `sev_skew`, `est_sev_m`, `est_sev_cv`, `est_sev_sd`, `est_sev_var`, `est_sev_skew`, m `freq_moms`, m `freq_pmf`, m `freq_pgf`, `panjer_ab` (Panjer parameters), m `prn_eq_0` ($\Pr(N=0)$ unmodified), `n` (frequency), `en` (vector), `unmodified_mean` (when ZT or ZM)

4. Statistical functions

`sevs` (list of `Severity`s), m `cdf`, m `sf` (survival), m `pdf`, m `pmf`, m `q` (lower quantile=VaR), m `tvar`, m `sev` (exact severity cdf, sf, pdf), m `q_sev`, m `tvar_sev`, m `var_dict`[1], m `sample`

5. Validation

`describe` (validation statistics), `valid` (true="not unreasonable" or false), `validation_eps` (validation epsilon threshold 1e-04), m `qt` ("quick test" validation details), m `aggregate_error_analysis` (agg errors over range of `bs`), m `severity_error_analysis` (truncation and discretization errors by severity component)

6. Output dataframes

`density_df`[1] (main output), `report_df` (component, mixture & empirical stats), `agg_density`, `agg_density_ceded`, `agg_density_gross`, `agg_density_net`, `sev_density`, `sev_density_ceded`, `sev_density_gross`, `sev_density_net`, `ftagg_density`, `xs`, `statistics_df` (row, by component), `statistics_total_df` (row, indep. vs. mixed), `statistics` (cols, combined, better index), `audit_df` (deprecated), `report_ser` (internal, series), *see also Reinsurance.*

7. Reinsurance

`agg_kind` (net of or ceded to), `agg_reins` (list), `agg_reins_df` (gcn loss and dists), `occ_kind`, `occ_reins`, `occ_reins_df`, m `agg_ceder`, m `agg_netter`, m `apply_agg_reins`, m `occ_ceder`, m `occ_netter`, m `apply_occ_reins`, m `reinsurance_description` (text rendering of re), `reinsurance_kinds` (None, occ, agg, occ & agg), `reinsurance_audit_df` (stats by gcn, splits severity for occ), `reinsurance_occ_layer_df` (aggregate gcn stats for occ layers), `reinsurance_df` (all combinations of gcn occ and agg densities), `reinsurance_report_df` (m, cv, sd, skew for `reinsurance_df`)

8. Visualization

m `plot`, `figure` (return last figure), m `reinsurance_occ_plot`

9. Risk and pricing

m `apply_distortion`, m `price(p, dist)` m `cramer_lundberg aka pollaczeck_khinchine` (probability of eventual ruin vs. initial capital and margin)

10. Approximations

Method of moments (shifted gamma or lognormal), or minimum entropy approximations.

m `approximate`, m `entropy_fit`

11. Meta

`aggregate_keys` (internal), m `more(regex)` (print all methods and fields matching `regex`), m `limits` (suggest axis limits for plotting), `info` (text meta info), m `html_info_blob` (internal), m `json` (persist to json), m `snap`[1] (snap argument to index)

Notes:

[0]: Arguments `sev_pick_attachments=None, sev_pick_losses=None,` omitted; see help.

[1]: matches `Portfolio`

Any vectorizable input accepts numeric or iterable datatypes.

Abbreviations: gcn=gross (subject), ceded, and net; stats: m=mean, cv=coefficient of variation, sd=standard deviation, var=variance, skew(ness); VaR=value-at-risk

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