

LuX Wealth Engine

Overview

LuX Wealth Engine is a goals-based forecasting application that enables users to make projections about wealth and their future savings and spending needs. The engine uses 100,000 Monte Carlo simulations to generate scenarios that describe the possible evolution of wealth. The tool is highly customizable and allows users substantial flexibility to change inputs, including: asset allocation, annual savings, incomes, retirement spending, Social Security, and inflation.

This guide will walk you through a simple simulation for Erik, a young carpenter who is making \$70,000 a year, but doesn't know if he is on track for retirement. Along the way we will illustrate some of different functions available in the tool and how to effectively interpret the results.

The LuX Wealth Engine is not a crystal ball, but what it does do is illustrate the range and central tendency of outcomes across many different market environments one may observe as they build and grow their wealth.

Follow along with the tool and your own assumptions to see how you're doing!

Section 1: Demographic Information

Here you will load the basic demographic information that the tool will use for forecasting. The inputs are as follows:

- 1) Current Age: This is the age at which the simulation will start. You will most likely want to use your current age.
- 2) Desired Retirement Age: This is the age at which you plan to retire. For 2020 the Social Security Administration considers full retirement age to be 66. If you don't know when you want to retire, then 66 is a good place to start.
- 3) End Analysis Age: This marks the end of the analysis and is another way of saying when you think you'll die.

For Erik, we have selected the following for the demographic inputs:

Current Age: 30

Desired Retirement Age: 66

End of Analysis: 92

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The screenshot displays the 'LuX Forecasting Engine' interface. At the top, there are two tabs: 'Demographic Information' (selected) and 'Asset Allocation'. Below the tabs, there are three sliders for age selection:

- Select Current Age:** The slider is set to 30. The range is from 1 to 100.
- Select Desired Retirement Age:** The slider is set to 66. The range is from 1 to 100.
- Select Age to End Analysis:** The slider is set to 92. The range is from 1 to 100.

Section 2: Asset Allocation and Inflation

In this section you will select your current or desired asset allocation. What's an asset allocation? Glad you asked! Basically, this is the percentage of your portfolio that you hold in stocks, bonds and cash. This is a **very** important section. When choosing your asset allocation, it's very important to consider your risk tolerance and cash needs. Taking more risk may lead to increased returns over time, but it also increases your chances of losing money in a given period. Ask yourself,

- "How comfortable am I losing money?"
- "Can I afford to lose money?"

It's also imperative to be realistic. Consider how much cash you hold at your bank, maybe you have a lot of expenses and need a lot of cash, maybe you're more comfortable when you hold a lot of cash. Take some time to review your accounts to see what your current allocation really is and determine what a reasonable allocation looks like going forward.

If you don't know where to start, then below we lay out some very general allocations you can consider based on your disposition to risk.

Of course, you can always play around with some different allocations and adjust accordingly based on the results. Note that the allocation you choose must add up to 100%; otherwise you will receive an error when you run the simulation.

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- Conservative: 20% Stock, 60% Bonds, 20% Cash
- Moderately Conservative: 40% Stock, 55% Bonds, 5% Cash
- Moderate: 60% Stock, 35% Bonds, 5% Cash
- Moderately Aggressive: 75% Stock, 20% Bonds, 5% Cash
- Aggressive: 90% Stock, 5% Bonds, 5% Cash

Erik is young and can afford to take some risks at this point in life, so he has selected an **Aggressive** allocation.

The screenshot shows the 'LuX Forecasting Engine' interface with the 'Asset Allocation' tab selected. It features four sliders for adjusting asset percentages:

- Select Allocation to Stock (as %):** The slider is set to 90%.
- Select Allocation to Bonds (as %):** The slider is set to 5%.
- Select Allocation to Cash (as %):** The slider is set to 5%.
- Select Annual Inflation Adjustment (as %):** The slider is set to 2%.

There is another input in this section that we haven't addressed, Inflation. In general, we don't recommend that you adjust this value. The analysis is sensitive to Inflation and 2% Inflation has been the average for a long time. As such, unless you have reason to believe that inflation will be higher or lower than the average, go ahead and leave 2% as the default; that's what Erik is doing!

Section 3: Goals and Expenses

In this section you will define your spending goals and projected expenses during retirement. The main input is yearly Desired Retirement Lifestyle; which is the amount that you want to spend in retirement. It is important to keep in mind that the input values in this section (and for the entire tool) are expressed in **today's dollars** (i.e.

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present value). This means that a Desired Retirement Lifestyle of \$50,000 is the equivalent of what \$50,000 can buy you today. The amount is automatically adjusted for inflation to ensure your spending is consistent over time.

In our example, Erik wants to maintain the equivalent of his current salary in retirement, so his goal is \$70,000 in spending annually.

Let's consider each of the other inputs in this section in turn.

