Multiregional Projection and Analysis

Lab description In this assignment you will generate multiretional cohort component population projections under alternative immigration scenarios. On the class website, you will find various functions that will allow you to generate alternative immigration scenarios. You will be able to answer question such as "What will happen if 20% of the immigration shifts to my region over the next 40 years?" Developing alternative scenarios is as much art as it is science. You will need to have a good understanding of you region in order to come with with reasonable scenarios. Be creative here.

Assignment 2:
Over the next week, Prof Sweeney will be out of town. You should develop at lest three alternative multiregional projection outcomes. Compare the projections with each other and with the uniregional projections you have already completed. Write up a 5-7 page report describing your results and presenting analysis on how your region might be affected. Provide supporting tables and figures.
Growth projections:
Recall the basic formula for the interregional cohort component model:

$$P^{\{t+1\}} = G * P^{\{t\}} + F * I^{\{t\}},$$

where

1. $P^{\{t+1\}}$ is the population to be projected,
2. $P^{\{t\}}$ is the current population,
3. G is the growth matrix that determines how maw many people die, have birth, move within the system, etc,
4. $I^{\{t\}}$ is the number of immigrants from outside the system, and
5. F is an immigrant redistribution matrix that determines how many immigrants stay where they initially came to and how many move to other regions.

In this lab, you will be able to alter the distribution of immigrants from one region to another, i.e. you will be able to change I^t for various time periods. Net week you will be given additional functions that will enable you to alter the total number immigrants from

outside the system (i.e. you will be able to make total immigration go up or down.)

Data Description: On the class website, you will find growth matrices G for each race, immigrant redistribution matrices F for each race, and baseline population and and immigration matrices. When you import a G or an F matrix, Matlab will give it the generic name **data**, so you will need to change the name to something meaningful, like G for "growth", or GA for "Growth Asian." When you import a baseline matrix, you will see that it has 4 columns, one for each race, so you will need to create a vector from each column.

Program Descriptions: On the website, you will also find various functions that you will be helpful. Don't forget to use **addpath** before you try to use them. All of the functions have help provided with them, so you can type **help** *functionname* and you will see how to use it, but the documentation is provided below as well.

1. `pop_extract`: Extracts the population for a single region from a multiregional population vector.
   Documentation:

```
pop_extract(data,regionid)
% Purpose: Extracts data for a single region from a
%     multiregional population vector
% Input:
%     data = either a population or immigrant vector
%     regionid = a number from 1-9 representing the region
% Output:
%     A [36x1] population vector, with females 0-85+
%         and then males 0-85+;
% REGION IDS:
% 1 = Tahoe
% 2 = LA
% 3 = San Diego
% 4 = Fresno
% 5 = SF
% 6 = Sacramento
% 7 = Shasta
% 8 = Oregon
% 9 = Rest of US
```

Example:

```
P2 = pop_extract(P,2)
```

This will take the multiregional population vector P, and store the data for LA (region 2) in the vector P2. Suppose I then want to make a population pyramid for LA, I would then type:

```
age = 0:5:85;
age = age+2.5;
barh(age,P2(1:18),1);
hold on;
barh(age,-P2(19:36),1);
```

2. `change_percent`: changes an immigrant vector so that a fixed percent of immigrants will move a specified region.
Documentation:

```
% out = change_percent(data,regionid,percent)
% Purpose: changes the percent of total immigration that comes to a region
% Input:
%     data = either a population or immigrant vector
%     regionid = a number from 1-9 representing the region
%     percent = a number from 0-1 representing the new proportion
%         of immigrants coming to the region
% Output:
%     A [36x1] population vector, with females 0-85+
%         and then males 0-85+;
% REGION IDS:
% 1 = Tahoe
% 2 = LA
% 3 = San Diego
% 4 = Fresno
% 5 = SF
% 6 = Sacramento
% 7 = Shasta
% 8 = Oregon
% 9 = Rest of US
```

Example:

```
Inew = change_percent(I,2,.5)
```

This will create a new immigrant vector Inew, such that the proportion of immigrants moving to LA (region 2) will be 0.5. The total number of immigrants will not be changed.

3. `project_percent` - use this function to change to percent of immigrants moving to a region over time.
Documentation:

```
project_percent(G,P,F,I,regionid,percent)
% Purpose: Projects population at 5 year increments until 2030 according
%     to P(t+5) = G*P(t)+F*I(t).  Allows the percentage of immigrants to
%     change over time.
%     By specifying regionid and percent, you can allow the proportion of
%     immigrants going to one region to change over time.
% Input:
%     G = Growth matrix
%     P = 1990 population vector
%     F = Immigrant redistribution matrix
%     I = 1990 immigrant vector
%     regionid = region to be changed
%     percent = percent of immigrants going to region in 2030
% Output:
%     A matrix of population vectors.  Column 1 is the population in
%     1990, and the last column is the population in 2030;
```

Example:

```
projection = project_percent(G,P,F,I,2,.5)
```

This will project the population out to 2030 using the data G, P, F, and I, so that the proportion of immigrants moving to LA (region 2) in 2030 will be 0.5.