# RBC Retirement Funding Sensitivity® analysis

RBC Wealth Management

## Table of contents

# Executive summary

Investors and financial advisors who are interested in taking a planning approach to funding retirement often use popular forecasting models to quantify expectations and predict outcomes. Looking at numbers that represent future possibilities helps take some of the "guess work" out of their decisions.

One drawback to using these models is it can be hard to interpret the data, because context about major assumptions (variables) used to calculate "the number" are not provided. However, the RBC Retirement Funding Sensitivity® analysis helps put forecasting numbers into perspective. By showing how changes in variables investors can control (such as how much to save and when to retire) and how changes in variables they cannot control (like inflation and longevity) may result in widely different outcomes, investors can see which variables their retirement income plan is sensitive to.

A RBC Retirement Funding Sensitivity analysis offers a more complete approach to forecasting. Both investors and financial advisors can use the context it provides to look beyond the numbers and better understand the underlying assumptions. Its transparency also builds stronger working relationships based on the responsibilities it helps define and the trust it helps establish.

## Forecasting models: the foundation of planning

Retirement income planning may be one of the most important — and most stressful — financial issues people face. Not only do they need to think about what they want for their future, it forces them to ask, "will I have enough?" That's why, as investors and financial advisors plan for retirement, they often want to use numbers generated by forecasting models to help quantify investment decisions.

## Where the forecasting numbers come from

The concept of modeling is appealingly Newtonian: financial markets are like a universe where "physical laws" can describe the forces governing the behavior of investments. And entering investor information into equations that represent those physical laws produces empirical data about possible portfolio performance. It's a great strategy ... in theory. But what do these numbers really tell us? A quick look at the underlying principles of popular models reveals some major short-comings.

# Model #1: an oversimplified view

The straight-line compound interest rate or "deterministic" model has been popular for years, because it gives you a quick way to see how a portfolio may grow over time. Simply plug in a base asset value, the amount invested every year, the expected rate of return, and you've got a number showing the portfolio balance over the course of an investor's lifetime.

**Deterministic**

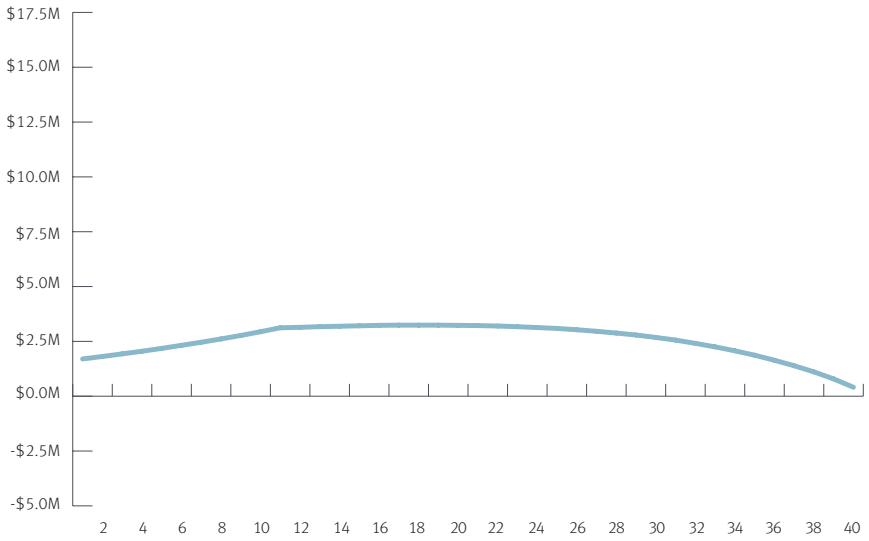



Illustration assumptions: $1.6 million beginning portfolio balance, 6% estimated annual return rate, 3% estimated annual inflation rate and $100,000 estimated annual withdrawal rate (in today's dollars.) Using these assumptions the investor would have a balance of $120,000 at age 95.

