Bayesian Rogers-Castro models for migration

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1 Overview

This Quarto document illustrates how to fit Rogers-Castro models to age-specific migration rates using the `rcbayes` R package. Here's a paper that gives some more information the package.

Load in the required packages:

```
library(tidyverse)
library(rcbayes)
```

2 What is a Rogers-Castro model?

The Rogers-Castro model (1981) for migration age schedules is multi-exponential parametric model that aims to capture the non-linear characteristic non-linear shape of migration. It has the form:

$$\begin{aligned} m(x) =& a_1 \exp\{-\alpha_1 x\} + \\ & a_2 \exp\{-\alpha_2 (x - \mu_2) - \exp[-\lambda_2 (x - \mu_2)]\} + \\ & a_3 \exp\{-\alpha_3 (x - \mu_3) - \exp[-\lambda_3 (x - \mu_3)]\} + \\ & a_4 \exp\{\alpha_4 x\} + \\ & c \end{aligned}$$

where $m(x)$ is the migration rate (in- or out-) for age x. The successive additive components of the model represent pre-working, working, retirement, post-retirement, and overall migration, respectively. Various versions of the model can be estimated; for example, a simpler version would remove the components related to retirement and post-retirement peaks. The `rcbayes` package has a built-in interaction Shiny application that you can use to explore how different parameter values affect the shape of the migration age curve:

```
rcbayes::interact_rc()
```

3 Read in data

XX todo

4 Fit model

XX todo

5 Plot

XX todo

6 Extensions

The `rcbayes` package was designed for users to be able to fit Rogers-Castro models to a single population. The Stan code for the models in the packages is here. These could be extended to fit, for example, hierarchical models for multiple areas at a time.