- **Legacy Wealth:** This optional parameter allows you to add a desired amount of wealth you want to leave when you die. If, for example, you want to leave \$250,000 to your children or a charity, then use this input, otherwise just leave it as \$0.
- **Projected Income Tax Rate:** This is average rate that you expect to pay for taxes during retirement. Taxes are a very important expense that is often neglected during retirement planning so take a moment to consider what is reasonable for you. The IRS offers a withholding calculator which you can use to get a better sense of your tax liability. To access the calculator, click this [link](#). You can also use the table below for the 2019 tax year to estimate your top marginal tax rate. If you don't know where to start, then leave this at the default rate of 22%. This is a pretty middle of the road estimate and many people fall in and around this range.
- **Projected Capital Gains Tax Rate:** This is the rate you expect to pay on gains made from your investments. Short-term capital gains are taxed at ordinary income tax rates while long term capital gains are generally taxed at 20%. To simplify the analysis, all projected gains are assumed to be long term. We do not recommend changing this variable unless you have specific reason to.

2019 tax brackets (for taxes due April 15, 2020)

TAX RATE	SINGLE	HEAD OF HOUSEHOLD	MARRIED FILING JOINTLY OR QUALIFYING WIDOW	MARRIED FILING SEPARATELY
10%	\$0 to \$9,700	\$0 to \$13,850	\$0 to \$19,400	\$0 to \$9,700
12%	\$9,701 to \$39,475	\$13,851 to \$52,850	\$19,401 to \$78,950	\$9,701 to \$39,475
22%	\$39,476 to \$84,200	\$52,851 to \$84,200	\$78,951 to \$168,400	\$39,476 to \$84,200
24%	\$84,201 to \$160,725	\$84,201 to \$160,700	\$168,401 to \$321,450	\$84,201 to \$160,725
32%	\$160,726 to \$204,100	\$160,701 to \$204,100	\$321,451 to \$408,200	\$160,726 to \$204,100
35%	\$204,101 to \$510,300	\$204,101 to \$510,300	\$408,201 to \$612,350	\$204,101 to \$306,175
37%	\$510,301 or more	\$510,301 or more	\$612,351 or more	\$306,176 or more

Source: IRS

Erik is single and making \$70,000 per year so he falls squarely into the 22% marginal bracket. He'd like to leave money to his kids one day, but isn't sure what amount is possible so for now he decides to leave Legacy Wealth at \$0.

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Demographic Information Asset Allocation **Goals and Expenses**

Desired Lifestyle Spending in Retirement (in \$)

50,000 500,000

20,000 116,000 212,000 308,000 404,000 500,000

Legacy Wealth (optional)

0 10,000,000

0 1,000,000 2,000,000 4,000,000 6,000,000 8,000,000 10,000,000

Input Projected Post-Retirement Income Tax Rate

0.22

Input Projected Capital Gains Tax Rate

0.2

Section 4: Income

In this section, the user can add various income sources to be used in the analysis including: Social Security, pensions, annuity income and income from rental properties.

Annually, the Social Security Administration adjusts payments to retirees to account for changes in costs of living (i.e. inflation) and these adjustments are done for you automatically in the simulation. Rental income is also automatically adjusted for inflation as rents tend to increase overtime.

Conversely, most pensions and annuity payments are not indexed to inflation and as such these payments remain constant in the simulation.

Social Security represents most retiree's main source of income in retirement and generally is intended to replace about 70% of pre-retirement earnings. You can find your current estimate for Social Security benefits by visiting ssa.gov. Note, if you are young (under 40) you may not have earned enough "credits" yet to qualify for Social Security benefits; as such you will not yet have an estimate of future benefits.

After visiting ssa.gov, Erik, who is still early in his career, determines that he does not yet have enough credits to qualify for Social Security. In this case, he has to make a best guess. He expects his income to grow over time, but also wants to be conservative with his estimate. He chooses \$30,000 for his future benefit which represents less than 50% of his current income.

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Demographic Information Asset Allocation Goals and Expenses **Income**

Input Projected Annual Social Security Benefit (in \$)

Input Projected Annual Pension Benefit (in \$)

Input Projected Annuity Payments (in \$)

Input Annual Rent Received (in \$)

Section 5: Assets, Savings and Liabilities

In this section you will catalogue your current assets and estimated future saving rates. This section represents the bulk of what the engine will use to calculate future wealth so take some time to consider your ability to save and which accounts are best for you.

Savings to all accounts are assumed to continue until retirement with no contributions thereafter. In the case of Brokerage, savings are automatically adjusted for inflation to maintain a consistent proportion of saving to income.

There are 5 types of accounts in this section:

1. **Brokerage:** Brokerage assets comprise most assets which do not grow tax-deferred (IRAs, 401Ks, etc.) or tax-free (Roth IRAs); they are also referred to as retail or taxable assets. Brokerage accounts are very general use and, unlike the tax advantaged accounts described below, allow for unlimited savings and withdrawals.
2. **Individual Retirement Accounts (IRAs):** An IRA is the first example of a “tax-deferred” account. Any person can open an IRA. The advantage of an IRA is that you are able to deduct contributions from your income in the year you contribute. Additionally, any growth in the value of the account is not taxed until you make a withdrawal.

