Insurance annuity calculator in R
User Manual

Brian Hooper, Heather McKinnon, Divya Kalla Chandrika
Central Washington University

January 29th, 2019

1 Introduction

This document describes the use and function of the *Annuity calculator* written in R. The program is intended to simulate 10,000 independent customers purchasing an annuities using a mortality table. An input file provided to the program will give a initial age range that will be used to randomly select a starting age, or the age that the person will purchase an annuity product. Then, the mortality table will be used to randomly select a death age based on the distribution provided by the mortality table. This can be used to calculate the amount of profit or loss for the insurance company for an individual annuity product.

2 Input

Two auxiliary comma-separated files are required to use the script: *input.csv* and *mortality.csv*. The *input.csv* contains the following input parameters that should be provided to the script, shown in table 2:

input_age_start	The lower bound of the age range for purchasing annuity
input_age_end	The upper bound of the age range for purchasing annuity
maturity_age	The age at which the annuity matures
monthly_annuity	The desired monthly annuity benefit
interest_rate	The interest rate
term_length	The number of terms for N-year annuities
iterations	The number of simulations to run

Table 1: Input parameter descriptions

An example *input.csv* file is shown in table 2. In this case, the program will simulate a group of 100 individuals, aged 25 to 40, purchasing a $1000 annuity benefit that matures at age 60.

input_age_start	input_age_end	maturity_age	monthly_annuity	interest_rate	term_length	iterations
25	40	60	1000	0.05	20	100

Table 2: Example *input.csv* file

The *mortality.csv* file should contain two columns: an *age* column containing a list of integer ages, and a *mortality* column containing the probability of death at each age. An example *mortality.csv* file is given in table 3.

Age	Mortality
0	0.02042
1	0.00133
2	0.00122
...	...
98	0.67499

Table 3: Example *mortality.csv* file

3 Use

To invoke the program, simply use the Rscript command from the directory containing the *input.csv* and *mortality.csv* files. The program will output a report and a set of tables containing the expected profit or loss to the company based on the simulated business block.