# Model #2: an imperfect improvement

Of course, investment performance can vary from year to year. So the "Monte Carlo" or "stochastic" model plots a random annual rate of return each year to forecast portfolio performance based on the effects of potential market ups and downs. For example, if an investor expects that market volatility may result in a portfolio gaining or losing up to 6% a year, this model would randomly calculate returns that average 6% to produce a forecast. Sometimes called a "sample portfolio," the following chart shows one possible outcome, based on random variable annual rates of return.

**Stochastic table**

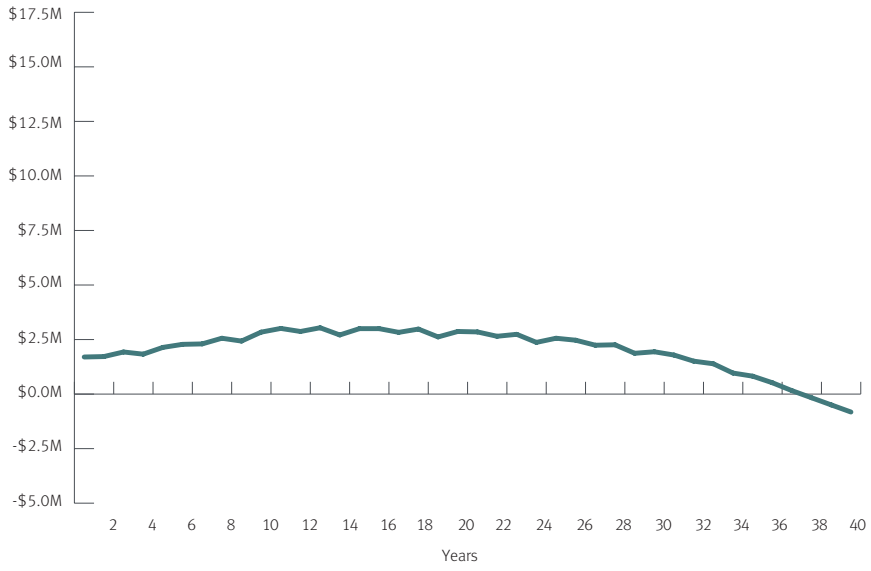



Illustration assumptions: $1.6 million beginning portfolio balance, with a repeating five-year variable estimated annual return rate cycle (6%, 0%, 12%, -6%, 18%), 3% estimated annual inflation rate and $100,000 estimated annual withdrawal rate (in today's dollars.) Using these assumptions the investor would have a balance of negative $1,170,000 at age 95.

Using the same variable guidelines, this model then creates thousands of other sample portfolios and uses statistical analysis of the results to calculate an "overall success rate" which is the percentage chance an investor will meet all their financial objectives during their lifetime. The desired goal and the terminal net worth of the 90th, 50th and 10th percentiles are also listed. The following chart shows how the results of a Monte Carlo simulation are displayed.

### Goal details

The graph below illustrates each of the trials in the Monte Carlo Simulation for each of the goals. Dark blue line shows the successful trials and gold shows the unsuccessful trials.

