

# WealthRuler™ Methodology

Version 1.0 | Updated September 24, 2007

<b>Summary</b> .....	2
<b>Income and Expenses</b> .....	2
<b>Assets and Financial Events</b> .....	4
<b>Calculations</b> .....	6
<b>Results</b> .....	6
<b>Other Assumptions</b> .....	9

## Summary

WealthRuler™ provides a simulation engine for retirement planning. Users enter their retirement timeline, including age, when they intend to retire, and anticipated time in retirement. They also provide information on current assets and current and future cash flows. They can also choose to include tax information. The tool's engine runs multiple simulations of the user's retirement plan to determine if the user's assets should be able to cover his/her expenses through the life of the financial plan. The tool uses inputs provided by the user, and assumptions detailed below. No personal financial information that might be available to TD AMERITRADE is used in the calculations. Results provided by the tool are hypothetical, are not guaranteed and may vary with each use and over time.

## Income and Expenses

### Income

Income information is used to provide estimates for other inputs into WealthRuler. Future expenses and social security benefits are estimated by extrapolating out current income until retirement.

### Retirement Expenses

By default the tool estimates your retirement expenses based upon your current income. You may choose to use the estimated number or enter your own. The estimation is done by assuming your current annual income will grow at a rate of 1% above inflation until retirement. This income is multiplied by a replacement percentage, 80%, to get the estimated value of your retirement expenses. The replacement percentage is chosen to reflect the lack of certain pre-retirement expenses that may no longer be needed (ex: your mortgage payments would be complete).

*Example:* Your current income is \$40,000 and you have 15 years until retirement. Your income at retirement, grown at 1% per year, would be \$46,438. Multiplying by the salary replacement percentage, 80%, gives us \$37,151 per year or \$3,095 per month. All retirement expenses are in today's dollars and are adjusted for inflation over the life of the financial plan.

*Note:* The calculation above is used to figure out the impact of inflation, but provide the dollar figures in today's value to keep the figures in context.

### Retirement Income

Retirement income is income you expect to receive from a job after you retire. The number entered in WealthRuler is the pre-tax annual amount. For each year in retirement this income, less taxes, will be added to your financial plan. If there is a surplus after covering expected retirement expenses then the surplus will be assumed to be added to a post-tax account. Retirement income is adjusted for inflation over the course of the financial plan.

*Example:* You expect to have a part time job after retirement making \$25,000 per year and estimate your expenses at \$3,500 per month (\$42,000 per year). Also assume your effective tax rate is 20%. Your annual taxes would be \$25,000 times 20%, or \$5,000. Thus, your net retirement expenses would be \$42,000 (expenses) - \$25,000 (income) + \$5,000 (taxes), or \$22,000, which would be deducted from your retirement accounts.

### **Tax Information**

There are two types of taxes handled in WealthRuler's engine: income taxes and capital gains taxes. Income taxes can be levied by state, local and federal governments on earned income, salary and wages. Your federal filing status and state affect the exact tax rates that you will incur. Capital gains taxes are taxes on the appreciation of assets. Long-term capital gains, generally assets held longer than one year, are taxed at 15%. Short-term capital gains are taxed as ordinary income which generally has a higher tax rate than long-term capital gains.

Federal and state tax brackets are integrated into WealthRuler's engine. If your municipality charges a local tax rate, you may enter that as a percentage as well. If you choose not to include your tax information, the default filing status of "Single" will be used and the engine will also assume that you live in a state and municipality that do not charge an income tax.

*Note: TD AMERITRADE does not provide tax advice, and tax laws can change. Please consult you own tax advisor.*

### **Social Security**

WealthRuler's engine internally handles social security benefits as ordinary income earned during retirement. You may specify your monthly social security benefit amount and starting age or have the tool estimate it for you. The estimation is done using your current income and assumes that you have enough social security credits to receive benefits. Income received from social security benefits are adjusted for inflation over the life of the financial plan.

## Assets and Financial Events

### Accounts

There are four types of accounts considered by WealthRuler's engine during simulations: taxable, tax-deferred, tax-free, and qualified.