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3. Roth IRA: A Roth IRA is an example of a “tax-free” account (who doesn’t like the sound of that!). With a Roth, contributions are taxed in the year they are made (opposite of an IRA where the income is basically removed from your earnings for that year). The advantage of a Roth is that any future account growth is **tax-free** when you make a withdrawal. Roths are a very powerful way to growth wealth particularly if you believe your tax bracket now is higher than what it will be during retirement.
4. 401K and Defined Contribution (DC) Plans: A Defined Contribution plan is generally offered through your employer and a 401K represents the most common version of this structure (there are others, but they all function basically the same). A 401K is essentially a super IRA as the contribution limits are higher and your employer generally matches your contributions up to a certain limit to incentivize saving for retirement. All 401Ks are different so consult with your HR department to determine how your plan works.
5. Bank Accounts: This consists of Checking and Savings accounts that you keep at a bank.

There are many, many rules concerning these different account types including: eligibility, contribution limits, and deductibility. The specifics will be saved for a separate post. If you’d like to learn more, we suggest you visit [irs.gov](https://www.irs.gov) where you can read up on different account types and features available to you!

For our example, we will keep things simple and assume that Erik only has Brokerage assets and that he only intends save to his Brokerage account until he retires. He’s a pretty good saver though and, so far, has accumulated \$100,000 in his account. His goal is to save \$10,500 annually; which represents about 15% of his current salary.

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- Demographic Information
- Asset Allocation
- Goals and Expenses
- Income
- Assets, Savings and Liabilities**

Current Value of Brokerage Accounts (in \$)

Define Annual Savings into Brokerage Accounts (in \$)

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Section 6: Results

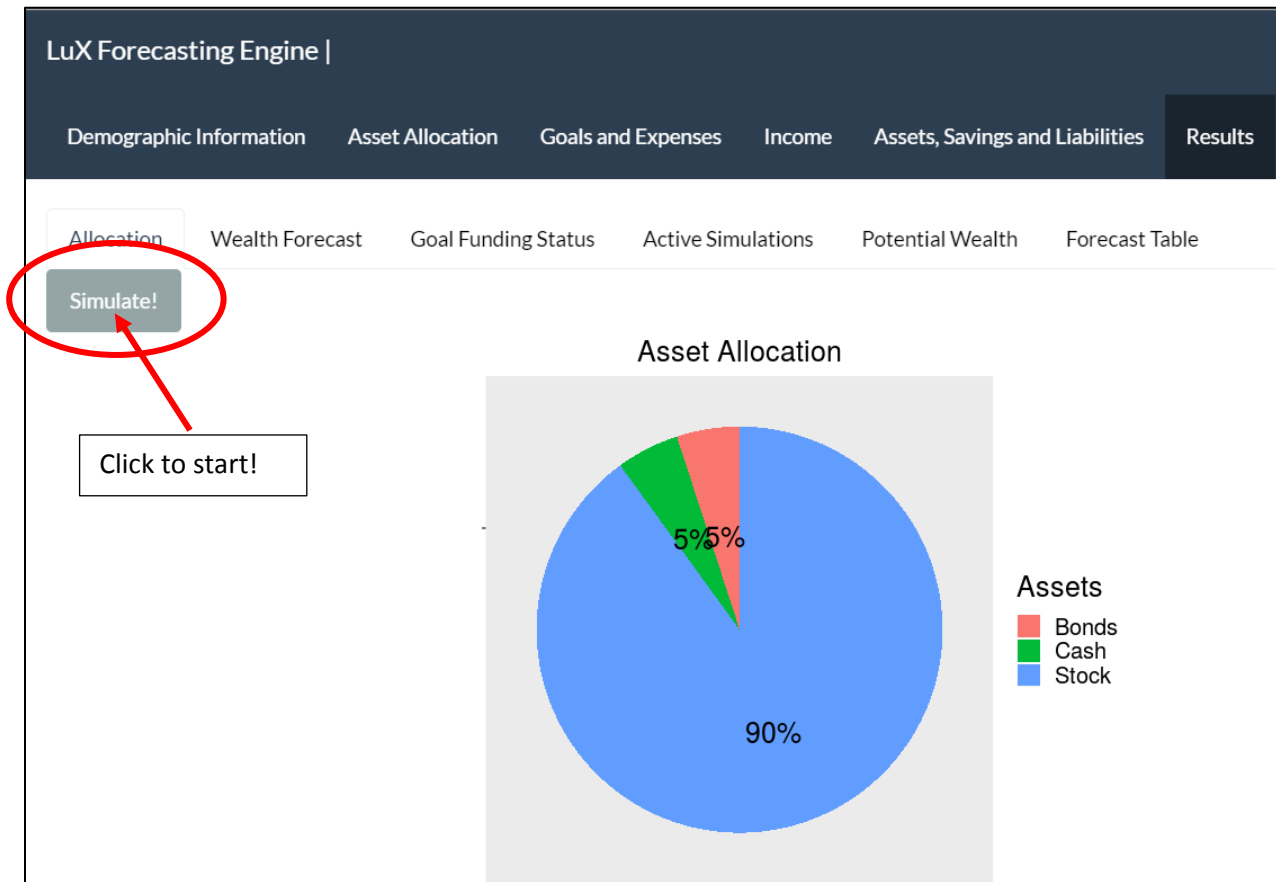
The moment has finally come to run the simulation and check out the results! The Results tab contains a number of nested tabs to communicate the results of the analysis and we will discuss each in turn.

Subsection A: Allocation

The first tab is the Allocation tab. Here, a pie chart depicts the percentage of your funds allocated to stocks, bonds and cash that you selected earlier. If at this time you want to change your investments, go back to Section 2: Asset Allocation and adjust the percentages, the pie chart will update automatically.