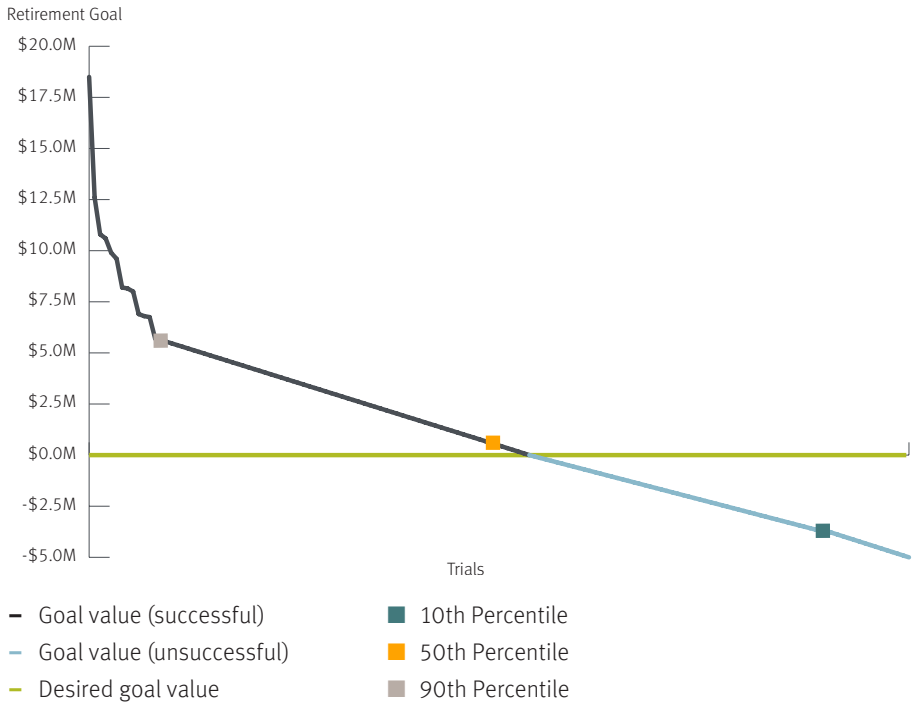



Illustration assumptions: each percentile illustrates the projected account value at which the corresponding percentage of sample portfolios resulted in lower values. For example, at the 90th percentile, 90% of the outcomes are lower than the given account value. Using these assumptions, the proposed plan has a 54% probability of success.

# Actual returns: what the markets say and sequence of returns matters

To get an idea of how a portfolio of retirement assets may behave in the future, many people find it helpful to look at how their actual investments would perform using actual market returns. The rationale is: economic and market cycles repeat themselves. And if conditions are sufficiently similar from cycle to cycle, they should produce similar results over time.

**Actual returns**

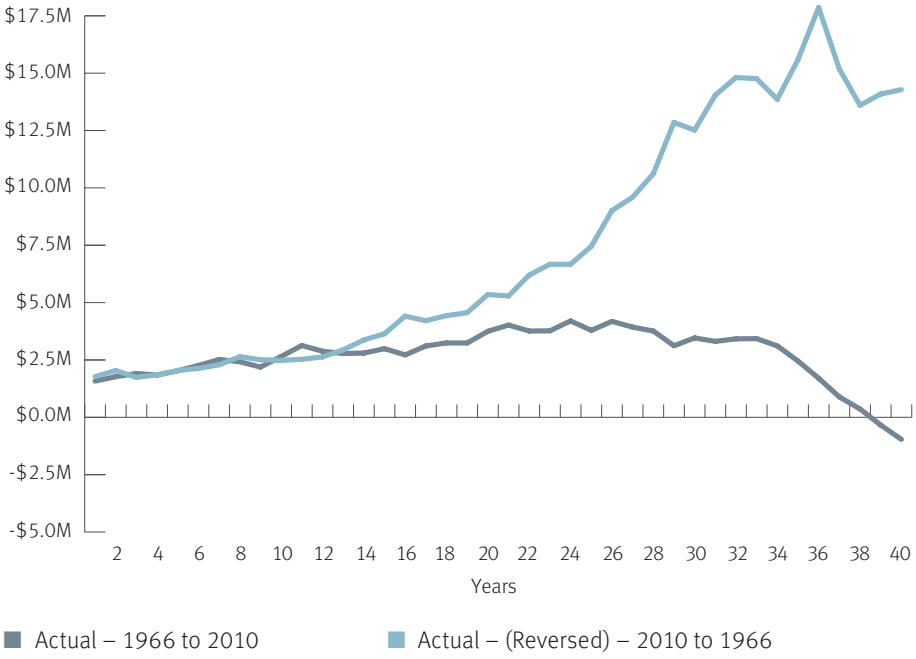



Illustration assumptions: $1.6 million beginning portfolio balance, actual returns are a mix of 50% of the Standard and Poor's 500 Index and 50% of the Barclays Capital Aggregate Bond Index from January 1, 1966 to December 31, 2010*, actual annual inflation rate and an estimated annual withdrawal of $100,000 (in today's dollars.) Using these assumptions the investor would have a balance of negative $1,610,000 at the age of 95.

