T.RowePrice®
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T. Rowe Price FuturePath® Tool Methodology and Assumptions

OVERVIEW

The T. Rowe Price FuturePath® Tool allows retirement savers to estimate the durability of their current savings across 1,000 randomly generated market scenarios, and to assess the impact of different savings rates, time horizons, and asset allocations on the projection of retirement income. The projections are used to provide retirement income estimates and to calculate a Confidence Number® score. The Confidence Number® score represents a snapshot of the likelihood that your retirement savings will be sufficient to generate income throughout retirement sufficient to meet an assumed or stated income goal.

The projections generated by the tool regarding the likelihood of various investment outcomes are based on historical performance data of specific asset classes as described below, but are hypothetical in nature, do not reflect actual investment results, and are not guarantees of future results. The tool presents only a range of possible outcomes. There can be no assurance that the projected or simulated results will be achieved or sustained. The potential for loss (or gain) may be greater than demonstrated in the simulations. Results may vary with each use or over time, depending on changes to your inputs or periodic updates to the underlying assumptions. See "Limitations".

The FuturePath® Tool assesses the adequacy of retirement savings based on your current asset allocation as well as on a desired asset allocation you specify or a model asset allocation T. Rowe Price believes to be generally appropriate for an investor of your age, or the age of your planning partner, if older. You may include a planning partner, such as a spouse, with whom you are jointly planning your retirement.

Although you may input information about outside accounts, incomes and specific expenses into the tool, it is not required. Please be sure to take other assets, income and investments into consideration in reviewing results that do not incorporate that information.

DATA USED AND HYPOTHETICAL PROJECTION METHODOLOGY

Data and Assumptions about You. In order to determine how likely your current and projected retirement savings are to last through retirement, we use data and assumptions about you, as follows.

The tool automatically imports accounts held under your name and tax id at T. Rowe Price, as well as those under the name and tax id of your planning partner, if you include one. College savings accounts are not included. You may provide data about outside investment accounts. We use the Morningstar® asset classes to determine your current allocation for T. Rowe Price accounts included in the tool and categorize them as stocks, bonds, or short-term bonds. Any percentage of holdings classified by Morningstar as "other" has been assigned to stocks.

We use salary information you provide, a retirement age of 65 (unless you have specified a different age) and a planning period in retirement of 30 years (unless you have specified a different planning period), and your stated contribution rate or amount. We assume that your salary and contributions will increase at a rate to keep pace with inflation (assumed to be 3% based on historic inflation rates) and that your contributions will stop at retirement, or any earlier time you specify. If you adjust your retirement date down, the date of last contribution will move downwards automatically; if you adjust your retirement age up, the date of last contribution will not automatically adjust. We use any anticipated retirement income you provide, and assume that you will receive Social Security, which we estimate based on your stated or assumed retirement age and current salary, but assume benefits begin at age 70 unless you provide otherwise. We assume that you are planning as an individual unless you provide information about a planning partner. See "Retirement Income and Withdrawal Assumptions" for more information about planning partners. We assume that you are planning to receive retirement income equal to 75% of your current income in future dollars, unless you specify a different retirement income goal. Once this goal has been established the tool converts it to a dollar amount that will not automatically adjust even if you input different salaries. We assume all retirement accounts represent pre-tax savings, unless you designate Roth IRAs. We do not distinguish among workplace retirement plan contribution sources.

Calculating Hypothetical Future Values of Asset Class Portfolios. The tool uses Monte Carlo analysis to generate 1,000 hypothetical market scenarios so that users can analyze hypothetical outcomes for specific asset class portfolios under a range of market conditions. (Asset classes used are limited to stocks, bonds and short-term bonds). Monte Carlo analysis provides ranges of potential future outcomes based on a probability model. Our Monte Carlo analysis creates potential simulated portfolio values by using asset class portfolio returns selected randomly from a consistent data set comprised of over 1 million potential monthly return values. The set of potential monthly returns was developed using the rates of return for each asset class, shown below. These rates account for the historical returns of the Representative Indices from the Index Data Start Date noted in the chart to 2016. We adjusted the historical returns to calculate long-term compound annual rates of return by combining the 2016 T-Bill rate with the difference between the returns of the Representative Indices and T-Bills during the look-back periods.

