

# Wescap Management Group

Spring 2000

For WESCAP Clients and Interested Readers

## Monte Carlo Simulations

Monte Carlo simulations are used to model "real world" possibilities in finance, economics, and many natural phenomena where uncertainty of outcome is the rule.



Instead of a single deterministic outcome, financial Monte Carlo techniques vary the rate of return and inflation rates randomly.

It is called Monte Carlo, because not just one projection is made, but many similar yet different projections are made. This is done by randomly altering rates of return and inflation rates using a normal (i.e. "bell curve") probability function.

The software that WESCAP uses does 1000 iterations at a time. Many thousands more can be run in a questionable case. Each outcome is graphed together with the others so that likely and less likely outcomes can

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## Who Wants to be a Billionaire?

Why shoot for a measly \$1 million as a contestant on "Who Wants to Be a Millionaire?", when you can invest in high tech stocks and perhaps become a billionaire?

With many tech stocks and stock funds returning over 100% last year, and over 20% per year the last 10 years, why do anything else?

Like Donald Trump though, you may flirt with disaster or like investors in Planet Hollywood, you may actually experience disaster. Once assets go to zero, there is no recovery potential!

This also can happen with a multiple stock portfolio if you are withdrawing cash from your portfolio to meet spending needs and if the portfolio dramatically declines and stays down long enough.

To illustrate the potential and risk of a multi-security, single asset class portfolio, we ran several Monte Carlo simulations (see left-hand side column) with the following assumptions:

Case 1: 100% technology stocks  
Annual Return: 20%  
Return Std Deviation: 40%

Case 2: Multi-asset class portfolio  
Annual Return: 8.5%  
Return Std Deviation: 7%

All Cases:

Portfolio Amount: \$1 million

Age: 62

Lifespan: to age 90

Spending from portfolio each year: \$38,400 plus 3% annual inflation.

Inflation Standard Deviation: 1%

Both the rate of return and standard deviations used here for the technology exposure are less than what

Morningstar is currently reporting as the technology mutual fund average. However, both a 20% return and the 40% standard deviation of returns is higher than the long-term average. Only hindsight

will reveal the true future return and risk, but we believe our assumptions are relevant to real investors.

What if instead of making 20% each and every year in these technology stocks, we vary the return. Perhaps you make +55%, -2%, +20% and

+41% the first 4 years, or perhaps it is -12%, +16%, -32% and -6%. Therefore, with this random approach

it is possible to have many good years in a row or many bad years, or more likely a mix of good and bad returns that on average works out close to 20% per year.

Running 1000 different Monte Carlo financial security projections by

*(Continued on page 2)*



**Monte Carlo simulations of the aggressive concentrated portfolio resulted in going broke almost 1/3 of the time**

## Monte Carlo Simulations

(Continued from page 1)

be seen and the likelihood of failure can be determined.

Standard deviations and returns are estimated by using forecasts, or past data or a combination of the two. In natural phenomena and some unnatural ones (like securities markets), the true underlying mean return and standard deviations are not known (and may not ever be known due to these figures continuing to “wander” over time—characteristics of fractal non-linear systems—but that’s another story).

Since rates of returns can be reasonably described as log-normally distributed, we can use the normal distribution probability function, or “bell curve”, to predict ranges of returns each year.

For example, there is a 2/3 chance of the outcome in any one year being one standard deviation away and there is a 95% chance in any one year that results will be within two standard deviations.

With good data and reasonable assumptions Monte Carlo simulations can realistically answer questions like “What is the likelihood that I will deplete my assets?”, and “What do I need to do to live worry free?” or “How much can I give away and still be secure?”



## Who Wants to be a Billionaire ?

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varying the rates of returns and inflation rates via their relevant standard deviations yielded the following results (and shown on the graphs attached):

### Case 1 portfolio at age 90:

Average Result: \$132 million  
Best Result: \$6 Billion (you’re a **billionaire!**)  
Worst Result: \$0 (you’re **broke**)  
% of time went broke: **28%**

**Once assets go to zero, there is no recovery potential**

### Case 2 portfolio at age 90:

Average Result: \$4 million  
Best Result: \$16 million  
Worst Result: \$69,000  
% of time went broke: **0%**

In other words, the Monte Carlo simulations of the aggressive concentrated portfolio resulted in going broke almost 1/3 of the time. This was also the same portfolio that gave a very small chance of being very wealthy.

