NaviPlan Standard Learning Guide

Monte Carlo and Scenario Probability Analyses

Canadian version 11.0

EISI, Winnipeg

Disclaimer

This software is designed to allow a financial planner to demonstrate and evaluate various strategies in order to achieve a client's financial goals. It is licensed on the understanding that EISI is not engaged in rendering legal, accounting, or other professional advice and, if any such advice is required, the services of a competent professional person should be obtained.

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Contents

Using the Learning Guide

The NaviPlan Standard Learning Guide is intended to help you learn how to use NaviPlan. To use this learning guide effectively, go through each page from start to finish.

Conventions

The NaviPlan Standard Learning Guide includes the following conventions:

- The names of items that are labelled on the screen are italicized. For example,

  The *Clients* page opens.

- Within instructions, the names of items that you must select, click, or enter appear in bold. For example,

  Select **Recommended,** and then click **OK**.

- To help you navigate through the application, locations are separated by en dashes. For example,

  Financial Picture section – *Net Worth* category – *Accounts* page

Essential Windows skills

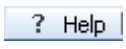
This learning guide assumes that you know how to perform the following tasks:

- Use the mouse (click, double-click, right-click, drag, and point)
- Move, resize, and close a window
- Navigate through a dialog box and use scroll bars
- Choose menu commands and select options from windows and submenus

If you are unsure about any of these Windows essentials, refer to Microsoft Windows user documentation.

Using Help

The quickest way to get information about any command, dialog box, or item within NaviPlan Standard is to use the application Help.



To access the Help, click the **Help** button at the top of the NaviPlan window.

Monte Carlo and Scenario Probability Analyses module

The NaviPlan Standard Monte Carlo and Scenario Probability Analyses Learning Guide was created using NaviPlan Standard version 11 and a joint analysis Level 2 Plan.

Purpose

The purpose of this learning guide is to determine the effects of market and longevity risks on your clients' financial plan and goals.

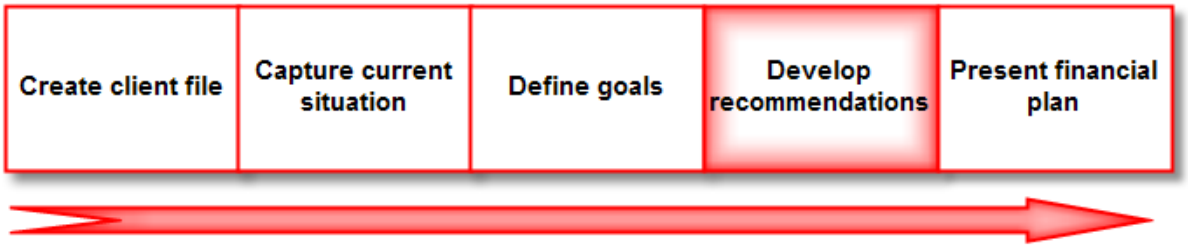
Learning objectives

Upon successful completion of this module, you will be able to

- Identify the purpose and key concepts of scenario probability and sensitivity analysis
- Compare the two simulation tools in NaviPlan – *Scenario Probability* vs. *Monte Carlo Sensitivity Analysis*
- Analyze *Scenario Probability* results
- Identify *Monte Carlo Sensitivity Analysis* settings
- Analyze *Monte Carlo Sensitivity Analysis* results

The following diagram shows the planning stages for creating a financial plan, and the planning stage or stages involved in this learning guide. The Monte Carlo and Scenario Probability Analyses module is part of the *Develop recommendations* stage.

NaviPlan planning stages



Learning objective: Identify the purpose and key concepts of scenario probability and sensitivity analysis

After entering your clients' current financial data and then implementing strategies that will meet their goals, you may want to see what would happen if some of the financial data and assumptions were to change due to market and longevity risks. Will your clients still be able to meet their goals?

In financial projections, simulation tools are often used to evaluate risk. NaviPlan's simulation tools, *Scenario Probability* and *Monte Carlo Sensitivity Analysis*, use a similar methodology to examine the effects of risk based on changes to certain variables. Scenario probability looks solely at the probability of covering goal expenses given varying degrees of market risk. Sensitivity analysis looks at how the clients' cash flow position in the plan is affected by market risk and, if selected, longevity.

Purpose of scenario probability and sensitivity analysis

- While the financial plan you have created is based on static assumptions such as fixed return rates and fixed life expectancies, in reality, these variables will not be static; any changes may cause your clients to outlive their resources or not achieve the accumulation needed
- Sensitivity analysis tools assess the effect of risks on the plan by
  - varying return rates to analyze the risk of market fluctuations (based on standard deviations defined for the account)
  - varying the life expectancy to analyze the risk of dying too soon or outliving assets (based on mortality tables)
- Scenario probability tools assess the effect of risk on a goal by varying return rates based on standard deviations; however, life expectancy cannot be randomized in a NaviPlan scenario probability analysis
- To assess the risks, NaviPlan projects the plan results multiple times
  - Each projection of the plan may be referred to as a trial or iteration
- During each trial, variables change, and in turn, the overall results for the plan or goal (e.g., asset values, ability to cover needs, goal coverage) may change

- For example, NaviPlan's *Monte Carlo Sensitivity Analysis* analyzes the plan with one set of assumptions for life expectancy and/or varying return rates, records the results (e.g., 75% success rate), and then runs the plan again with another set of assumptions
- This process continues for 100–1,000 trials, depending on the number of trials you specify

Effects of standard deviation

NaviPlan's sensitivity analysis and scenario probability tools use standard deviation as a statistical measure of the range of each asset's performance volatility. The higher the standard deviation of an asset, the higher the volatility of the asset's returns. Standard deviations are associated with both asset classes and individual assets.