	Stocks	Bonds	Short-term Bonds
Long-term Compound Annual Rate of Return	8.3%	5.0%	3.8%
Representative Index	S&P 500	Bloomberg Barclays U.S. Aggregate Bond*	Barclays 1-3 Year Gov't Credit
Index Data Start Date	January 1960	January 1960*	February 1976

*IA SBBI US Intermediate Government from January 1960 to December 1975. Bloomberg Barclays U.S. Aggregate Index since January 1976.

These returns do not reflect fees and expenses or the effects of inflation.

We assumed a variability of returns based on historic volatility data from market indices:

	Stocks	Bonds	Short-term Bonds
Annualized Volatility	16.4%	6.3%	4.5%

Finally, we assumed that returns of each asset class would move in correlation to the other asset classes in a manner consistent with historical experience as follows:

	Stocks	Bonds	Short-term Bonds
Stocks			
Bonds	0.3		
Short-term Bonds	0.2	0.8	

The correlation values range from 0 to 1.0; the closer the value is to 1.0, the higher the tendency the assets have to move in the same direction.

We use the assumptions above for all retirement accounts.

Taxable Account Returns. If you have included taxable accounts as part of the tool's assessment or such accounts become part of the tool's withdrawal assumptions, see below, our model assumes that taxes decrease earnings of that account. Accordingly, the model uses data from the Lipper peer group for each asset class to calculate an assumed percentage of four categories of earnings with different tax impacts: realized short-term capital gains, realized long-term capital gains, qualified dividend payments and interest or nonqualified dividend payments. The coefficients used to determine the amount by which we assume taxes reduce earnings in taxable accounts (the "tax drag") are:

Asset Class	Tax Drag Coefficient
Stocks	13%
Bonds	24%
Short-term Bonds	28%

These coefficients are used to reduce monthly return assumptions for your taxable assets in the 1,000 hypothetical market scenarios.

Portfolio Value Projections. How your current account balance might evolve over time—before and after retirement—is displayed in the Projected Asset graph in today's dollars. This illustration of projected portfolio value represents the median value calculated in the 1,000 market simulations generated by the tool.

Retirement Income and Withdrawal Assumptions. A separate Projected Income graph shows retirement income (at the median value of the 1,000 market simulations) as adjusted for retirement withdrawals in future dollars. In order to model your retirement income and your post-retirement portfolio value, we start with the assumed value of your account at an asset class level based on the median result from the 1,000 hypothetical return projections, and assume withdrawals pro rata across asset classes at the assumed or stated income goal level, increased each year for inflation. The figures do not take into account any taxes that may be due upon withdrawal. We assume that required minimum distributions for non-Roth IRA accounts begin at age 70½, and are made in 12 equal monthly payments. To the extent Social Security payments or required minimum distributions exceed your assumed or stated retirement income goal, we assume the amounts are reinvested in a taxable account.

In withdrawing to meet the income goal, we assume a specific withdrawal sequence from account types. We start with any required minimum distributions. We then move to any taxable accounts, followed by tax-deferred accounts. Finally, we withdraw from any tax-free Roth IRA accounts. When a planning partner is included, we follow the same sequence, but take into account the age of the partner.

If you are modelling retirement income with a planning partner, we calculate each person's Social Security benefits separately, and assume that the surviving spouse or partner is entitled to receive the higher of the two estimated Social Security benefits through the end of the planning period. If you have entered data concerning a pension benefit, we allow you to determine the amount of the pension that will be paid to your planning partner. Required minimum distributions are calculated using the uniform lifetime table even if your planning partner is a spouse more than 10 years younger than you.

