# 1 New structures

## 1.1 Variability model

| Slot | Type | Description |
|---|---|---|
| **Class: SaemixVarModel** | | |
| name.level | character | name of variability level |
| *variable* | *character* | *which variable (in the dataset) is the variability associated to*[*] |
| log | character | warning messages |
| nphi | numeric | number of parameters (size of omega.model) |
| param | numeric | vector of population parameters in the model (variance and covariances) |
| param.names | character | names of the population parameters to be estimated (variances and covariances) |
| omega.model | matrix | variance-covariance matrix (square matrix) of 0/1, 1 indicating that the parameter is present in the model |
| omega | matrix | variance-covariance matrix |
| omega.estim | matrix | variance-covariance matrix with elements estimated, fixed or prior |
| subomega | matrix | positive-definite submatrix of omega |
| **Indices** | | |
| idvec.var | numeric | indices of variance terms in param |
| idvec.cov | numeric | indices of covariance terms in param |
| idvec.estim | numeric | indices of elements estimated in the matrix, as vector |
| idcol.eta | numeric | which parameters have variability |
| idcol.eta.fix | numeric | which parameters have variability and this variability is fixed |
| idmat.var | numeric | indices of variance term in lower triangular matrix (with diag=TRUE) |
| idmat.cov | numeric | indices of covariance term in lower triangular matrix |
| idmat.estim | numeric | indices of elements estimated in the matrix, as vector |
| **Added in Class: SaemixVarModelHat** | | |
| omega.hat | matrix | estimated variance-covariance matrix |
| omega.var | matrix | estimated variance of estimation for the variance-covariance matrix |
| param.hat | numeric | estimated parameters (same order as param.names) |
| param.se | numeric | estimated SE for the parameters (same order as param.names) |
| conf.int | data.frame | Table giving the estimates, SE, CV and confidence intervals (assuming normality of the estimators) |

[*] *Remove eventually, belongs after matching model and data objects*

Table 1: Class slots for variability models. Note: nphi is the number of model parameters (eg ka, V, CL...), while param holds the population parameters (eg mu.ka, beta.ka.wt, etc...).

## 1.2 Fixed effect model

| Slot | Type | Description |
|---|---|---|
| **Class: SaemixPopModel** | | |
| name.level | character | name of variability level |
| log | character | warning messages |
| nphi | numeric | number of model parameters (nb of columns in phi) |
| param | numeric | vector of population parameters in the model (mu and beta) |
| param.names | character | names of the population parameters to be estimated (mu and beta) |
| phi.model | matrix | parameter + covariate model matrix of 0/1, 1 indicating that the parameter is present in the model<br>the first row represents the fixed effect and subsequent rows the covariate models |
| phi | matrix | parameters in matrix form (as phi.model), initialised to the CI for mu and beta |
| phi.estim | matrix | same matrix indicating whether elements are estimated, fixed or prior |
| **Indices** | | |
| idvec.mu | numeric | indices of mu terms in param |
| idvec.beta | numeric | indices of beta terms in param |
| idvec.estim | numeric | indices of elements in param to be estimated (the other parameters are fixed) |
| idmat.mu | numeric | indices of mu terms in phimodel |
| idmat.beta | numeric | indices of beta terms in phimodel |
| idmat.estim | numeric | indices of elements estimated in phimodel, as a vector (by column) |
| **Added in Class: SaemixPopModelHat** | | |
| phi.hat | matrix | estimated parameters, in matrix form |
| phi.se | matrix | estimated SE for parameters, in matrix form |
| param.hat | numeric | estimated parameters, vector in order of param |
| param.se | numeric | estimated SE on parameters, vector in order of param |
| param.fim* | matrix | estimated variance-covariance matrix of estimation for fixed effects block (square matrix of size length(estimated parameters)) |
| conf.int | data.frame | Table giving the estimates, SE, CV and confidence intervals (assuming normality of the estimators) |

* *Maybe change name to param.VCOV if we use something else than the FIM... but in this case full matrix (not only mubeta)*

Table 2: Class slots for fixed effect models

## 1.3 Statistical model

The statistical model is a child of the individual model, which includes a list of fixed effect models and variability models for each level of variability in the model, and adds slots for the model functions (structural and optionally simulation function for non-Gaussian outcomes) and the outcomes.

| Slot | Type | Description |
|---|---|---|
| **Class: SaemixIndivModel** | | |
| log | character | A record of the warnings and messages during the creation of the object |
| nphi | numeric | number of model parameters (size of param.names) |
| param.names | character | names of the model parameters |
| distribution | character | a vector specifiying the distribution of each parameter (currently one of normal, lognormal, logit, probit) |
| transform | list | list of functions to transform parameters |
| invtransform | list | list of inverse transformation for parameters |
| varlevel | character | variability levels (vector of grouping levels) |
| covariate | character | a vector giving the names of the covariates in the model |
| popmodel | list | a list with for each level in varlevel, the fixed effect model as a SaemixPopModelHat object |
| varmodel | list | a list with for each level in varlevel, the variability model as a SaemixVarModelHat object |
| **Added in Class: SaemixModel** | | |
| description | character | model description |
| model | function | name of structural model function |
| sim.model | function | name of function used to simulate from data (used for diagnostic plots for non-Gaussian models) |
| nb.responses | integer | number of responses in the model (=length(outcome)) |
| outcome | list | list of outcomes in the model (of class SaemixOutcome, either discrete SaemixDiscreteOutcome or continuous |

Table 3: Class slots for statistical model