When capturing your clients' current situation, you can enter asset class weightings for each account.

Account Details dialog box

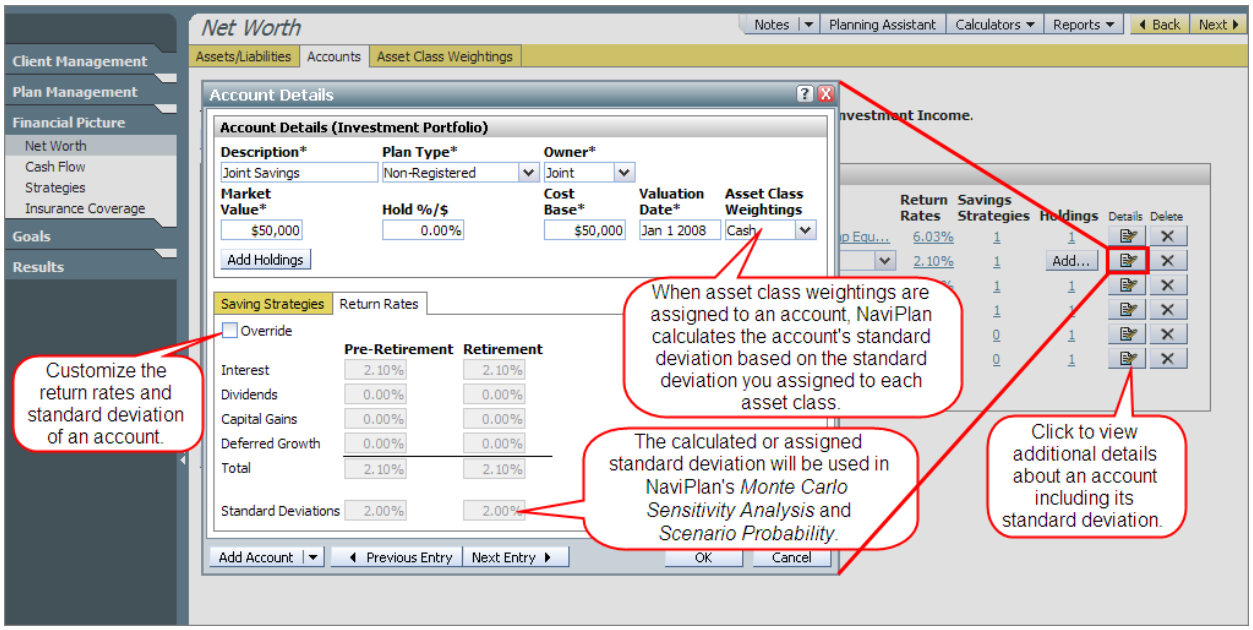


Figure 1: Financial Picture section – Net Worth category – Accounts page – <account name> Details button – Account Details dialog box – Return Rates tab

- NaviPlan uses the asset class weightings information to assign a standard deviation to the account based on the standard deviation associated with each asset class.

- To view the account's standard deviation, click the **Details** button next to that account, and then go to the **Return Rates** tab.
- The *Override* check box allows you to override the pre-retirement and retirement standard deviations.
- In both the *Monte Carlo Sensitivity Analysis* and *Scenario Probability* tools, the standard deviation values determine the variability of the return rates of the assets in a plan.
- In the current plan analysis, the standard deviation values from the *Accounts* page determine the variability of the return rates of the assets in a plan.
- In the proposed or recommended analysis in plans using asset allocation, the source of the standard deviation value differs. For accounts funding goals, the standard deviation is based on the investor profile selected for the scenario. For unlinked accounts, the standard deviation is based on the investor profile selected for the plan.