Confidence Number® Score. The hypothetical projections are used to determine your Confidence Number® score. This number is calculated on a 100 point scale and factors in two measures of risk. The primary basis of the Confidence Number® score is the Simulation Success Rate, which is a probability measure and represents the number of times our outcomes succeed (i.e., have at least $1 remaining in the portfolio at the end of retirement). That score can be adjusted by the Portfolio Measure, which can move the Confidence Number® score by up to 3 points if the asset class portfolio under analysis varies from the T. Rowe Price model asset allocation for hypothetical investors of your age with your time horizon (see below).

Asset Allocation Assumptions. If you do not establish your own asset allocation goal, the FuturePath® Tool compares hypothetical retirement income projections and Confidence Number® score of your current asset allocation against a model asset allocation we believe to be generally appropriate for investors of your age, or the age of your planning partner if older. Model asset allocations have been developed based on stock increments of 10% from 20% to 90% and are assigned to ages as follows:

	Age							
	49 and younger	50–54	55–59	60–64	65–69	70–79	80–89	90 and older
Stocks	90	80	70	60	50	40	30	20
Bonds	10	20	25	30	35	40	45	50
Short-term Bonds	0	0	5	10	15	20	25	30

The model asset allocations are based upon analysis that seeks to balance long-term projected returns with anticipated volatility. The model reflects our view of appropriate levels of volatility for investors of certain ages.

LIMITATIONS

While the FuturePath® Tool has been designed with reasonable assumptions and methods, the tool provides hypothetical projections only and has certain limitations.

- Failure of the assumptions to accurately project actual market conditions or tax rates may result in over- or understatement of projected retirement income.
- The salary and contribution growth rate assumption (3%) may not match your circumstances and may result in over- or understatement of retirement savings and income projections.
- At certain salary levels, the failure to incorporate IRS or plan contribution limits may also result in overstated retirement savings and income projections.
- The failure to take into account taxes at distribution may result in overstated retirement income projections. Future spending capacity from the projected income stream will be impacted by taxes.
- The use of current salary to estimate Social Security payments may not represent your situation.
- The assumption that Social Security payments to age 70 will increase by the amount of assumed inflation may result in overstated retirement income projections.
- If your input includes information about a planning partner that is not your spouse, then assumptions about the transfer of Social Security or pension benefits to a surviving spouse do not apply and may result in overstated projected retirement income for the survivor.
- The model asset allocation displayed may not be appropriate for you if your risk tolerance varies from the assumptions we used in creating the model.

The information provided in this tool is for general and educational purposes only, and is not intended to provide legal, tax or investment advice. This tool does not provide fiduciary recommendations concerning investments or investment management, nor is it intended to serve as the primary basis for investment decision-making. Other T. Rowe Price educational tools or advice services use different assumptions and methods and may yield different outcomes.

IMPORTANT: The projections or other information generated by the FuturePath® Tool regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results, and are not guarantees of future results. The simulations are based on assumptions. There can be no assurance that the projected or simulated results

will be achieved or sustained. The charts present only a range of possible outcomes. Actual results will vary with each use and over time, and such results may be better or worse than the simulated scenarios. Clients should be aware that the potential for loss (or gain) may be greater than demonstrated in the simulations.

Index Definitions

S&P 500 Index: A market cap-weighted index of 500 widely held stocks often used as a proxy for the overall stock market. Performance is reported on a total return basis.

Bloomberg Barclays U.S. Aggregate Bond Index: An unmanaged index that tracks domestic investment-grade bonds, including corporate, government, and mortgage backed securities.

Bloomberg Barclays 1–3 Year U.S. Government/Credit Bond Index: An index that measures the performance of U.S. government, investment-grade corporate, and investment-grade international dollar-denominated bonds that have maturities of between 1 and 3 years and are publicly issued.

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