

## **Wills Monte Carlo Retirement Program**

### **Help file, Windows Program Revision 1.00**

First, be advised that this is my first Windows GUI program. In general it seems to work pretty good and while a significant part of the UI work is error checking, I am sure there are still error conditions that are not going to be handled well. This started off as a command line program and there are still a considerable number of features in that program that do not yet exist in this GUI version. My development platform is a Windows 7 machine and I don't really have an easy way to test the program on other platforms. Feedback is always appreciated.

This program runs three kinds of simulations in parallel with the same random rate-of-return data. This is to make comparisons can be 'fair' in that they use the same set of random return data for each simulation so any differences in the outcome are due solely to the difference in the simulation model, not the random data going into it.

Mode 0 is the "normal" simulation where the expenses are fixed every year (the max amounts for each category).

Mode 1 is a variation I wanted to try that I feel represents the bit more realistic scenario where you'd likely spend less money in a year in which returns are bad. In this mode, the minimum expenses are guaranteed, but expenses above those minimums are capped to no more than than years rate of return. Returns more than the maximum amounts go to savings.

Mode 2 follows the suggested practice of having at least "n" (I have this set to three, but it is changeable by recompiling) years' worth of cash for living expenses. Hence, this program siphons off three years of living expenses before the simulation starts, then tries to keep the that cache at three years by siphoning off any returns each year to get back up to that three-year level. The amount siphoned off will be the lesser of the return for the year or the amount to get to three years. If the cache runs out of money, then money is pulled from the stocks at whatever amount is needed to cover expenses. Interestingly, this mode consistently fails more than Mode 1.

There are three expense categories that are interchangeable. Each category has its own minimum and maximum amounts and inflation rate. Only the maximum values are used for Mode 1. The intent is one category for fixed expenses, one for optional expenses, and one for health care. The latter is separated out as its predicted inflation rate is different than regular living expenses.

The program does not need installing, just extract all the files to a location of your choice, and run the program by double-clicking on it. It is highly recommended you keep all the files including the executable and data files in the same directory.

## The File Menus

The file menus deal with the source data, or the data used to run the simulation. The format of the data storage is an .ini file. With the program is a file called test.ini that contains some data for a hypothetical simulation. The .ini file can be edited with any text editor if you feel so compelled.

## The input dialog box

The main data input window is under the Simulation | Input/Review source data dialog box. This dialog box lets you review and edit all the data necessary to run a simulation. The input data is divided up into nine general areas. These parameters are listed below along with their name in the .ini file and a more full description of their meaning.

| Dialog Caption                  | Data file name    | Description   |
|---------------------------------|-------------------|---|
| <b>Retirement Start and End</b> |                   |   |
| Retirement Age                  | Start_age         | The age at which you will be retiring   |
| Retirement Year                 | Start_year        | The year you will start retirement. This program assumes you retire Jan 1 of that year.   |
| Stash                           | start_amount      | This is your predicted retirement nest egg the year to expect to retire   |
| Ending Age                      | End_age           | The age you want to ensure you have funds to last until   |
| <b>Social Security</b>          |                   |   |
| Start Age                       | Soc_sec_age_start | Age which you expect to start withdrawing Social Security   |
| Start Amount                    | Soc_sec_amt       | The annual amount you expect to get from Social Security the year you retire  |
| COLA                            | Soc_sec_inflation | Anticipated Social Security COLA per year   |
| Use It                          | Soc_sec_use       | Include Social Security income in the simulation. This is kept as a separate checkbox so you can leave the raw data in and just check the box to use the data or not.   |
| <b>Simulation Controls</b>      |                   |   |
| Number of Sims                  | Num_sims          | Number of simulations to run. 2000 seems to be about the right number to get fairly consistent results between simulations.   |
| Run-time Logs                   | Logs              | Generates detailed logs for the results of each year for all requested simulations to the file debug.txt. Checking this box with more than 10 simulations requested can generate a huge debug file                          |
| Debug Information               | Debug             | Shows intermediate calculations for each year of the simulation. Used to cross-check the results with a spreadsheet, for example. Checking this box with more than 10 simulations requested can generate a huge debug file. |
|                                 |                   |   |