Asset Allocation Settings dialog box

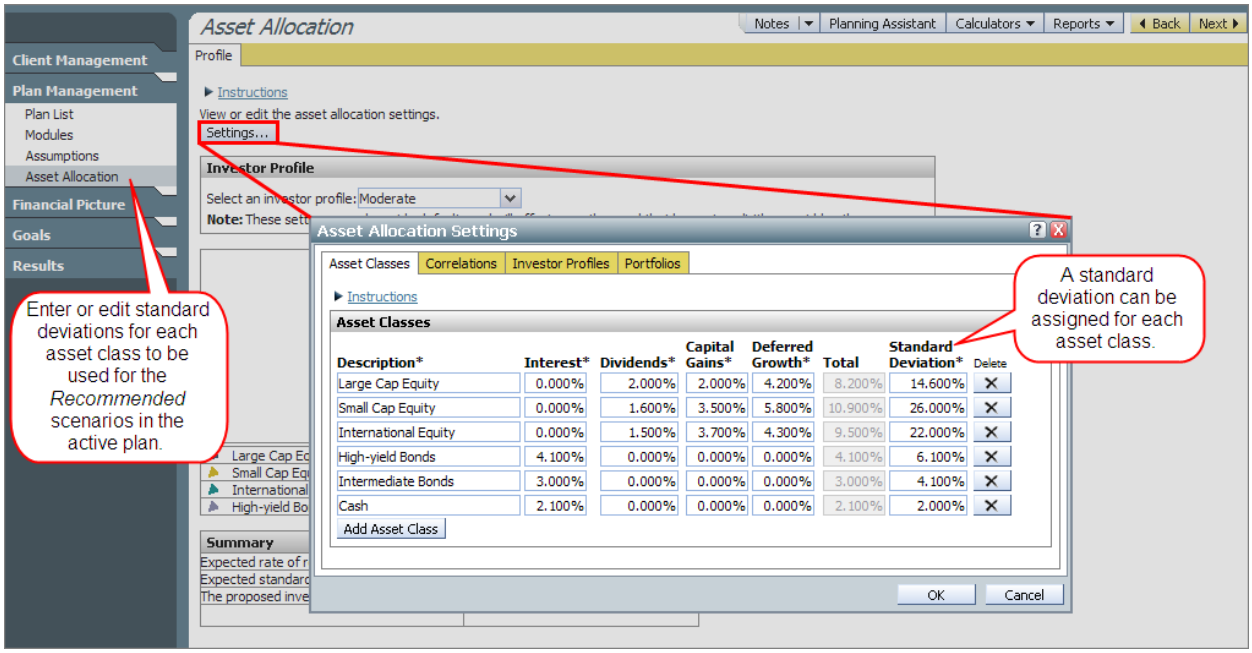


Figure 2: Plan Management section – Asset Allocation category – Profile page – Settings button – Asset Allocation Settings dialog box – Asset Classes tab

For more information about asset allocation settings, please see the Asset Allocation Learning Guide.

Learning objective: Compare the two simulation tools in NaviPlan: Scenario Probability vs. Monte Carlo Sensitivity Analysis

Knowing the differences between the *Scenario Probability* and *Monte Carlo Sensitivity Analysis* tools in NaviPlan will allow you to select the analysis that best suits your clients' situation. This section will help you identify the main similarities and difference between the two tools.

Both *Scenario Probability* and *Monte Carlo Sensitivity Analysis*

- Generate multiple trials/iterations
- Randomize return rates based on standard deviations

Scenario Probability

Scenario Probability is a tool you can use to analyze an individual goal to determine the effect of market risk on a scenario in a completed plan.

Scenario Probability dialog box

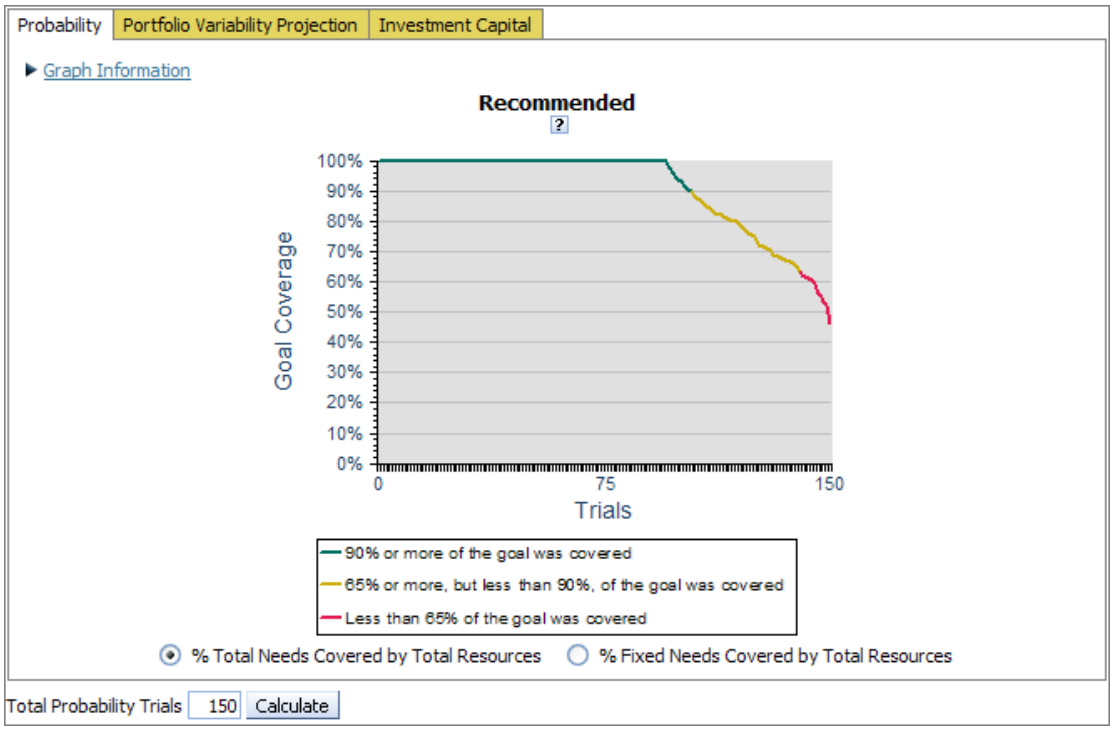


Figure 3: Goals section – Retirement category – Scenarios page – Objectives tab – Scenario Probability link – Scenario Probability Details dialog box – Scenario Probability dialog box – Probability tab