Important note regarding impact sequence of returns can have on portfolio performance: If annual returns are calculated in reverse order (starting 2010 and ending in 1966) the ending value would be $14,840,000.

* January 1, 1966 to December 31, 2010; Average annual return during this period was 10.85%.

# Reality: an uncertain future

The true value of what popular forecasting models can contribute to retirement income planning becomes clear when you compare the forecasts to actual market returns. With such widely disparate results, how do you know which model to use as a basis for decision making? While these models may help investors feel like they are taking a methodical approach, the plans they are based upon may not live up to expectations.

**Deterministic vs. stochastic vs. actual returns**

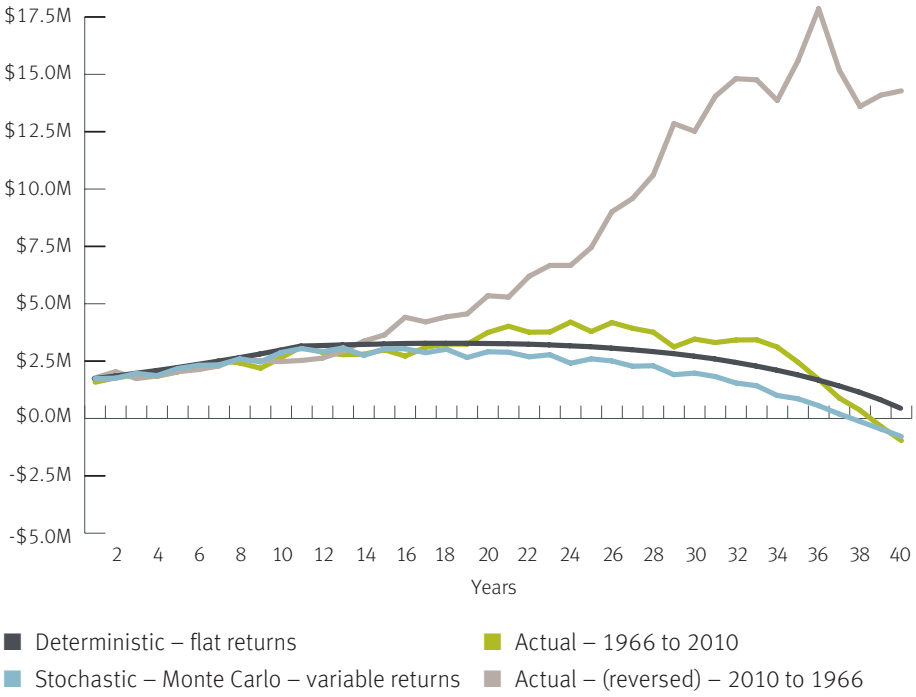



Illustration assumptions: Projections vary widely depending on the model you choose. The forecast is important, but should be reviewed periodically to make sure you are on a path to meet your goals.

## A key finding

As you can see, many forecasting models fall short of what they promise in terms of the value the numbers contribute to financial decision-making because the calculations lack the depth or detail required to plan appropriately. Here's why.

## Measuring major forces

Effective planning begins with a solid understanding of the investor's current net worth and future goals. Once these parameters are established the potential effects of seven major forces, when taken together, will shape what happens in the investor's financial life.

1. Saving Strategies
2. Retirement Age
3. Lifestyle Expenses (spending)
4. Investment Return Rate
5. Income Taxes
6. Inflation
7. Life Expectancy

These major forces are all variables. Some variables, investors can control, such as how much to invest, when to retire and their retirement lifestyle spending choices. Other variables, such as investment return rate and tax consequences can be influenced by asset allocation and tax management. And other variables, such as the effects of inflation and a person's life expectancy are beyond the investor's control.