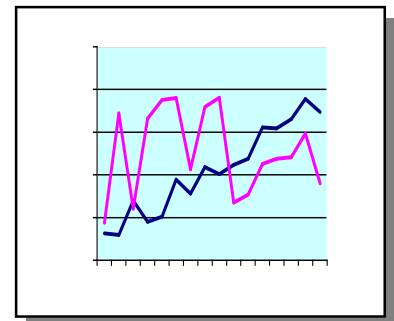
If large capital withdrawals must be made over an extended time after investments have declined, it is possible that the portfolio will become so depleted by the time the portfolio returns recover that the portfolio can never recover its

former value and eventually becomes **entirely depleted**.

The Case 2 diversified portfolio—multiple strategies, multiple asset classes, partially hedged—achieves the goal of meeting all desired expenditures. In the second case, the investor did not have to sell the house, cut expenses dramatically or need to move in with the children.

Each individual has unique goals, cash flow needs and tolerance for risk. These should determine the design characteristics of the portfolio.

Aggressive might be fine for you, or perhaps not. Running a custom series of Monte Carlo simulations might be just what you need to manage your finances for the range of outcomes best for you.



**About WESCAP:** Wescap Management Group is a Burbank, California registered investment advisor and fee-only financial advisory firm. Wescap has been serving individuals and families since 1988. For additional information, please contact either Joel Edstrom, Rick Weinlein, or Mark Gleason. We can be contacted at 303 N. Glenoaks Blvd. Suite 905, Burbank, CA 91502, at 800-820-2453 or contact us via e-mail at wescap@pacbell.net.

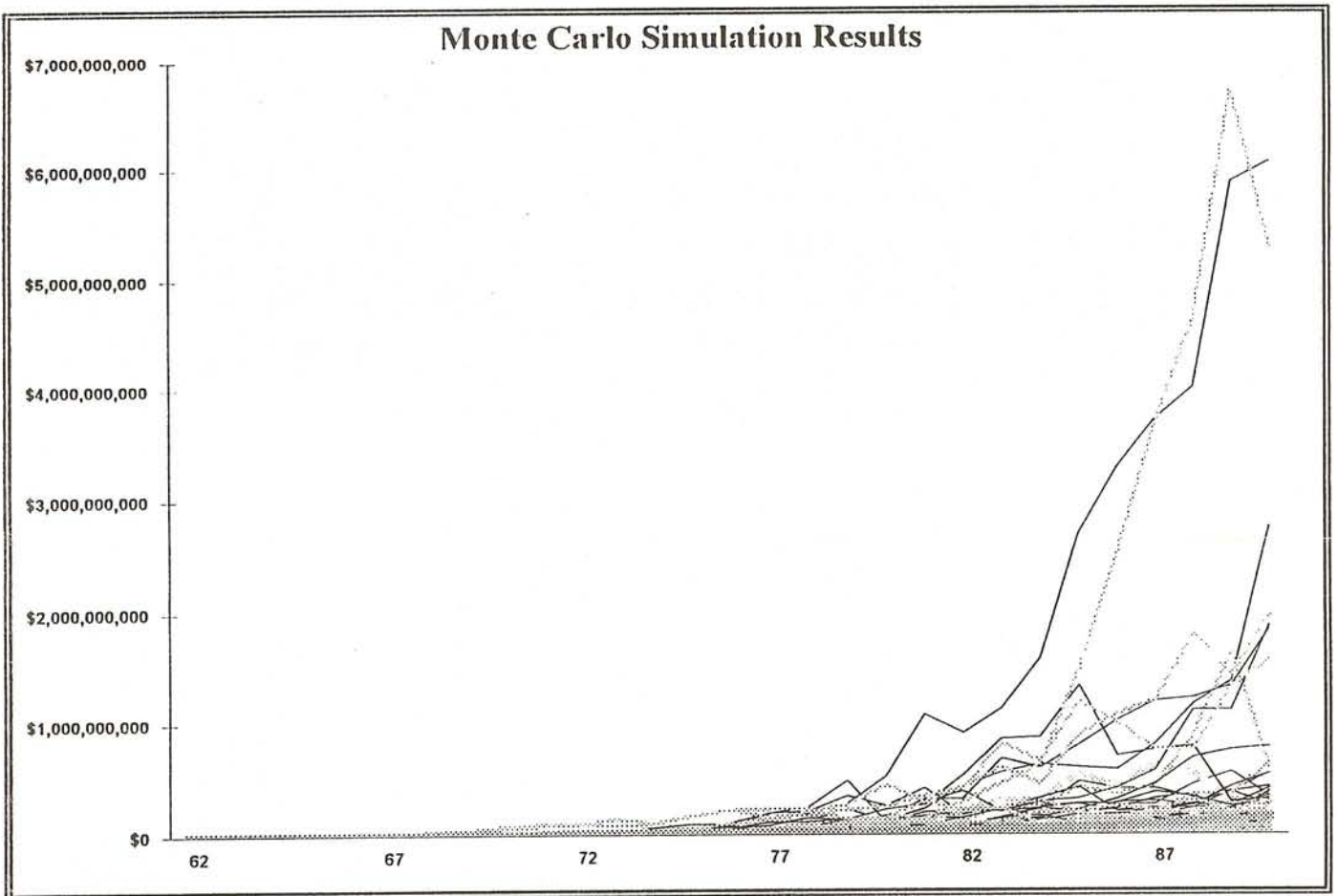
## Monte Carlo Retirement Projection Simulation