Key facts

- *Scenario Probability* assesses one goal at a time
- *Scenario Probability r*eports on the goal coverage of a specific goal
- Use this tool when working on the *Scenarios* page and testing goal-specific recommendations within alternative scenarios
- *Scenario Probability* runs multiple trials of a plan and randomizes return rates based on their standard deviations to assess the resulting changes to the overall goal coverage for a single goal based on available accounts
  - For an accurate analysis, you must ensure that all investment accounts have a realistic standard deviation; riskier assets will have higher standard deviations
- By varying the return rates each year for multiple trials, account balances will change in each trial, and the resulting goal coverage for the trial will be affected
- *Scenario Probability* evaluates overall goal coverage, rather than annual cash flow; for example, by applying different rates of return each year of the plan to the assets linked to this goal
  - trial 1 may have 100% goal coverage
  - trial 2 may have 65% goal coverage
  - trial 3 may have 85% goal coverage
- The results will be plotted on a graph that summarizes the values using ranges of results based on the goal coverage of the trials; for example,
  - in 98 trials, 90% or more of the goal was covered
  - in 47 trials, 65% or more but less than 90% of the goal was covered
  - in 5 trials, less than 65% of the goal was covered

Monte Carlo Sensitivity Analysis

Monte Carlo Sensitivity Analysis is a simulation tool you can use to analyze all goals to determine the effects of market and longevity risks on a completed plan.

Goal Summary graph

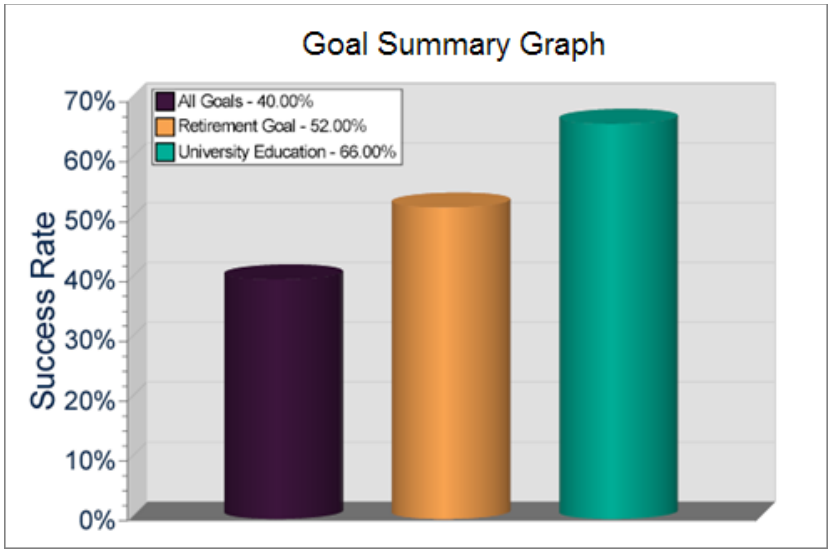


Figure 4: Reports menu – Monte Carlo – Monte Carlo – Monte Carlo Sensitivity Analysis graph (showing the Goal Summary graph)

Key facts

- *Monte Carlo Sensitivity Analysis* assesses all goals at the same time
- Since it reports on success or failure for multiple goals, use the *Monte Carlo Sensitivity Analysis* when you have finished making all of your recommendations and your clients' goals are 100% achieved, otherwise it is very likely the projection will fail
- *Monte Carlo Sensitivity Analysis* runs multiple trials of a plan and randomizes return rates based on their standard deviations and life expectancy (if applicable) to assess if the goal expenses create deficits beyond a tolerance that you define
  - For an accurate analysis, you must ensure that all investment accounts have a realistic standard deviation; riskier assets will have higher standard deviations

- By varying the return rates each year and life expectancy (optional) for multiple trials, account balances, incomes, and expenses may change in each trial, and the resulting goal expenses will or will not be covered within the tolerance you define
- *Monte Carlo Sensitivity Analysis* evaluates the annual cash flow position, rather than overall goal coverage, and determines whether the trial is a success or failure
- For example
  - trial 1 may incur deficits and fail to cover the applicable expenses within the tolerance you defined (failure)
  - trial 2 may incur deficits and fail to cover the applicable expenses within the tolerance you defined (failure)
  - trial 3 may meet all applicable expenses within the tolerance you defined (success)
- NaviPlan displays the percentage of total trials where the goal was completely covered within the tolerance you defined (success); for example,
  - retirement goal expenses were covered in 50% of the trials
  - education goal expenses were covered in 54% of the trials
  - all (both retirement and education) goal expenses were covered in 30% of the trials

Learning objective: Analyze Scenario Probability results

This learning objective will help you learn how the *Scenario Probability* tool works.

