

1 The Program

Here is my withdrawal code and my accumulation code. The C++ programs are inefficient since they repeatedly read the input data.

2 Questions to Answer

1. Approximately what amount per year do we, as young people, have to save every year to obtain an eighty percent chance of accumulating \$1M in 10, 15, 20, 25, 30, 35, and 40 years? Answer for a handful of “reasonable” asset allocations such as Cooley, Hubbard, and Walz chose.

Solution:

We define a handful of reasonable asset allocations as three, e.g., 100% large-cap stocks, 50% large-cap stocks and 50% long-term corporate bonds, and 50% long-term corporate bonds and 50% U.S. Treasury bills.

I used binary search to determine values to the nearest \$1000. Some data is to the nearest \$100, which is about as precise as our data permits. Amounts are rounded up and “guarantee” an 80% probability rate.

years	100% stocks	50% stocks/50% bonds	50% bonds/50% cash
10	66900	71000	83000
15	33000	38000	49000
20	20000	23000	32000
25	9700	15000	22000
30	5400	9000	15000
35	2700	5000	12000
40	1500	4000	9100

2. To a first approximation, how much can one contribute annually to an IRA? (Hint: See IRS Publication 590.) What must one do to make this enough to reach the \$1M goal?

Solution:

For regular and Roth IRAs, one can contribute \$2000 per year, ignoring contribution limits based on income.

The question is poorly written. One can increase the asset allocation toward more rewarding assets and/or contribute for more years. Let’s assume allocating 100% small-cap stocks. (In the real world, this aggressive allocation should probably be balanced with another source of income.) Then, one can achieve the goal, with reasonably high probability, in approximately 32 years:

years	25	28	30	32	35	40
probability	4.2%	42.2%	72.0%	87.8%	100%	100%

3. What is the probability that \$1M will last 10, 15, 20, 25, and 30 years assuming a withdrawal rate of \$50K per year?

Solution:

Again, the question is poorly written. Let's assume an asset allocation of 60% large-cap stocks and 40% long-term corporate bonds.

years	10	15	20	25	30
1926–1997	100%	100%	90.6%	75.2%	74.4%
1946–1997	100%	100%	84.8%	64.3%	56.5%

Inflation in the 1970s was very detrimental to investments. In an inflationary environment, neither stocks nor bonds do well, but the withdrawal amount increases greatly.

4. A lot of people consider the Great Depression and subsequent decade an aberration. How does your answer to the previous question change when considering only the post-WWII period of 1946–1997?

Solution: See the previous answer.