| Dialog Caption  | Data file name          | Description  |
|---|-------------------------|--|
| <b>Stage 1 Returns.</b> This is your predicted rate of return of your investments from when you first start retirement until (or if) you have a more conservative stage (2) later.  |                         |  |
| Age   | N/A                     | Stage 1 starts at retirement   |
| Interest  | Mkt_return_avg1         | This is your expected average return rate for this stage of your retirement  |
| Range   | Mkt_return_range1       | The variation in interest you will get for this stage. This is a +/- value, so the minimum return will be the interest minus this value and the max will be the interest plus this value. Interest values are chosen are just random values between these two extremes. There is no enforcement of a bell curve or ensuring the average over the years ends up with the market return. |
| <b>Stage 2 Returns.</b> This is your predicted rate of return of your investments assuming at some age you decide to move to more conservative investment strategy. These parameters will last from the age specified until (or if) you have a more conservative stage (3) later. |                         |  |
| Age   | Age_ror_phase2          | Age at which this investment stage begins  |
| Interest  | Mkt_return_avg2         | This is your expected average return rate for this stage of your retirement  |
| Range   | Mkt_return_range2       | The variation in interest you will get for this stage.   |
| <b>Stage 3 Returns.</b> This is your predicted rate of return of your investments assuming at some age you decide to move to an even more conservative investment strategy. These parameters will last from the age specified until the end of the simulation                     |                         |  |
| Age   | Age_ror_phase3          | Age at which this investment stage begins  |
| Interest  | Mkt_return_avg3         | This is your expected average return rate for this stage of your retirement  |
| Range   | Mkt_return_range3       | The variation in interest you will get for this stage.   |
| <b>Group 1 Expenses</b>   |                         |  |
| Name  | Cat1_expense_name       | Category name  |
| Min Spend   | Cat1_expense_amount_min | Used for Mode 1 only. Minimum spend for this category, no matter how bad investments perform that year.  |
| Max Spend   | Cat1_expense_amount_max | Amount to spend in this category for Modes 0 and 2. Max amount to spend in Mode 0 no matter how good investments perform that year   |
| Inflation   | Cat1_expense_inflation  | Annual inflation rate for this category  |
| <b>Group 2 Expenses</b>   |                         |  |
| Name  | Cat2_expense_name       | Category name  |
| Min Spend   | Cat2_expense_amount_min | Used for Mode 1 only. Minimum spend for this category, no matter how bad investments perform that year.  |
| Max Spend   | Cat2_expense_amount_max | Amount to spend in this category for Modes 0 and 2. Max amount to spend in Mode 0 no matter how good investments perform that year   |
| Inflation   | Cat2_expense_inflation  | Annual inflation rate for this category  |
| <b>Group 2 Expenses</b>   |                         |  |
| Name  | Cat3_expense_name       | Category name  |
| Min Spend   | Cat3_expense_           | Used for Mode 1 only. Minimum spend for this   |

|           |                         |  |
|-----------|-------------------------|--|
|           | amount_min              | category, no matter how bad investments perform that year.   |
| Max Spend | Cat3_expense_amount_max | Amount to spend in this category for Modes 0 and 2. Max amount to spend in Mode 0 no matter how good investments perform that year |
| Inflation | Cat3_expense_inflation  | Annual inflation rate for this category  |
|           |                         |  |

Entries with dollar amounts can have dollar signs as well as commas. Should you enter in a value that is not valid, you will get a warning and the title for the value in error will be highlighted in red. This same highlighting will happen if there is an error in the source data file.

#### Run Simulation

Select this to run the actual simulation. Upon completion, you will see a summary of the results for the three modes. The general rule of thumb is that you want to see better than 80% of simulations pass. A pass is if at the end of that simulation, you did not run out of money by your specified ending age. If results are >80% the results are green, red otherwise.

#### Save Results

The results of the simulation are stored in two files. The main file (default summary.txt) contains a summary of the input data, the results by every 10<sup>th</sup> percentile for each of the modes, and the min, max, median, and mean values for each mode.

The percentile summary shows what the average RoR was and ending value of your portfolio for the simulation that yielded the result at that percentile. There is only a loose correlation between the average RoR and final portfolio value.

If you check the "more detail" box, you will additionally get a report of the results of each years simulation showing the average ROR and results for each mode. The data are sorted by the Mode0 final value.

You can request a histogram file. This file will be a .csv file intended for a spreadsheet program. It will contain the simulation data sorted into 100 buckets. It is up to you to convert this into a chart using whatever your favorite spreadsheet is. The histogram data will be added to the summary file as well.