Scenario Probability dialog box

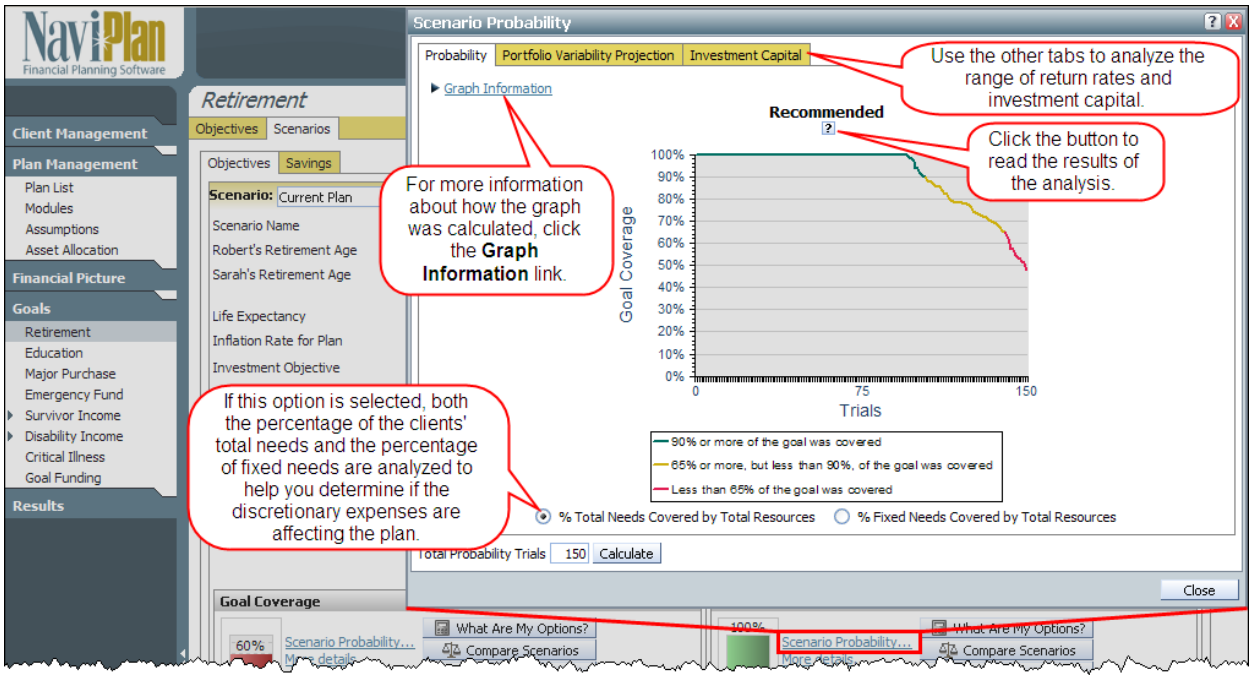


Figure 5: Goals section – Retirement category – Scenarios page – Objectives tab – Scenario Probability link – Scenario Probability dialog box – Probability tab

To perform a scenario probability analysis on the selected scenario, complete the following steps:

1. Go to the **Plan Management** section – **Modules** category – **Modules** page to ensure that the *Monte Carlo Analysis* module is selected.
2. Go to the **Goals** section – <**goal name**> category – **Scenarios** page – **Objectives** tab.
3. Click the **Scenario Probability** link. The *Scenario Probability* dialog box opens.

   OR

   To compare two scenarios side by side and perform a probability analysis on both of the selected scenarios, click the **Compare Scenarios** button.

Analysis results

- The *Probability* tab displays the <scenario> probability graph which sorts and colour-codes the goal coverage percentage values
- Goal coverage percentage is the ability to cover the total needs divided by the total needs
  - Scenarios in the plan use constant return rates so the goal coverage remains constant
  - In *Scenario Probability* trials, return rates vary each year of the trial, so goal coverage percentage values may change with each trial
- The graph sorts and colour-codes the resulting goal coverage percentage values for each trial in descending order
- Even though the scenario with constant return rates may have 100% goal coverage, when the effect of market risk is considered, your clients may not be able to sustain their goal
- The *% Total Needs Covered by Total Resources* option determines if resources will cover all fixed and discretionary expenses (for retirement goals only)
- The *% Fixed Needs Covered by Total Resources* option determines if resources will cover all fixed expenses (for retirement goals only)
- Because the variations are random, results may differ each time you calculate the scenario probability
  - For example, you may run 150 trials that produce 101 trials with 90% or higher goal coverage, and then run another 150 trials that produce 95 trials with 90% or higher goal coverage
- As the number of projections increases, the more statistically significant the results will be; however, the time required to perform the calculations also increases
- The *Portfolio Variability Projection* tab displays rates of return over time compared to the assumed return rate for the scenario for the 90^{th}, 50^{th}, and 10^{th} percentile trials
  - 90^{th} percentile trial is the trial where 90% of the trials are lower than this amount, and 10% of the trials are higher
  - 50^{th} percentile trial is the trial where half the trials are higher than this amount and half are lower
  - 10^{th} percentile trial is the trial where 10% of the trials are lower than this amount, and 90% are higher

- The *Investment Capital* tab displays the ending goal funding account value (net worth for retirement) for each year of the scenario

Financial Needs Summary client report

Both the *Financial Needs Summary* and the *Financial Needs Analysis* client reports can include the scenario probability results, but they are not included by default. If you want to share your results with your clients, select the **Probability Analysis** check box under *Scenarios* in the *Select Document Sections* dialog box.