## Prioritizing efforts

Why is it important to understand which variables can be controlled? Because it helps the investor and financial advisor know what they are responsible for when it comes to portfolio performance — and where to focus their efforts when they need to adapt to the forces they cannot do anything about.

## What this means for the future of forecasting

For a planning approach to be successful, it is critical for the investor and his or her financial advisor to understand the seven major forces and the role each may play in the investor's unique financial life. This is the reason many forecasting models have one or both of these two fundamental flaws.

1. The number provided may leave out one or more major force.
2. The number provided may have no context for interpretation.

# RBC Retirement Funding Sensitivity analysis:

## A quantum leap forward in predictive modeling

If traditional forecasting models are like 18th Century Newtonian physics, a new model for investors and financial advisors who wish to take a planning approach has more in common with the quantum physics of the 21st Century. Similar to the perspective Einstein's theory of relativity offers to scientists studying the cosmos, RBC Retirement Funding Sensitivity analysis shows investors and financial advisors how slight changes to the major forces can result in different outcomes — some of them substantial.

### Zoom in for detail

For example, RBC Retirement Funding Sensitivity modeling can show the impact retiring two years sooner or later can have on portfolio balances. Depending on the investor's situation, risk tolerance and opinion about where inflation is headed, maybe it's time to adjust the amount invested annually, portfolio allocation or lifestyle expectations?

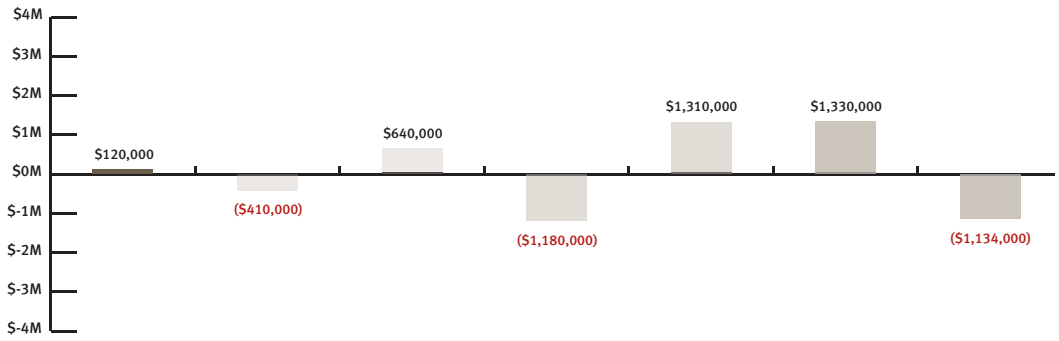
### Zoom out for big picture

RBC Retirement Funding Sensitivity modeling provides similar comparisons for assumptions about the other major forces, providing a total of 14 different "numbers" and the necessary context for them to be meaningful. Taken in aggregate, a RBC Retirement Funding Sensitivity analysis allows investors and their financial advisors to make truly well-informed decisions.