Most retirement projections are created using fixed assumptions for inflation rate, rates of return, tax rates and retirement benefits. While these projections are useful for planning and decision making purposes, they are static models of future financial results and do not show the effect of normal economic variations that occur in the real world. One way to illustrate unpredictability of the financial world, and its effects on your retirement, is a probability based model known as Monte Carlo Simulation.

Monte Carlo Simulation introduces random variance into the annual assumptions of the retirement projection model, and then runs the model many times. Observing results from a large number of projections illustrates the trends and potential range of future outcomes based on changable conditions. Your financial information produced the following Monte Carlo Simulation results at your age 90.\*

### Results from 1000 Monte Carlo Simulations:

|                                      |               |                                  |                 |
|--------------------------------------|---------------|----------------------------------|-----------------|
| Projection estimate (at 20.00% rate) | \$144,832,819 | Percentage of results above zero | 72%             |
| Percentage within 20% of estimate    | 18%           | Minimum (worst case) result      | \$0             |
| Percentage of results above estimate | 15%           | Average Monte Carlo result       | \$132,097,074   |
| Percentage of results below estimate | 85%           | Maximum Monte Carlo result       | \$6,052,584,481 |



\*Simulation rates of return average 20.00%, with a standard deviation of 40.00%. (95% of values fall between -60.00% and 100.00%.)

\*Simulation inflation rates average 3.00%, with a standard deviation of 1.00%. (95% of values fall between 1.00% and 5.00%.)