Account Types:

<b>Account Type</b>	<b>Tax Status</b>
401(k)	Tax- Advantaged
403(b)	Tax- Advantaged
457	Tax- Advantaged
529 Plan	Educational Savings
Brokerage/Mutual Fund	Taxable
Charitable Gift	Tax-Free
Checking/Savings Account	Taxable
Coverdell ESA	Educational Savings
Defined Benefit Plan	Tax-Advantaged
Individual 401(k)	Tax- Advantaged
Money Purchase Pension	Tax- Advantaged
Pre-Paid Tuition	Educational Savings
Profit Sharing Plan	Tax Advantaged
Rollover IRA	Tax- Advantaged
Roth IRA	Tax-Free
Roth IRA for Minor	Tax-Free
SEP-IRA / SARSEP	Tax- Advantaged
SIMPLE IRA	Tax- Advantaged
Tax-Deferred Annuity	Tax- Advantaged
Thrift Plan	Tax- Advantaged
Traditional IRA	Tax- Advantaged
Traditional IRA for Minor	Tax- Advantaged
UGMA / UTMA	Tax- Advantaged
Fixed Deferred Annuity	Tax- Advantaged
Variable Deferred Annuity	Tax- Advantaged
Other Taxable Account	Taxable
Other Tax-Deferred Account	Tax- Advantaged
Other Annuity	Tax- Advantaged

Taxable accounts, such as a brokerage account, are populated with post-tax dollars and any realized portfolio gains are subject to capital gains tax. Withdrawals may happen from these accounts at any time for any type of spending without incurring additional penalties or taxes.

Tax-Advantaged accounts, such as a 401(k) or IRA, are populated with pre-tax dollars and incur no tax exposure for growth until withdrawal. Withdrawals from tax-advantaged accounts are counted toward taxable income. Withdrawing from a tax-advantaged account prior to the minimum withdrawal age of 59 ½ may also be subject to a penalty of 10% of the withdrawal amount.

Tax-free accounts, such as Roth IRAs, incur no tax exposure for growth. Withdrawal from these accounts prior to the minimum withdrawal age of 59 ½ may incur a penalty of 10% of the withdrawn amount. The tool assumes that the assets in the account have been held for the minimum holding period.

Educational Savings accounts, such as Coverdell Education Savings Accounts and 529 plans, incur no tax exposure for growth. Qualified withdrawals, to pay for tuition, books, room and board, etc., incur no penalties or federal tax consequences. If withdrawals are not used for higher education expenses, they will be considered non-qualified withdrawals. The earnings portion of non-qualified withdrawals is subject to income tax and a 10% IRS penalty tax.

*Note: TD AMERITRADE does not provide tax advice, and tax laws can change. Please consult your own tax advisor.*

The “Current Value” and “Annual Contribution” amounts represent the current value of the account and additional amount added to the account each year. WealthRuler’s engine assumes that all contributions continue until retirement. The annual contribution amount entered is assumed to keep pace with inflation over the life of retirement and the tool automatically adjusts the amount accordingly.

The “Asset Allocation” section for each account represents the distribution among stocks, bonds and cash for the account. The asset allocation for all accounts is combined together to form a total asset allocation, displayed in the pie chart on the top left of the screen. This total allocation drives the initial risk tolerance and expected portfolio returns used by WealthRuler’s engine.

### **Financial Events – Expected income**

Expected income is positive cash flow such as selling a home or business. WealthRuler’s engine assumes that the number entered is the after-tax amount of the income. During simulations, this income is added to a taxable account that continues to grow with the rest of your assets. If the income is to be received as series of equal payments the number of recurring payments may be entered as well. The tool treats the amount entered as the value in today’s dollars of the income and automatically adjusts it for inflation. Recurring income is adjusted for inflation for each of the years it affects.

### **Financial Events – Planned expenses**

Planned expenses are expected negative cash flows such as the purchase of a second home or college tuition that would not be factored into normal retirement

expenses. If the expense is expected to be paid as a series of equal payments, such as four years of college tuition at \$15,000 per year, then the number of recurring payments may be entered as well.

Within WealthRuler’s engine, planned expenses are processed as additional spending on top of the retirement spending for the years they affect. Expenses that are marked as qualified may be deducted from qualified accounts (ex: 529 plan accounts) without additional penalties.

Planned Expense types:

<b>Planned Expense</b>	<b>Expense Type</b>
College Tuition	Qualified
Home Purchase	Normal
Other	Normal

The tool assumes that the expense amounts entered are in today’s dollars and automatically adjusts them for inflation. Recurring expenses are adjusted for inflation for each of the years they affect.

## Calculations

### Monte Carlo Simulations

Monte Carlo methods are randomized algorithms used to study systems with a significant uncertainty in inputs. They are widely used in a variety of fields to approximate solutions to problems that are too complicated to solve analytically. Monte Carlo methods work by generating many random scenarios, called simulations, and observing the fraction of these scenarios obeying some property or properties.