This page also contains a very important button, the “Simulate!” button. The “Simulate!” button begins the analysis. Click it and the analysis begins in the background.

Erik feels comfortable with his allocation choices and is ready to begin!

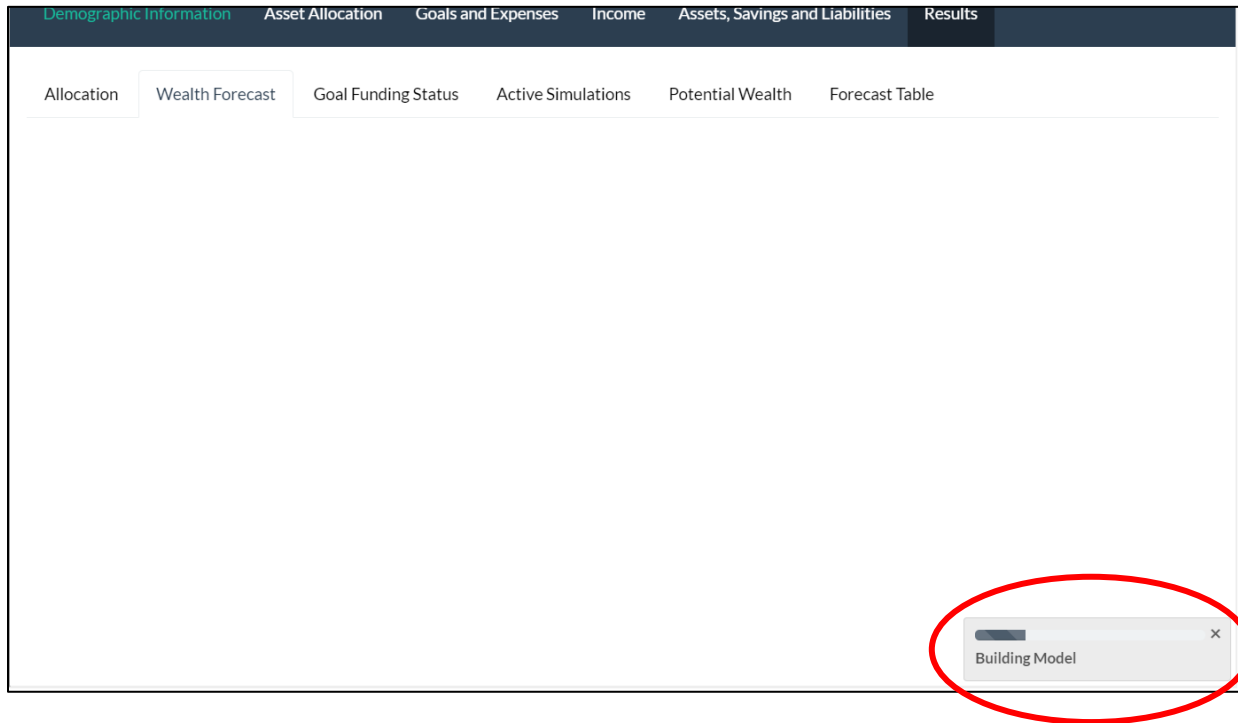


Subsection B: Wealth Forecast

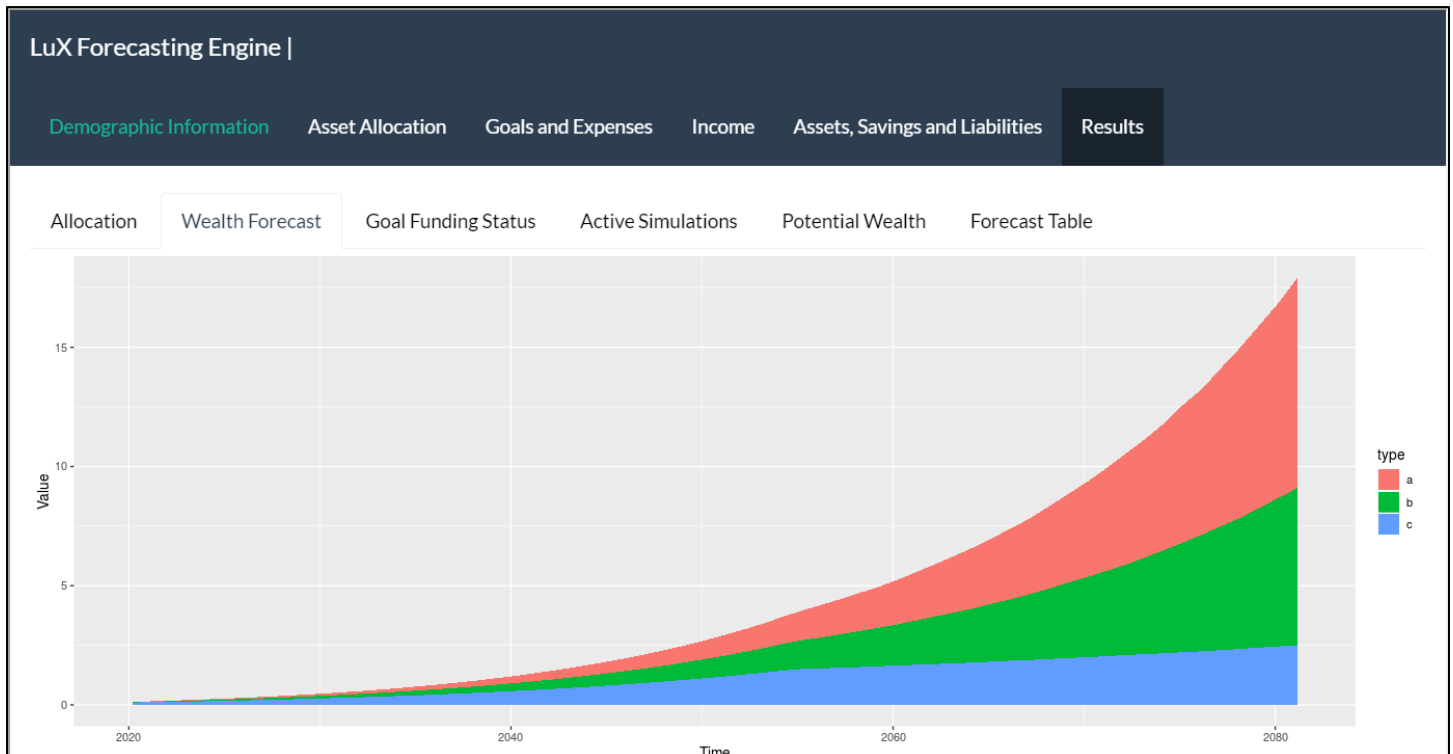
Next, proceed to the Wealth Forecast tab. This slide will initially be blank as the simulation runs and you will see a loading bar in the bottom right hand corner indicating the progress. Building the model may take a minute or