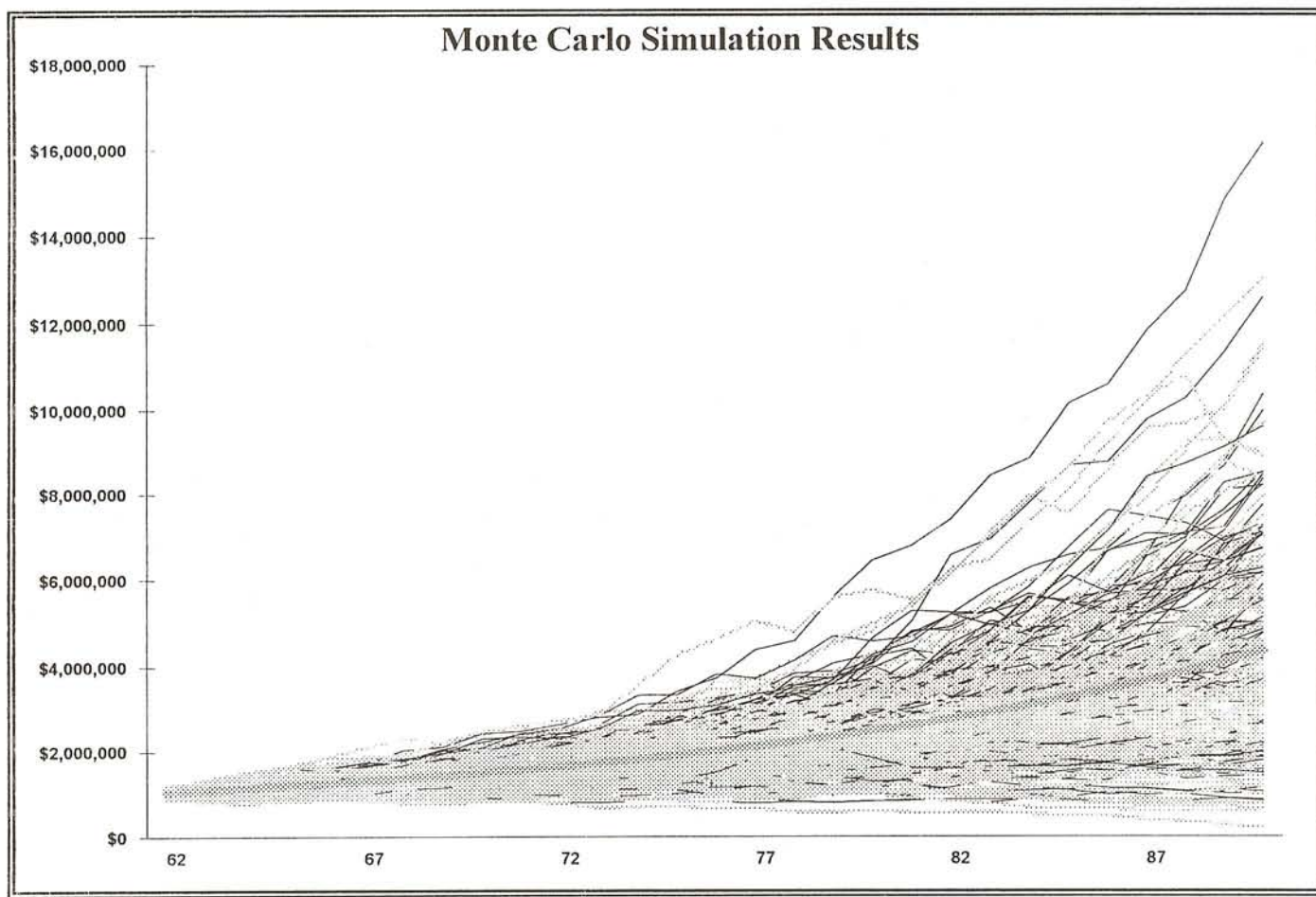
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### Results from 1000 Monte Carlo Simulations:

|                                      |             |                                  |              |
|--------------------------------------|-------------|----------------------------------|--------------|
| Projection estimate (at 8.50% rate)  | \$4,368,116 | Percentage of results above zero | 100%         |
| Percentage within 20% of estimate    | 59%         | Minimum (worst case) result      | \$69,831     |
| Percentage of results above estimate | 45%         | Average Monte Carlo result       | \$4,413,984  |
| Percentage of results below estimate | 55%         | Maximum Monte Carlo result       | \$16,569,311 |



\*Simulation rates of return average 8.50%, with a standard deviation of 7.00%. (95% of values fall between -5.50% and 22.50%.)

\*Simulation inflation rates average 3.00%, with a standard deviation of 1.00%. (95% of values fall between 1.00% and 5.00%.)