Formation/dissolution hazard

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The hazard used for the formation and dissolution events (between persons i and j) has the following form:

$$h = \exp\left[\alpha_0 + \alpha_1 P_i + \alpha_2 P_j + \alpha_3 |P_i - P_j| + \alpha_4 \left(\frac{A_i + A_j}{2}\right) + \alpha_5 |A_i - A_j - D_p| + \beta t_{diff}\right]$$

The properties used are:

- α_k, β : Constants
- P_i, P_j : Number of partners of these persons
- A_i, A_j : Age
- D_p : Preferred age difference
- t_{diff}: Time since relationship became possible between these two persons

Here, both the age and t_{diff} contain a time dependency as follows:

$$A_i(t) = t - t_{B,i}$$

$$t_{diff} = t - t_r$$

where

- $t_{B,i}$: Time at which person i was born
- t_r : Time at which relationship became possible between these two persons

This hazard can be rewritten as follows, where the time dependency is now explicitly shown:

$$h = B \exp(Ct)$$

In this expression, B and C are no longer time dependent:

$$B = \exp\left[\alpha_0 + \alpha_1 P_i + \alpha_2 P_j + \alpha_3 |P_i - P_j| - \alpha_4 \left(\frac{t_{B,i} + t_{B,j}}{2}\right) + \alpha_5 | - t_{B,i} + t_{B,j} - D_p| - \beta t_r\right]$$

$$C = \alpha_4 + \beta$$

Integrating the hazard to obtain the relationship between a real-world time interval Δt and the internal time interval ΔT yields:

$$\Delta T = \int_{t_0}^{t_0+\Delta t} B \exp(Ct) dt = \frac{E}{C} \left[\exp(C\Delta t) - 1\right]$$

where E is defined as follows:

$$E = \exp\left[\alpha_0 + \alpha_1 P_i + \alpha_2 P_j + \alpha_3 |P_i - P_j| + \alpha_4 \left(\frac{2t_0 - t_{B,i} - t_{B,j}}{2}\right) + \alpha_5 | - t_{B,i} + t_{B,j} - D_p| + \beta(t_0 - t_r)\right]$$

Solving for Δt this equation becomes:

$$\Delta t = \frac{1}{C} \log\left(\frac{C}{E}\Delta T + 1\right)$$