In this tool, Monte Carlo simulations are used to model portfolio performance in the market over time. A single simulation randomly generates a series of annual returns for the length of your plan. By running many simulations (a call to the calculation engine will run a minimum of 1000), the tool is able to infer the likelihood of your plan succeeding more accurately than by using market averages alone.

Your plan’s likelihood of success is the fraction of simulations that have succeeded, with the measure of success being that the portfolio remains solvent (has value greater than zero) throughout its entire lifespan. Your plan is deemed to be on track if the likelihood of success is greater than 90%, indicating that your plan meets or exceeds your goal in at least 9 out of every 10 simulations.

## Results

The results shown are based on how the model portfolio most similar to your current holdings performed in the Monte Carlo simulations. The tool considers a

portfolio's average performance in the market to be at the 50% confidence level. This means that in half of the simulations the model portfolio meets or exceeds the results shown for average performance, while in the other half of simulations the model portfolio fails to reach the results shown. Using a confidence level of 50% helps to illustrate how your plan may perform if market averages continue.

It is also important to consider how your plan may perform if market returns are consistently worse than historical averages. The tool considers poor performance in the market to be at the 90% confidence level. This means that in nine out of every ten simulations the model portfolio meets or exceeds the results shown for poor performance, while in one out of every ten simulations the model portfolio fails to reach the results shown.

Market Performance	Model portfolio...		Confidence Level
	...meets or exceeds results shown	...fails to reach results shown	
Average	1 out of 2 simulations	1 out of 2 simulations	50%
Poor	9 out of 10 simulations	1 out of 10 simulations	90%

Using a confidence level of 90% helps to illustrate how your plan may perform if market conditions are less favorable than historical averages. Your plan should have sufficient funds to cover your expenses and meet your goals in the event of a market downturn.

### Assets at Retirement

The tool provides two estimates of your expected assets at retirement under both poor and average market conditions. The tool also provides an estimate of the assets required at retirement to cover your expenses until the end of your plan.

Results shown in the Assets at Retirement chart:

- *Assets at Retirement, Average Performance*
- *Assets at Retirement, Poor Performance*
- *Your Target Assets at Retirement*

### Assets at retirement – your target

The tool estimates the total assets needed by your financial plan at retirement using your expected spending, planned expenses, retirement income and risk tolerance level. Using the annual portfolio returns associated with your risk tolerance level, less inflation, the tool discounts the net spending (annual income minus spending and expenses) for each year from retirement to the end of your financial plan. The resulting number is an approximation of the assets needed at retirement given poor market conditions.

### Assets over Time

The tool presents a chart of your assets over time under both poor and average market conditions, with a time increment of one year. This chart allows you to

visualize your plan's assets from year to year and the length of time that your expenses are covered.

Results shown in the Assets over Time chart:

- *Assets over Time, Average Performance*
- *Assets over Time, Poor Performance*
- *Retirement Age*
- *Shortfall Age*

Under average market conditions, the tool charts results based on how the model portfolio most similar to your current holdings performed in 50% of the simulations. Half of the simulations meet or exceed the results shown and half fail to meet the results shown.

Average market conditions do not mean that the tool uses a fixed rate of return to determine assets over time, but rather that returns follow a probabilistic model that reflects past market volatility. The average market numbers represent the median of the simulation results.

Under poor market conditions, the tool charts results based on how the model portfolio most similar to your current holdings performed in 90% of the simulations. Nine out of ten of the simulations meet or exceed the results shown, while only one out of ten fail to meet the results shown.

Results shown under poor market conditions will be less favorable than those under average market conditions, but can help you understand how your plan might perform in the event of a market downturn.

If, under poor market conditions, your assets reach zero before the end of your plan or your expenses are unable to be covered, the tool reports the year that the shortfall is expected to occur.

### **Adjustments to Your Plan**

After seeing the results of the tool's simulations, you have the opportunity to make adjustments to your plan and have the tool recalculate your plan. To increase your plan's likelihood of success, consider increasing your monthly savings, delaying retirement, or adjusting your risk tolerance.

Adjustments you can make to your plan:

- *Additional Monthly Savings*
- *Expected Retirement Age*
- *Risk Tolerance*

Additional monthly savings are additional dollars to save beyond what has been specified in your existing accounts in step three. The tool assumes these are after-tax dollars going into a taxable account (ex: a brokerage account) and the

contribution continues up until retirement. The tool automatically adjusts the contribution number annually for inflation.

The benefits of increasing your retirement age are two-fold: each year that your retirement age is increased is an additional year of savings and one year less of retirement spending that will be deducted from your retirement accounts. Conversely, if your financial plan shows excess assets at retirement then it may be possible for you to retire earlier.