Select Document Sections dialog box

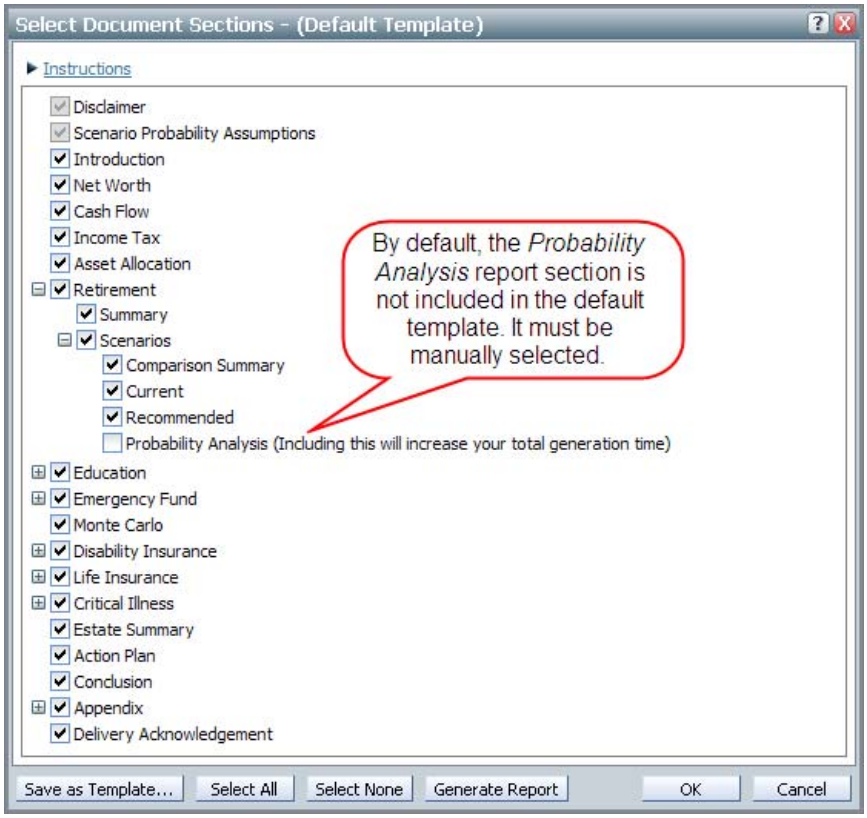


Figure 6: Results section – Client Reports category – Client Report page – Select Document Sections button – Select Document Sections dialog box

You can use the *Select Document Sections* dialog box to customize the order and content of the *Financial Needs Summary* or the *Financial Needs Analysis* client reports.

- Click the ⊞ beside a section to expand the list and view additional sections
- Click the ⊟ beside a section to collapse the section
- Click **Save as Template** to save your selections as a template for this type of report so that you can quickly access the template on the *Client Report* page for future use with any client

The *Financial Needs Summary* client report provides an overview of the clients' current financial position and the alternative scenario marked as *Recommended*. Typically, this report is used when the recommended plan has been finalized and is ready for the final presentation to the clients.