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two; remember, we are running 100,000 simulations to ensure maximum accuracy! Initially, the screen should look as follows:



After the simulation runs you should see a graph that looks similar to the below. Keep in mind that your specific results may differ (possibly substantially!) from those of Erik.



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This graph describes the growth in Erik's wealth over time at 3 different levels of confidence (depicted as the different colored sections) based on his inputs. The color codes are as follows:

- Blue: 80%
- Green: 50%
- Red: 30%

Erik's graph probably looks like a good-looking graph to you...and you'd be right! He's projected to do quite well for himself.

How to Interpret this Output?

If you don't deal with probabilities often, then the color codes might appear a bit confusing at first glance. Let's break them down and discuss the intuition.

As mentioned, the engine runs 100,000 simulations during the analysis. This means that it examines 100,000 different possible return scenarios and subsequently generates 100,000 different outcomes for your wealth. Some will inevitably be high and others low. The goal here is to illustrate what you can reasonably expect across all of those different market environments.

Consider the Green region, which illustrates wealth in the best 50% of scenarios. Specifically, consider the right most edge of the graph which is when his analysis ends; approximately 2081. In Erik's case, this number is around \$9,000,000. This means that out of all 100,000 scenarios run, 50% of them (i.e. 50,000) show Erik with an ending wealth of *at least* \$9,000,000...not bad!

The other regions have a similar interpretation. The Blue region corresponds to 80% of cases examined. For Erik, this number is about \$2,500,000. The interpretation then is: out of 100,000 cases examined, 80% of them (i.e. 80,000) show Erik with an ending wealth of *at least* \$2,500,000. An equally valid interpretation would be that in 20% of cases (i.e. 20,000) Erik's end wealth is less than \$2,500,000.

The Red region corresponds to the top 30% of cases. For Erik, this number is around \$20,000,000(!). The interpretation is: out of 100,000 cases, 30% of them (i.e. 30,000) show Erik with a terminal wealth of *at least* \$20,000,000. Or, conversely, in 70% of cases, Erik's wealth is projected to be less than \$20,000,000.