### **Suggestions and Next Steps**

If your current plan is unsuccessful, the tool presents the age at which a shortfall is expected to occur and suggests an additional monthly contribution. This contribution should be close to the amount needed to increase your plan's likelihood of success above 90%. Due to the nature of Monte Carlo simulations, however, this amount should only be considered a rough approximation.

*Note: Since retirement plan contributions have a maximum amount, the system defaults to after-tax savings. If you have not "maxed out" your retirement plan savings, you may also consider increasing your contributions to tax-advantaged accounts.*

## **Other Assumptions**

### **Inflation**

Inflation within WealthRuler's engine is modeled as a normal random variable with a mean of 3% and a standard deviation of 2%. This means that over the life of the financial plan the average inflation rate will be 3% but this rate may vary from year to year. This variation of the inflation, as opposed to a fixed rate, allows for a more realistic modeling of real world situation where economic shocks may vary the exact inflation rate from year to year.

### **Portfolio Performance**

Asset allocation refers to the process of distributing assets in a portfolio among major categories such as stocks, bonds and cash. The purpose of asset allocation is to reduce risk by diversifying the portfolio. The ideal asset allocation differs based on the risk tolerance and time horizon of the individual investor.

Using the categories of Equities, Fixed Income and Cash, the tool considers five different investment strategies corresponding to different risk tolerances and time horizons. Your risk tolerance level is determined by analyzing the weight of equities in your current holdings. Your time horizon is typically the number of years until your retirement; however, planning for a large withdrawal before retirement can shorten your time horizon and significantly influence your plan.

Portfolio Strategy/Risk Tolerance	Equities	Fixed Income	Cash
Capital Preservation/Low	30%	60%	10%
Stable/Low-Moderate	40%	55%	5%
Balanced/Moderate	50%	49%	1%
Growth/Moderate-High	70%	29%	1%
Aggressive Growth/Aggressive	89%	10%	1%

*Five model portfolios, with weights*

Your risk tolerance and time horizon are both considered when constructing your initial model portfolio and determining the general strategy for investing over the lifetime of your plan. If you are five or more years from retirement, your portfolio will initially seek capital appreciation by allocating assets toward equities. As you approach retirement, your portfolio will shift into progressively more conservative allocations. This helps to maximize returns when more risk can be taken while preserving accumulated assets later in life.

### Risk and Return

The annual portfolio returns used in the tool are based upon the indicated risk tolerance level and the number of years to retirement. As the individual investor gets near retirement the tool defaults to more conservative investments. Portfolio returns are represented as normal random variables. The following table lists the average returns and standard deviations used given the years to retirement:

Risk Tolerance	Years Until Retirement			
	0-1	2-4	5-8	8+
Capital Preservation/Low	6%/6%	6%/6%	6%/6%	6%/6%
Stable/Low-Moderate	6%/6%	7%/7.5%	7%/7.5%	7%/7.5%
Balanced/Moderate	6%/6%	7%/7.5%	8%/9.5%	8%/9.5%
Growth/Moderate-High	6%/6%	7%/7.5%	8%/9.5%	10%/13.5%
Aggressive Growth/Aggressive	6%/6%	7%/7.5%	8%/9.5%	11%/16%

*Note: WealthRuler assumes that as retirement nears, you will rebalance your accounts to a more conservative approach.*

Each year of each simulation run generates a random return using the average and standard deviation numbers associated with that year of the financial plan. Choosing a higher level of risk tolerance will result in higher average returns but will also increase the variance from that average.

### Time Value of Money

Time value of money is the premise that an amount of money available now is worth more than the same amount in the future, due to its potential to earn interest. Future value refers to the value of a present amount at a specific date in the future. Future values illustrate how a current amount would grow over time, taking into

account the effects of the time value of money and inflation. Present value refers to the value of a future amount discounted to account for the time value of money and other factors, such as inflation. Present values are smaller than their corresponding future values.

### **Today's dollars vs. future dollars**

It is important to distinguish between the present value and future value of money. While both are correct ways of representing values over time, ambiguity can result when both are used without qualification. To prevent any ambiguity, all monetary values in the tool are reported at their present values. This provides a meaningful basis for the comparison of cash flows at different times.

All inputs, outputs and calculations in the tool are handled in today's dollars.

Income, expenses and contributions are automatically adjusted for inflation to remain consistent with changing prices levels throughout the financial plan.

Similarly, all outputs from WealthRuler's engine, assets at retirement and over time, are in today's dollars to allow easier comparison to the inputs that drive them.