| | | Things You Control | | | | | |
|---|---|---|---|---|---|---|---|
| | | Qualified Savings | | Retirement Age | | Retirement Expense | |
| | | Lower | Higher | Sooner | Later | Lower | Higher |
| | | $10,000 | $30,000 | 64 | 68 | $90,000 | $110,000 |
| **Sensitivity** | **Base Case** | **1a** | **1b** | **2a** | **2b** | **3a** | **3b** |
| Current Age - Client | 55 | 55 | 55 | 55 | 55 | 55 | 55 |
| Assets - Non Qualified | $800,000 | $800,000 | $800,000 | $800,000 | $800,000 | $800,000 | $800,000 |
| Assets - Qualified | $800,000 | $800,000 | $800,000 | $800,000 | $800,000 | $800,000 | $800,000 |
| Total Investment Assets | $1,600,000 | $1,600,000 | $1,600,000 | $1,600,000 | $1,600,000 | $1,600,000 | $1,600,000 |
| Social Security 1 - Client | $12,000 | $12,000 | $12,000 | $12,000 | $12,000 | $12,000 | $12,000 |
| Social Security 2 - Spouse | $6,000 | $6,000 | $6,000 | $6,000 | $6,000 | $6,000 | $6,000 |
| Annual Savings Until Retirement (Qualified) | $20,000 | $10,000 | $30,000 | $20,000 | $20,000 | $20,000 | $20,000 |
| Retirement Age - Client | 66 | 66 | 66 | 64 | 68 | 66 | 66 |
| Assets at Retirement | $3,110,000 | $2,960,000 | $3,260,000 | $2,770,000 | $3,500,000 | $3,110,000 | $3,110,000 |
| Retirement Lifestyle Expense (Income After-Tax - Today's Dollars) | $100,000 | $100,000 | $100,000 | $100,000 | $100,000 | $90,000 | $110,000 |
| Investment Estimated Expected Return Rate (Pre-Tax) | 6.0% | 6.0% | 6.0% | 6.0% | 6.0% | 6.0% | 6.0% |
| Income Tax Rate - Average | 25.0% | 25.0% | 25.0% | 25.0% | 25.0% | 25.0% | 25.0% |
| Inflation Rate | 3.0% | 3.0% | 3.0% | 3.0% | 3.0% | 3.0% | 3.0% |
| Life Expectancy - Client | 95 | 95 | 95 | 95 | 95 | 95 | 95 |
| Investment Assets at Life Expectancy | $120,000 | ($410,000) | $640,000 | ($1,180,000) | $1,310,000 | $1,330,000 | ($1,140,000) |
| Present Value | $36,000 | NEGATIVE | $196,000 | NEGATIVE | $370,000 | $407,000 | NEGATIVE |
| Age Investment Assets Run Out | | 94 | | 92 | | | 92 |

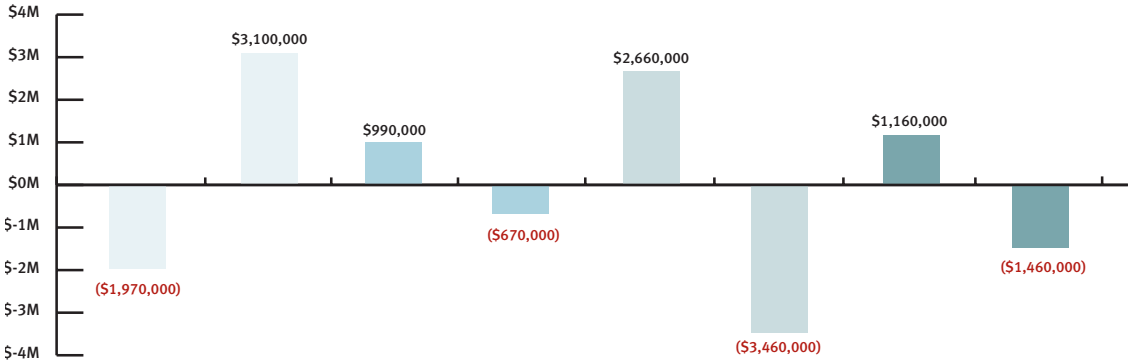
By connecting different outcomes to one variable change at a time, investors and financial advisors can better understand the role each force plays in the investor's financial future, identify opportunities and threats and gain insights into what the different numbers are really telling them.

