

# The Big Picture®

## Technical Overview

### About Our Firm — Investments Illustrated, Inc.

Based at our offices in Palo Alto, California and B.C., Canada, we are professional financial analysts, software developers, and interaction designers.

In addition to the Big Picture® software program, we are the creators of the Big Picture® chart in print, a FINRA-reviewed illustration of historical investment returns that is widely used by the financial services industry in the U.S., Canada, and Mexico.

Investments Illustrated was founded in 2010.

### Big Picture: Computations

The Big Picture allows advisors to build the retirement portfolios of their choice, and back-test them over hundreds of rolling historical periods. In the click of a button, advisors can illustrate for clients the success rates, safe withdrawal rates, portfolio longevities, and other outcomes associated with various asset allocations and cost burdens.

Methodologically, the software is grounded in the William Bengen's [seminal work](#) re: the use of rolling historical periods to determine safe withdrawal rates in retirement.

Here's how the software computes success rates for a given portfolio:

The computations rely on historical index data. For each of the 11 major asset classes featured in the software, we use monthly-frequency, total return series that start on January 1st, 1926 and continue to the most-recent month end.

“Total return” means that the index includes not just changes in price but reinvested income (dividends, in the case of the stocks, and interest payments, in the case of bonds) — and thus represents the investor's full or “total” return. Portfolios are assumed to exist within a tax-deferred environment.

A “series” is simply a string of figures that denote the value of a given asset class at different points in time. For example, one of the asset classes featured in the software is the S&P 500 total return index.

Here is a snippet from that index series:

1925-12-31	1.40
1926-01-31	1.40
1926-02-28	1.35
1926-03-31	1.27
1926-04-30	1.32
1926-05-31	1.34
1926-06-30	1.41
1926-07-31	1.47
1926-08-31	1.51

From these raw data, the program derives monthly returns by taking the change in value from one month to the next, and dividing it by the previous month's index value.

With monthly return data in hand for each asset class, the software can take a portfolio and compute its change in value over a given time frame. For example, if a user selects a portfolio composed of 75% Bonds and 25% Stocks, and enters a starting value for the portfolio of \$1,000, the software will allocate \$750 to the Bond index and \$250 to the Stock index, and then grow those amounts per their respective monthly returns, as calculated above.

If a user selects a 30-year horizon, the software will find the value of the portfolio at the end of 30 years. It will do this for each historical rolling 30-year period.

The first 30-year rolling period began on January 1st, 1926 and ran for thirty years. The second rolling period began February 1st, 1926 and ran for thirty years. And so on, up to the present. In all, there are about 735 historical 30-year periods (to date) over which these computations are performed.

The software thus gathers an array of portfolio end values — one corresponding to each historical 30-year period. If the user selects a “legacy capital” value of “x” dollars as their goal, the software will compute the number of portfolio end values that were greater than “x”, and divide it by the total number of end values to obtain the “Success Rate”.

Layered into these calculations are any withdrawals made—or, in the “Saving” modality, contributions. If the former, the portfolio is debited monthly by whatever the selected withdrawal amount is. If the latter, it is credited by the relevant amount. **Withdrawals and contributions are constant in real terms; they are grown at the actual rate of inflation (CPI) that prevailed in each historical month over which the simulations are run.**

Also, users can select whether to rebalance or not, and at what frequency. The default setting is annual rebalancing. This means that the software will restore the portfolio’s original allocations each year in its computations. In our example, if after the first year (in a given rolling period) Stocks had grown to represent 80% of the portfolio’s value, and Bonds 20%, the software will re-weight the portfolio to 75 / 25 by taking some of the dollars from the former and investing them in the latter. It will repeat this process each year.

### Historical Analysis vs. Monte Carlo

One question that often arises relates to the differences between the historical approach used in our tool vs. the forward-looking “Monte Carlo” approach used by other planning programs.

Monte Carlo requires that certain assumptions be made about the future returns, volatilities, and correlations of the asset classes contained in a given portfolio. It then uses these assumptions to randomly generate hypothetical portfolio trajectories and, from there, a “probability of success”.

Our tool does not make predictions; it only shows how one’s strategy would have fared in all the real-life retirement periods that have so far come to pass.

Did a given retirement strategy survive history’s worst sequences of returns? If so, it may well survive whatever misfortunes arise between now and the end of a client’s retirement. Or did it produce a shortfall, even in the stock market booms of the 80s and 90s? If so, it may fall short in the years ahead, too.

### Data Sources

The software computes results using historical total return index data. Following is a list of the various indices that underpin the software, and their respective sources:

U.S. Micro Cap Stocks, U.S. Small Cap Stocks, U.S. Mid Cap Stocks, U.S. Large Cap Stocks, U.S. Total Market Stocks, U.S. Treasury Bills, U.S. 5-Year Government Bonds: USA 5-Year Government Bond Total Return Index—**Center for Research in Security Prices (CRSP).**

International Stocks: ex-U.S.A. Total Return Index, U.S. 10-Year Government Bonds:  
USA 10-Year Government Bond Total Return Index, Global Bonds: GFD Global  
USD Total Return Government Bond Index, Gold: Gold Bullion Price-New York

(US\$/oz)—Global Financial Data, Inc. U.S. Inflation: Consumer Price Index—  
**Global Financial Data, Inc.**

We hold long-term licenses with two of the world's premier historical investment data  
compilers. For more information about the historical data included in the tool, please  
visit our vendors' websites:

- [Center for Research in Security Prices \(CRSP\)](#)
- [Global Financial Data Inc.](#)