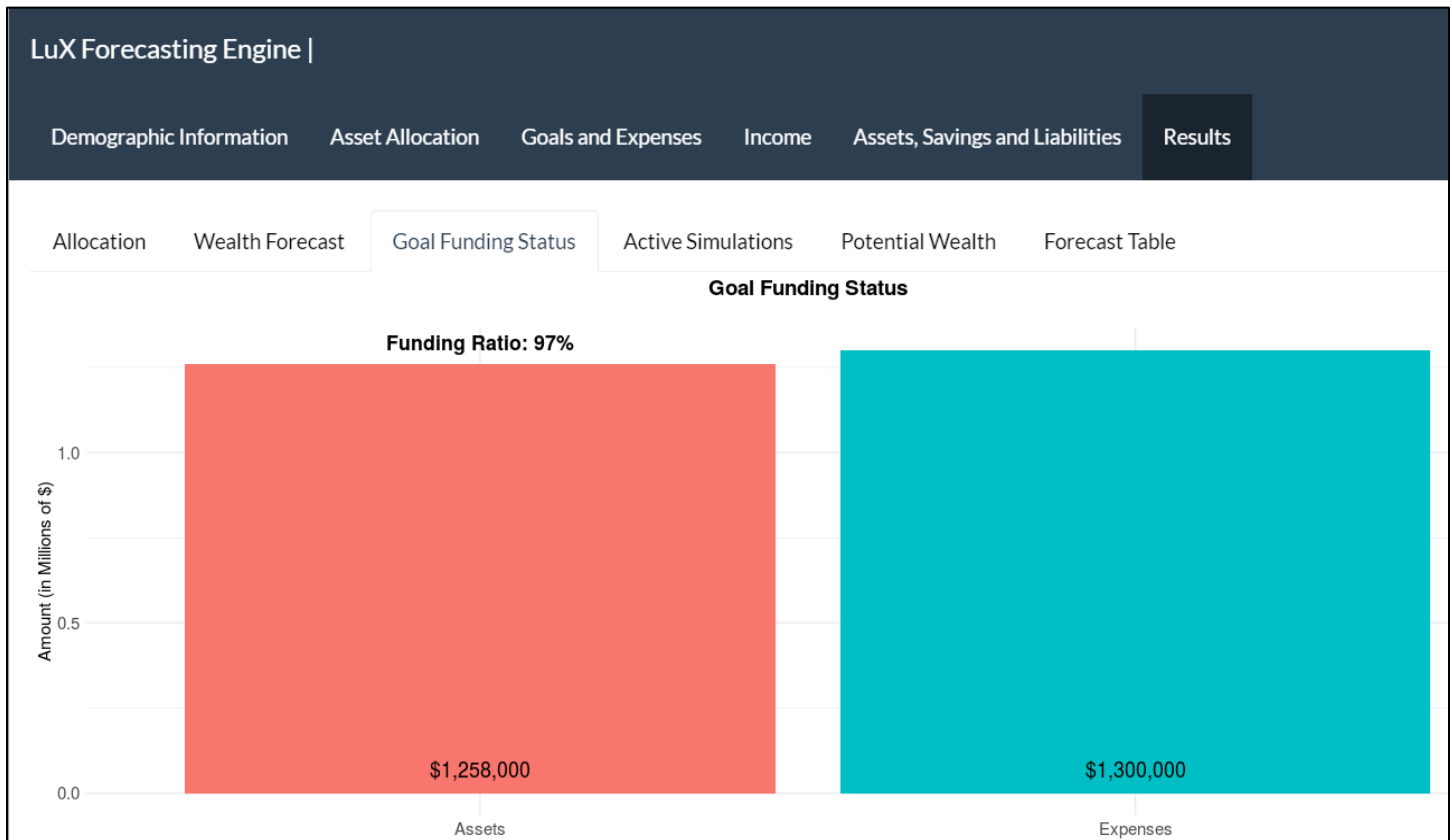
All in all, not bad for a carpenter just getting started!

Subsection C: Goal Funding Status

The next section in the Results is Goal Funding Status. This section is distinctly different from the Wealth Forecast as it does not account for market performance as part of the calculation. Instead, this section only considers your current assets, projected future savings, and projected future spending.

This slide attempts to show if you are able to self-fund your retirement through assets and savings alone with no market help. As such, this slide is the most restrictive slide in the Results section. It is designed to be conservative. The goal is for the Funding Ratio to be over 100%. If your Ratio is over 100% then it is highly likely that you will be able to fund your spending goals during retirement.

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Let's take a look at Goal Funding Status for Erik. The figures at the bottom of each bar represent the summation in present value terms (i.e. today's dollars) of current assets/savings and expenses/spending, respectively. So, Erik's total goal spending (again, expressed in today's dollars) is \$1,300,000 over his lifetime. While between his current assets and annual savings he will have \$1,258,000 with which to fund retirement. If we divide these two numbers, then we get a Funding Ratio of 97%. Erik is very close to being able to entirely fund his retirement just through saving!