| | | Things You Control | | | | | |
|---|---|---|---|---|---|---|---|
| | | Qualified Savings | | Retirement Age | | Retirement Expense | |
| | | Lower | Higher | Sooner | Later | Lower | Higher |
| | | $10,000 | $30,000 | 64 | 68 | $90,000 | $110,000 |
| **Sensitivity** | **Base Case** | **1a** | **1b** | **2a** | **2b** | **3a** | **3b** |
| Current Age - Client | 55 | 55 | 55 | 55 | 55 | 55 | 55 |
| Assets - Non Qualified | $800,000 | $800,000 | $800,000 | $800,000 | $800,000 | $800,000 | $800,000 |
| Assets - Qualified | $800,000 | $800,000 | $800,000 | $800,000 | $800,000 | $800,000 | $800,000 |
| Total Investment Assets | $1,600,000 | $1,600,000 | $1,600,000 | $1,600,000 | $1,600,000 | $1,600,000 | $1,600,000 |
| Social Security 1 - Client | $12,000 | $12,000 | $12,000 | $12,000 | $12,000 | $12,000 | $12,000 |
| Social Security 2 - Spouse | $6,000 | $6,000 | $6,000 | $6,000 | $6,000 | $6,000 | $6,000 |
| Annual Savings Until Retirement (Qualified) | $20,000 | $10,000 | $30,000 | $20,000 | $20,000 | $20,000 | $20,000 |
| Retirement Age - Client | 66 | 66 | 66 | 64 | 68 | 66 | 66 |
| Assets at Retirement | $3,110,000 | $2,960,000 | $3,260,000 | $2,770,000 | $3,500,000 | $3,110,000 | $3,110,000 |
| Retirement Lifestyle Expense (Income After-Tax - Today's Dollars) | $100,000 | $100,000 | $100,000 | $100,000 | $100,000 | $90,000 | $110,000 |
| Investment Estimated Expected Return Rate (Pre-Tax) | 6.0% | 6.0% | 6.0% | 6.0% | 6.0% | 6.0% | 6.0% |
| Income Tax Rate - Average | 25.0% | 25.0% | 25.0% | 25.0% | 25.0% | 25.0% | 25.0% |
| Inflation Rate | 3.0% | 3.0% | 3.0% | 3.0% | 3.0% | 3.0% | 3.0% |
| Life Expectancy - Client | 95 | 95 | 95 | 95 | 95 | 95 | 95 |
| Investment Assets at Life Expectancy | $120,000 | ($410,000) | $640,000 | ($1,180,000) | $1,310,000 | $1,330,000 | ($1,140,000) |
| Present Value | $36,000 | NEGATIVE | $196,000 | NEGATIVE | $370,000 | $407,000 | NEGATIVE |
| Age Investment Assets Run Out | | 94 | | 92 | | | 92 |




| | Social Security 1 | Social Security 2 | Cash Inflow | Cash Inflow | Cash Inflow | Cash Inflow | Cash Inflow |
|---|---|---|---|---|---|---|---|
| Current Age – Spouse | | 55 | | | | | |
| Start Age | 66 | 66 | 55 | 55 | 55 | 55 | 55 |
| End Age | 95 | 95 | 65 | 55 | 55 | 55 | 55 |
| Number of Years | 30 | 30 | 11 | 30 | 1 | 1 | 1 |
| Inflation/Index | 1.0% | 1.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| Amount $ (Today's $) | $12,000 | $6,000 | $0 | $0 | $0 | $0 | $0 |
| Tax Rate | | 66 | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| Amount $ After-Tax | | 95 | $0 | $0 | $0 | $0 | $0 |
| Future Value | $13,388 | $6,694 | $0 | $0 | $0 | $0 | $0 |
| Type/Description | Social Security 1 | Social Security 2 | Additional Savings (Taxable) | Pension | | | |