Retirement Probability Scenario page

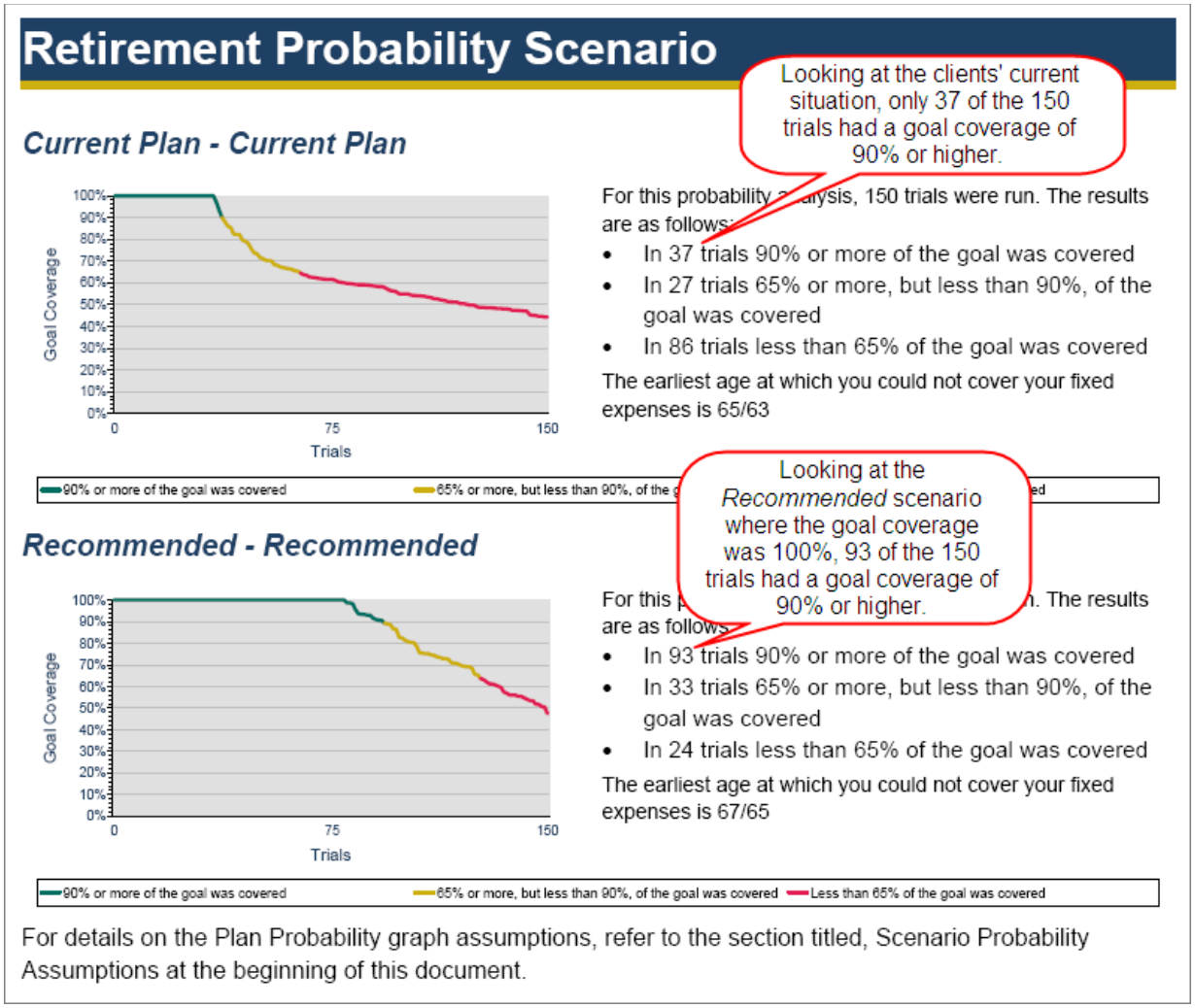


Figure 7: Financial Needs Summary client report – Retirement Probability Scenario page

Learning objective:
Identify Monte Carlo Sensitivity Analysis settings

This learning objective will help you understand the various settings that you can use when you generate a *Monte Carlo Sensitivity Analysis* graph.

When you generate the *Monte Carlo* graph from the *Reports* menu, you can define the settings for the graph.

When you include the *Monte Carlo* section in a client report, you cannot control the settings, and the defaults will be used.

To generate the *Monte Carlo* graph from the *Reports* menu, follow these steps:

1. Go to the **Plan Management** section – **Modules** category – **Modules** page.
2. Ensure that the *Monte Carlo Analysis* module is selected.
3. Go to the **Reports** menu – **Monte Carlo** category, and then select the **Monte Carlo** graph. The *Assign Settings* dialog box opens.
4. Select the appropriate settings, and then click **OK.** The *Monte Carlo* graph generates.

Reports menu

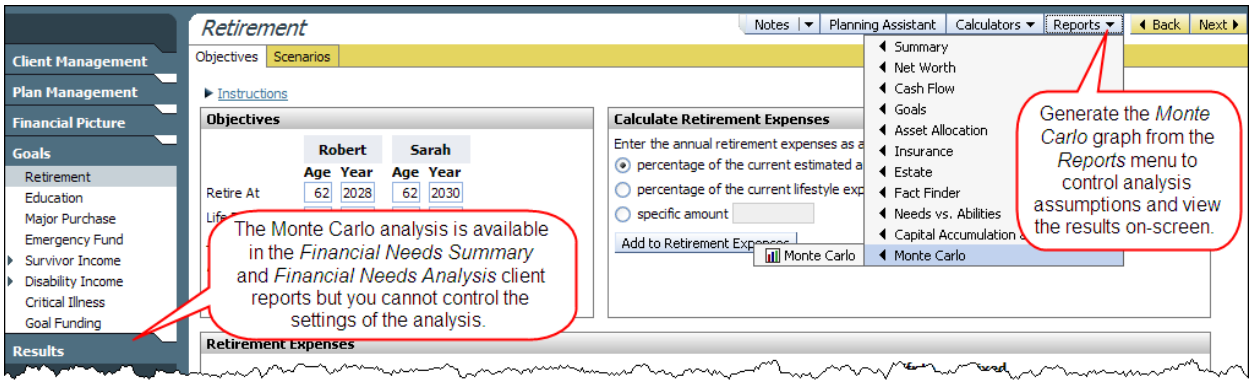


Figure 8: Goals section – Retirement category – Objectives page

Assign Settings dialog box

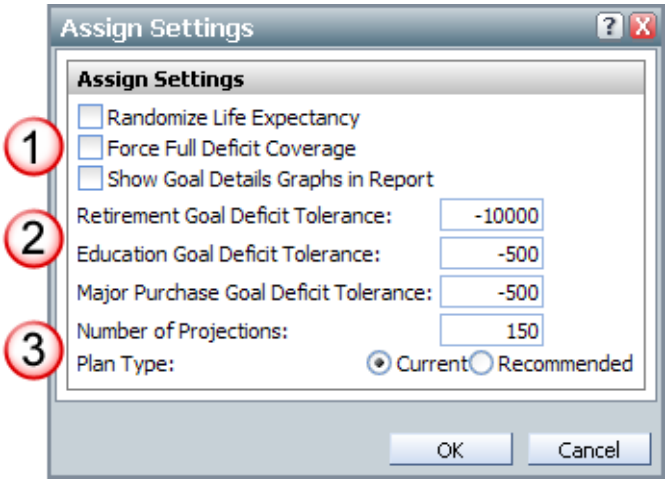


Figure 9: Reports menu – Monte Carlo – Monte Carlo – Assign Settings dialog box

1 Check boxes

- *Randomize Life Expectancy*
  - When this check box is cleared, life expectancies are based on the dates entered in the plan (the check box is cleared by default)
  - When this check box is selected, longevity risk is evaluated by randomizing the clients' life expectancy up to a maximum of 110 based on actuarial tables used by insurance companies
  - Group Annuity Mortality (GAM) 1983 tables are used to randomize the life expectancy
- *Force Full Deficit Coverage*
  - This option only affects the retirement goal
  - When this check box is cleared, NaviPlan assumes that the clients will never redeem assets to cover deficits during pre-retirement (the check box is cleared by default)
  - When this check box is selected, the analysis automatically redeems accounts to cover annual cash flow deficits during pre-retirement and retirement
  - During pre-retirement, non-registered accounts linked to retirement as well as unlinked accounts are eligible for redemption; non-registered accounts linked to education and major purchase goals only become available for redemption once the goal to which the asset is linked is completed