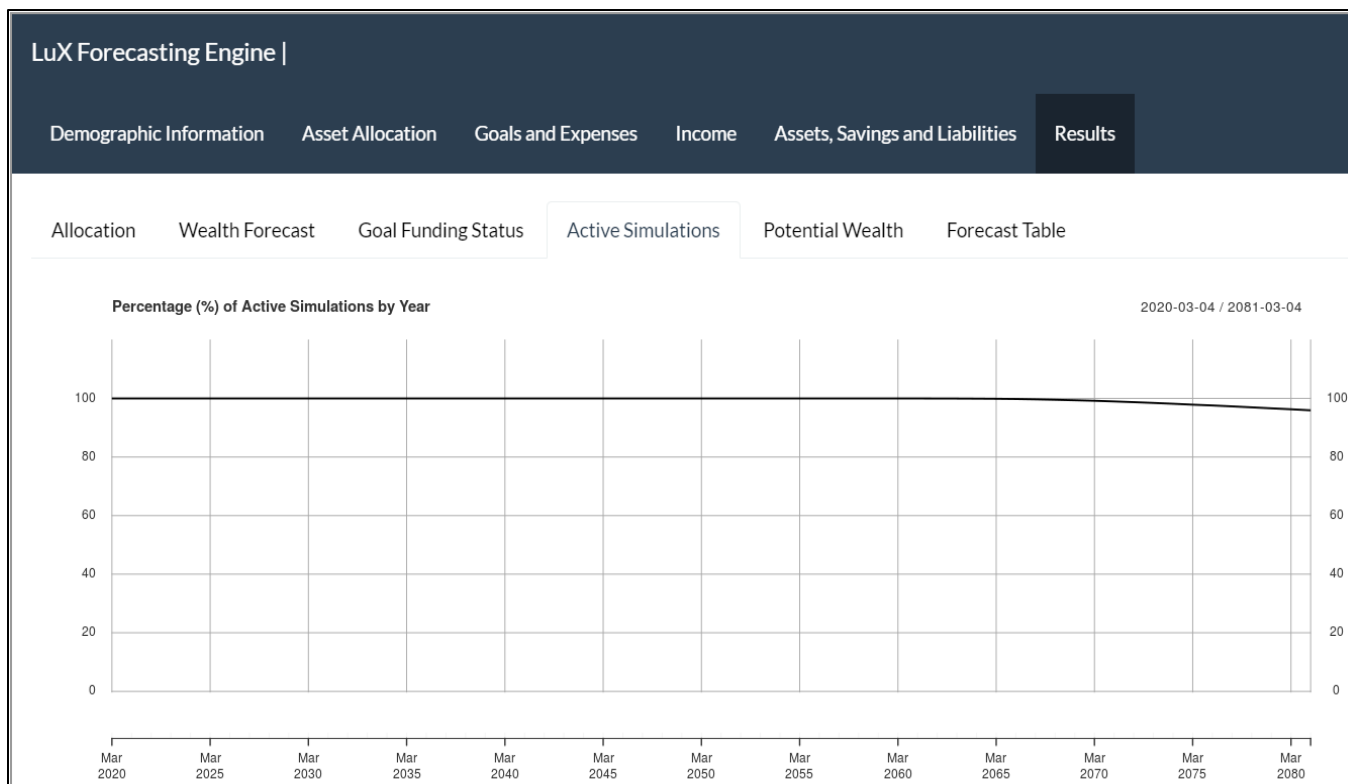
Subsection D: Active Simulations

We might be interested in knowing how likely it is that our plan fails at any point during retirement. That is, "what is the probability that I run out of money in a given year?". The Active Simulations slide answers this question.

Recall that the engine runs 100,000 simulations. That means that for each year there are 100,000 different possible values for your wealth. If in a given year any of those 100,000 scenarios is \$0, then your plan fails and you run out of money! Each year of your plan, Active Simulations looks at the proportion of cases that are still active (i.e. non-negative values) and graphs that percentage over time.

Let's examine the results for Erik and discuss the intuition.

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The horizontal axis shows the year while the vertical axis shows the percentage of active simulations (100 means 100% active, 50 means 50% active, etc.). As you can see, for most of Erik's life the thick line runs right along the 100%. This means that at each of those points in time Erik's wealth is positive. Toward the end of his life the line bends down ever so slightly and ends at around 95% in 2081. This implies that late in life some of the simulations produce results where Erik's wealth goes to \$0.

The takeaway here is that there is a small chance that Erik runs out of money very late in life. This probability is less than 5% so overall, he is in pretty good shape, but this risk is something that he will need to remain cognizant of.

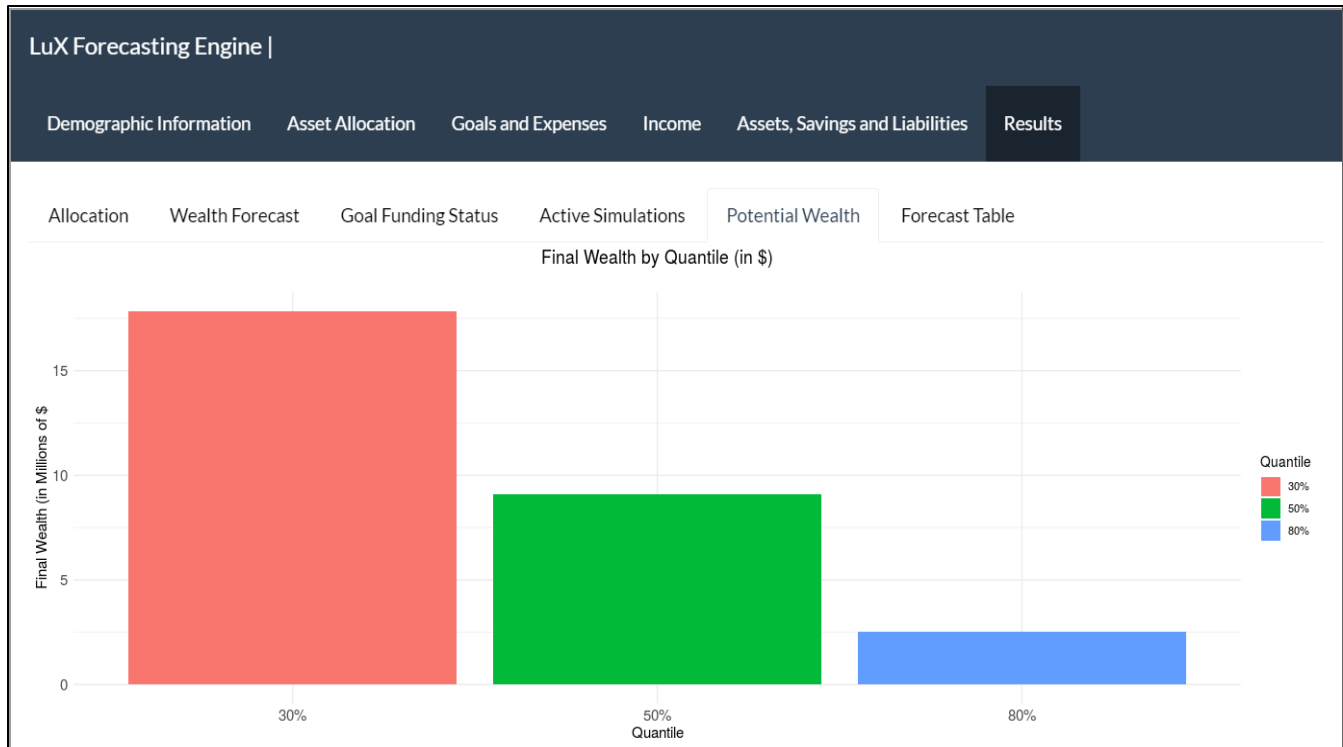
Notice how well this figure matches up with the Funding Ratio from Subsection C. Even when market performance is accounted for a small probability of failure is evident in the plan.

