Cohort tutorial

Appendix

DARTH workgroup

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Cohort tutorial model components

This table contains an overview of the key model components used in the code for the Sick-Sicker example from the DARTH manuscript: "Implementation of cohort state-transition models in R". The first column gives the mathematical notation for some of the model components that are used in the euqations in the manuscript. The second column gives a describtion of the model component with the R name in the third column. The forth gives the data structure, e.g. scalar, list, vector, matrix etc, with the according dimensions of this data structure in the fifth column. The final column indicated the type of data that is stored in the data structure, e.g. numeric (5.2,6.3,7.4), categoric (A,B,C), integer (5,6,7), logical (TRUE, FALSE).

Element	Description	R name	Data structure	Dimensions	Data type
n_t	Time horizon	`n_t`	scalar		numeric
v_s	Names of the health states	`v_n`	vector	`n_states` x 1	categorical
n_s	Number of health states	`n_states`	scalar		numeric
v_{str}	Names of the strategies	`v_names_str`	scalar		categorical
n_{str}	Number of strategies	`n_str`	scalar		numeric
$\mathbf{d_c}$	Discount rate for costs	`d_c`	scalar		numeric
$\mathbf{d_e}$	Discount rate for effects	`d_e`	scalar		numeric
	Discount weights for costs	`v_dwc`	vector	(`n_t` x 1) + 1	numeric
	Discount weights for effects	`v_dwe`	vector	(`n_t` x 1) + 1	numeric
$\mathbf{v_{hcc}}$	half-cycle correction	`v_hcc`	vector	(`n_t` x 1) + 1	numeric
age_0	Age at baseline	`n_age_init`	scalar		numeric
age	Maximum age of follow up	`n_age_max`	scalar		numeric
M	Cohort trace	`m_M`	matrix	(`n_t` + 1) x `n_states`	numeric
m_0	Initial state vector	`v_s_init`	vector	1 x `n_states`	numeric

Transition probabilities

Element	Description	R name	Data structure	Dimensions	Data type
$p_{[H,S1]}$	From Healthy to Sick conditional on surviving	`p_HS1`	scalar		numeric
$p_{[S1,H]}$	From Sick to Healthy conditional on surviving	`p_S1H`	scalar		numeric
$p_{[S1,S2]}$	From Sick to Sicker conditional on surviving	`p_S1S2`	scalar		numeric
$p_{[H,D]}$	Annual all-cause mortality	`p_HD`	scalar		numeric
$hr_{[S1,H]}$	Hazard ratio of death in Sick vs Healthy	`hr_S1`	scalar		numeric
$hr_{[S2,H]}$	Hazard ratio of death in Sicker vs Healthy	`hr_S2`	scalar		numeric
$or_{[S1,S2]}$	Odds ratio of becoming Sicker when Sick under New treatment 2	`or_S1S2`	scalar		numeric
γ	Weibell parameters gamma	`n_gamma`	scalar		numeric
λ	Weibell parameters lambda	`n_lambda`	scalar		numeric
P	Transition probability matrix	`m_P`	matrix	`n_states` x `n_states`	numeric
$p_{[S1,S2,t]}$	Time dependent transition probability from sick to sicker	`v_p_S1S2_tunnels`	vector	`n_t` x 1	numeric
$r_{[H,D,t]}$	Age-specific background mortality rates	`v_r_mort_by_age`	vector	(`n_age_max` + 1) x 1	numeric
$p_{[H,D,t]}$	Age-specific mortality risk in the Healthy state	`v_p_HDage`	vector	`n_t` x 1	numeric
$p_{[S1,D,t]}$	Age-specific mortality risk in the Sick state	`v_p_S1Dage`	vector	`n_t` x 1	numeric
$p_{[S2,D,t]}$	Age-specific mortality risk in the Sicker state	`v_p_S2Dage`	vector	`n_t` x 1	numeric
	Annual costs				
	Healthy individuals	`c_H`	scalar		numeric
	Sick individuals in the Sick state	`c_S1`	scalar		numeric
	Sick individuals in the Sicker state	`c_S2`	scalar		numeric
	Dead individuals	`c_D`	scalar		numeric
	Additional costs of New treatment 1	`c_trt1`	scalar		numeric
	Additional costs of New treatment 2	`c_trt2`	scalar		numeric
	Utility weights				
	Healthy individuals	`u_H`	scalar		numeric
	Sick individuals in the Sick state	`u_S1`	scalar		numeric
	Sick individuals in the Sicker state	`u_S2`	scalar		numeric

Element	Description	R name	Data structure	Dimensions	Data type
	Dead individuals	`u_D`	scalar		numeric
	Being treated	`u_trt1`	scalar		numeric
	Transition weights				
	Utility decrement of healthy individuals when transitioning to the Sick state	`du_HS1`	scalar		numeric
	Cost of healthy individuals when transitioning to the Sick state	`ic_HS1`	scalar		numeric
	Cost of dying	`ic_D`	scalar		numeric
P	Age-dependent transition probability array	`a_P`	array	`n_states` x `n_states` x `n_t`	numeric
A	Transition dynamics array	`a_A`	array	`n_states` x `n_states` x (`n_t` + 1)	numeric
	Number of tunnel states	`n_tunnel_size`	scalar		numeric
	Tunnel names of the Sick state	`v_Sick_tunnel`	vector	1 x `n_t`	numeric
	Number of states including tunnel states	`n_states_tunnels`	scalar		numeric
	State names including tunnel states	`v_n_tunnels`	vector	1 x `n_states_tunnels`	categorical
	Initial state vector for the model with tunnels	`v_s_init_tunnels`	vector	1 x `n_states_tunnels`	numeric
	Transition dynamics array for the model with tunnels	`a_A_tunnels`	array	`n_states_tunnels` x `n_states_tunnels` x (`n_t` + 1)	numeric
	Transition probability array for the model with tunnels	`a_P_tunnels`	array	`n_states_tunnels` x `n_states_tunnels` x `n_t`	numeric
R$_u$	Transition rewards for effects	`a_R_u`	array	`n_states` x `n_states` x (`n_t` + 1)	numeric
R$_c$	Transition rewards for costs	`a_R_c`	array	`n_states` x `n_states` x (`n_t` + 1)	numeric
Y$_u$	Expected effects per states per cycle	`a_Y_u`	array	`n_states` x `n_states` x (`n_t` + 1)	numeric
R$_c$	Expected costs per state per cycle	`a_Y_c`	array	`n_states` x `n_states` x (`n_t` + 1)	numeric
	Expected QALYs per cycle	`v_qaly`	vector	1 x (`n_t` + 1)	numeric
	Expected costs per cycle	`v_cost`	vector	1 x (`n_t` + 1)	numeric
	Total expected discounted QALYs for all strategies	`v_tot_qaly`	vector	1 x `n_str`	numeric

Element	Description	R name	Data structure	Dimensions	Data type
	Total expected discounted costs for all strategies	`v_tot_cost`	vector	1 x `n_str`	numeric
	Summary of the model outcomes	`df_cea`	data frame		
	Summary of the model outcomes - reformatted	`table_cea`	table		