| | Things Hard to Control | | | | Things Very Hard to Control | | | |
|---|---|---|---|---|---|---|---|---|
| | Investment Return Rate | | Income Tax Rate | | Inflation Rate | | Life Expectancy | |
| | Lower | Higher | Lower | Higher | Lower | Higher | Lower | Higher |
| | 5.0% | 7.0% | 20% | 30% | 2.0% | 4.0% | 90 | 100 |
| **Sensitivity** | 4a | 4b | 5a | 5b | 6a | 6b | 7a | 7b |
| Current Age - Client | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 |
| Assets - Non Qualified | $800,000 | $800,000 | $800,000 | $800,000 | $800,000 | $800,000 | $800,000 | $800,000 |
| Assets - Qualified | $800,000 | $800,000 | $800,000 | $800,000 | $800,000 | $800,000 | $800,000 | $800,000 |
| Total Investment Assets | $1,600,000 | $1,600,000 | $1,600,000 | $1,600,000 | $1,600,000 | $1,600,000 | $1,600,000 | $1,600,000 |
| Social Security 1- Client | $12,000 | $12,000 | $12,000 | $12,000 | $12,000 | $12,000 | $12,000 | $12,000 |
| Social Security 2 - Spouse | $6,000 | $6,000 | $6,000 | $6,000 | $6,000 | $6,000 | $6,000 | $6,000 |
| Annual Savings Until Retirement (Qualified) | $20,000 | $20,000 | $20,000 | $20,000 | $20,000 | $20,000 | $20,000 | $20,000 |
| Retirement Age - Client | 66 | 66 | 66 | 66 | 66 | 66 | 66 | 66 |
| Assets at Retirement | $2,850,000 | $3,400,000 | $3,150,000 | $3,070,000 | $3,110,000 | $3,110,000 | $3,110,000 | $3,110,000 |
| Retirement Lifestyle Expense (Income After-Tax - Today's Dollars) | $100,000 | $100,000 | $100,000 | $100,000 | $100,000 | $100,000 | $100,000 | $100,000 |
| Investment Estimated Expected Return Rate (Pre-Tax) | 5.0% | 7.0% | 6.0% | 6.0% | 6.0% | 6.0% | 6.0% | 6.0% |
| Income Tax Rate - Average | 25.0% | 25.0% | 20.0% | 30.0% | 25.0% | 25.0% | 25.0% | 25.0% |
| Inflation Rate | 3.0% | 3.0% | 3.0% | 3.0% | 2.0% | 4.0% | 3.0% | 3.0% |
| Life Expectancy | 95 | 95 | 95 | 95 | 95 | 95 | 90 | 100 |
| Investment Assets at Life Expectancy | ($1,970,000) | $3,100,000 | $990,000 | ($680,000) | $2,660,000 | ($3,460,000) | $1,160,000 | ($1,460,000) |
| Present Value | NEGATIVE | $950,000 | $303,000 | NEGATIVE | $1,204,000 | NEGATIVE | $412,000 | NEGATIVE |
| Age Investment Assets Run Out | 90 | | | 94 | | 89 | | 99 |




| | Cash Outflow | Cash Outflow | Cash Outflow | Cash Outflow | Cash Outflow | Cash Outflow |
|---|---|---|---|---|---|---|
| | | | | | | |
| Start Age | 55 | 55 | 55 | 55 | 55 | 55 |
| End Age | 55 | 55 | 55 | 55 | 55 | 55 |
| Number of Years | 1 | 1 | 1 | 1 | 1 | 1 |
| Inflation/Index | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| Amount $ (Today's $) | $0 | $0 | $0 | $0 | $0 | $0 |
| Tax Rate | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| Amount $ After-Tax | $0 | $0 | $0 | $0 | $0 | $0 |
| Future Value | $0 | $0 | $0 | $0 | $0 | $0 |
| Type/Description | | | | | | |

# Find out how well RBC Retirement Funding Sensitivity analysis suits your planning approach

As you can see, a RBC Retirement Sensitivity analysis offers a relatively concise means to gain valuable context necessary for well-informed financial decision making. And it provides this information in a transparent way that can help investors and their financial advisors work better together.

For more information, contact your financial advisor.

RBC Wealth Management does not provide tax or legal advice. All decisions regarding the tax or legal implications of your investments should be made in connection with your independent tax or legal advisor.

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