Subsection E: Potential Wealth

The next section is Potential Wealth. The graph here is essentially another way to view your terminal wealth at the end of the analysis. Specifically, it reorients the graph from Subsection A and only focuses on the last period. The interpretation is very similar to that of Subsection A.

Let's take a look at Erik's analysis and review the interpretation.

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The Red bar illustrates the best 30% of the 100,000 scenarios. For Erik, this number is around \$20,000,000. So, similar to Subsection A, the interpretation that follows is: out of 100,000 cases, 30% of them (i.e. 30,000) show Erik with a terminal wealth of *at least* \$20,000,000. Or, conversely, in 70% of cases, Erik's wealth is projected to be less than \$20,000,000.

The interpretation for the Green and Blue bars follows.

Subsection F: Forecast Table

The final section of Results is the Forecast Table. The Forecast Table provides a very detailed review of your wealth at each point in time across "probabilities" ranging from 95% to 5%. To echo the preceding discussions, 95% represents the *highest* probability scenarios and consequently the *lowest* levels of wealth accumulation; 95% of all scenarios examined are better than those of this column. Similarly, 5% represents the *lowest* probability scenarios and consequently the *highest* levels of wealth accumulation; only 5% of all possible scenarios are better than the figures in this column.

If Erik wishes to know what his wealth will be in 2047 with a 70% probability, then he can find it in this table. What about 2055 with a 10% probability? That figure can also be located in the table.

Let's take a look at the results from the final 2 years of his life 2080 and 2081 and see how the numbers look for a couple of the different probabilities.

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Demographic Information Asset Allocation Goals and Expenses Income Assets, Savings and Liabilities **Results**

Allocation Wealth Forecast Goal Funding Status Active Simulations Potential Wealth Forecast Table

Show 10 entries Search:

	95%	90%	85%	80%	75%	70%	65%	60%	55%	50%	45%	40%	35%
2080-03-05	87945	921646	1685096	2446492	3252215	4122044	5080942	6132116	7322994	8676897	10175012	11992236	141589
2081-03-05	18521	889072	1697569	2501610	3360167	4279589	5282176	6410548	7659764	9091264	10722363	12690475	149908

Showing 61 to 62 of 62 entries Previous 1 2 3 4 5 6 7 Next

Examine the circled figure corresponding to 95% in 2081. We find that at a 95% level of probability his wealth will only be \$18,521. This result recalls some of the findings we observed in Subsections C & D. In general, Erik's plan does very well, but there is a small chance that late in life he runs out of money (or very nearly runs out).

Correspondingly, examine the circled figure under the 50% column. At a 50% level of probability his wealth is estimated to end at around \$9,091,264. This is very close to the conclusions we arrived at in Subsections A & E. Approximately 50% of the time, Erik's terminal wealth will be around \$9,000,000.

Section 7: Concluding Remarks

As you conduct your own analysis you will likely notice that the results are highly variable. The wealth you are projected to accumulate at a 95% probability will likely be vastly different from that projected at 5%. Showing you the range of outcomes in the objective of this application. It is designed to illustrate the worst of bad, the best of the good and everything that can occur in between. Consider the full scope of the results and determine if you are comfortable with the range of possible outcomes.

Do you need to adjust your plan if you see that under a 95% probability scenario you may run out of money? Most likely not, but as you plan for retirement you should be aware that the outcome exists and decide how that makes you feel. Likewise, if you see that under a 5% scenario you end up with many millions, does that imply you are free to spend as you wish and pay no mind to budgeting and saving? No, it does not. But it does enable you to evaluate how constrained your plan is.

If you do need to make some changes, decide what is reasonable for your particular circumstances, adjust the inputs and rerun the tool to see how your outcomes react. Often, if implemented early, small changes can make a big difference. Saving an additional \$100 per month or cutting your annual budget by \$1,000 will add up over time.

If you need additional help or strategies, please review the resources available on our blog. We have a wealth (pun intended) of articles dedicated to helping people plan, save and grow their wealth for retirement and we want you to take advantage of them!