Replication Guide for
"A Preferred-Habitat Model
of the Term Structure of Interest Rates"

The instructions for replication concern the material in Section 5, which is on Calibration and Policy Analysis. The data used for the calibration are public, and the sources are given in Section 5. The programs for the nominal calibration, for both the main sample and the subsample, are in the directory `Nominal`. The programs for the real calibration are in the directory `Real`. They are Matlab programs.

The main task in each calibration is to solve for the first seven parameters in Table 1. The parameters are κ_r (`kr` in the program), $\sigma_r^2 = \sigma_\beta^2$ (`sir` and `sib` in the program), κ_β (`kb` in the program), $a\theta$ (`ath` in the program), $a\alpha$ (`aal` in the program), δ_α (`dal` in the program) and δ_θ (`dth` in the program). The solution follows an iterative process, starting from a vector of initial values `(kr,sir,kb,ath,aal,dth,dal)`.

Step 1 is to determine values for `(kr,sir)` (given values for `(kb,ath,aal,dth,dal)`) so that the volatility of the one-year yield in levels and in annual changes is the same in the model and in the data. This is done by trial-and-error, by running the program `MainFigures` for the nominal calibration and `MainFiguresReal` for the real calibration, and ensuring that the values in Figures 5 and 6 produced by the programs for the one-year maturity are the same in the model and in the data. This procedure converges quickly. The rationale for Step 1 is that the volatility of the one-year yield in levels and in changes depends almost exclusively on `(kr,sir)`. The programs `MainFigures` and `MainFiguresReal` solve for the equilibrium term structure for given values of `(kr,sir,kb,ath,aal,dth,dal)` and produce the figures shown in the paper.

Step 2 is to determine values for `(kb,ath,aal)` (given values for `(kr,sir)` determined in Step 1, and for `(dth,dal)`) so that the average volatility of yields in levels and in annual changes, and the average correlation of annual yield changes, are the same in the model and in the data. This is done by running the program `MinSSR` for the nominal calibration and `MinSSRReal` for the real calibration, in which the variable `daloptinel` is set to the value of `dal` and the variable `dthoptinel` is set to the value of `dth`. These programs minimize, over `(kb,ath,aal)`, a penalty function that depends on the distance between the volatilities and correlations in the model and in the data. They solve for the equilibrium term structure for given values of `(kr,sir,kb,ath,aal,dth,dal)`, as do the programs `MainFigures` and `MainFiguresReal`, and they change the values of `(kb,ath,aal)` to find the minimum of the penalty function, which is zero. The programs `MinSSR` and `MinSSRReal` use grid search, which can be refined iteratively when close to the solution.

Step 3 is to determine values for `(dth,dal)` (given values for `(kr,sir)` determined in Step 1, and for `(kb,ath,aal)` determined in Step 2) so that the fractions of relative volume up to the two-year maturity and from the eleven-year maturity onward, are the same in the model and in the data. This is done by running the program `MinFitVolume`. This program takes as inputs `(kb,aal,ath)`, in that order. It minimizes a penalty function that depends on the distance between the fractions of relative volume in the model and in the data. It imposes the constraint $\delta_\theta \geq \delta_\alpha + 0.01$, to avoid numerical instability. That constraint is binding in the nominal calibrations. The program `MinFitVolume` solves for the equilibrium term structure for given values of `(kr,sir,kb,ath,aal,dth,dal)`, as do the programs `MainFigures` and `MainFiguresReal`, and it changes the values of `(dth,dal)` to find the minimum of the penalty function. That minimum is non-zero if the constraint $\delta_\theta \geq \delta_\alpha + 0.01$ is binding.

After completing Steps 1, 2 and 3, we iterate on Steps 2 and 3 keeping the values of `(kr,sir)` from Step 1, but changing iteratively those of `(kb,ath,aal,dth,dal)`. We end the iterative process of Steps 2 an 3 when the values of relative volume in the model are within 7% of the values in the data. We then repeat Step 1, then repeat the iterative process of Steps 2 and 3, and so on. When this process ends, the values of five moments pertaining to volatilities and correlations are the same in the model and in the data, while the values of relative volume are within 7% of the values in the data. Using the values of `(kr,sir,kb,ath,aal,dth,dal)`, we run the program `MainFigures` for the nominal calibration and `MainFiguresReal` for the real calibration, to obtain the figures shown in the paper. The elasticity tables are produced by running the program `SensMatrix` for the nominal calibration and `SensMatrixReal` for the real calibration.