- During retirement, both non-registered and registered accounts are eligible for redemption; non-registered accounts linked to education and major purchase goals only become available for redemption once the goal to which the asset is linked is completed
- Selecting *Force Full Deficit Coverage* may deplete accounts that would normally be used to fund the retirement goal, leading to a higher incidence of failures in the simulation

- *Show Goal Details Graphs in Report* – Select this check box to provide more details in the generated output (it is cleared by default)

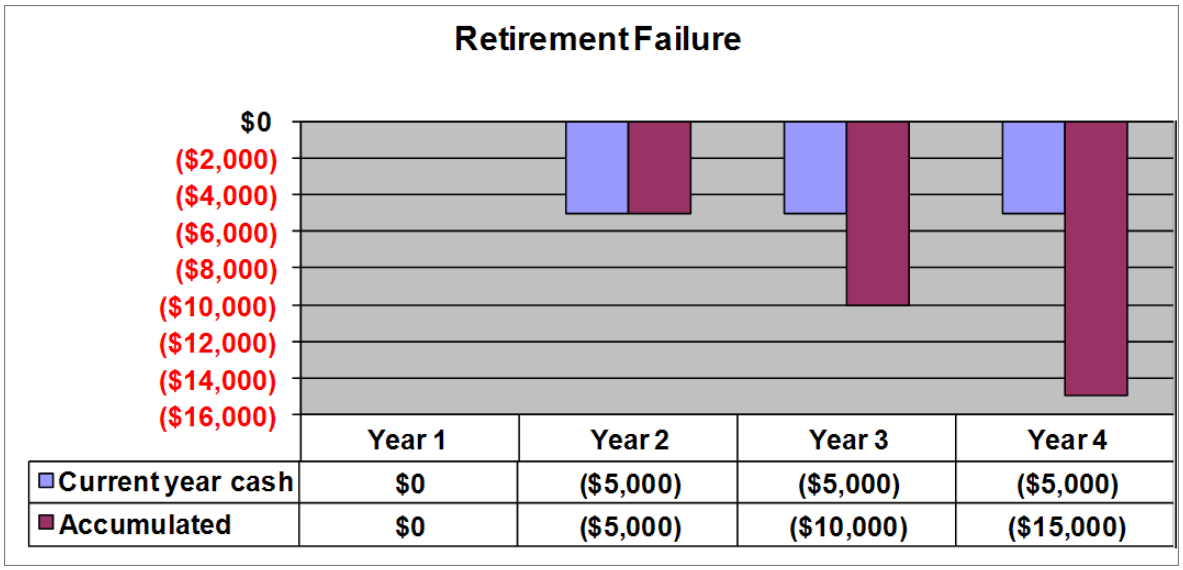
2 <goal> Deficit Tolerance settings

Use the *Deficit Tolerance* fields to enter the amount of deficits or shortfalls your clients are comfortable with while still considering each goal a success.

- The success rate displayed in the output is measured based on trials that exceed the deficit tolerance levels that you define for each goal

Avoid using deficit tolerance values between 0 and -20 as they can produce 0% success due to rounding used in the deficit coverage calculations.

- *Retirement Goal Deficit Tolerance* – By default, if the accumulated deficit during retirement is within $10,000, your clients may still consider the goal successful; they may believe a loan or line of credit could carry them through a shortfall period up to the tolerance amount



	Year 1	Year 2	Year 3	Year 4
Current year cash	$0	($5,000)	($5,000)	($5,000)
Accumulated	$0	($5,000)	($10,000)	($15,000)

Figure 10: Hypothetical retirement cash flow graph (showing failure triggered in Year 4)

- *Education Goal Deficit Tolerance* – By default, if a deficit in any year of the education goal is within $500, your clients may still consider the goal successful; for example, they may think the child can apply for financial aid or get a part-time job to support education costs up to this amount
- *Major Purchase Goal Deficit Tolerance* – By default, if a deficit for the goal is within $500, your clients may still consider the goal successful; for example, they may decide to stay at a four-star hotel instead of a five-star to make up for the insufficient funds
- When selecting appropriate deficit tolerance values consider your clients'
  - risk tolerance
  - duration of the goal
  - ability to borrow
  - net worth
  - cash flow
  - other risk factors

3 Number of Projections and Plan Type settings

- *Number of Projections* – Defines the number of trials that NaviPlan will generate
  - Because the variations are random, results will differ each time you generate the *Monte Carlo Sensitivity Analysis*
  - For example, you may run 150 trials that produce a 50% success rate for the retirement goal, and then run another 150 trials that produce a 56% success rate for the retirement goal
  - As the number of projections increases, the more statistically significant the results will be; however, the time required to perform the calculations also increases
- *Plan Type* – Bases the report or graph on the selected plan type
  - *Current* – Select this option to generate reports and graphs based on the data from the *Current Plan* scenario
  - The standard deviations assigned to accounts on the *Accounts* page are used in the analysis
  - *Recommended* – Select this option to generate reports and graphs based on the data from the recommended scenarios for all goals which are marked as *Recommended* on the *Goals* section – <*goal*> category – *Scenarios* pages
  - The standard deviation is based on the investment profile selected for the *Recommended* scenario used in the analysis (if the *Asset Allocation* module is included in the plan)

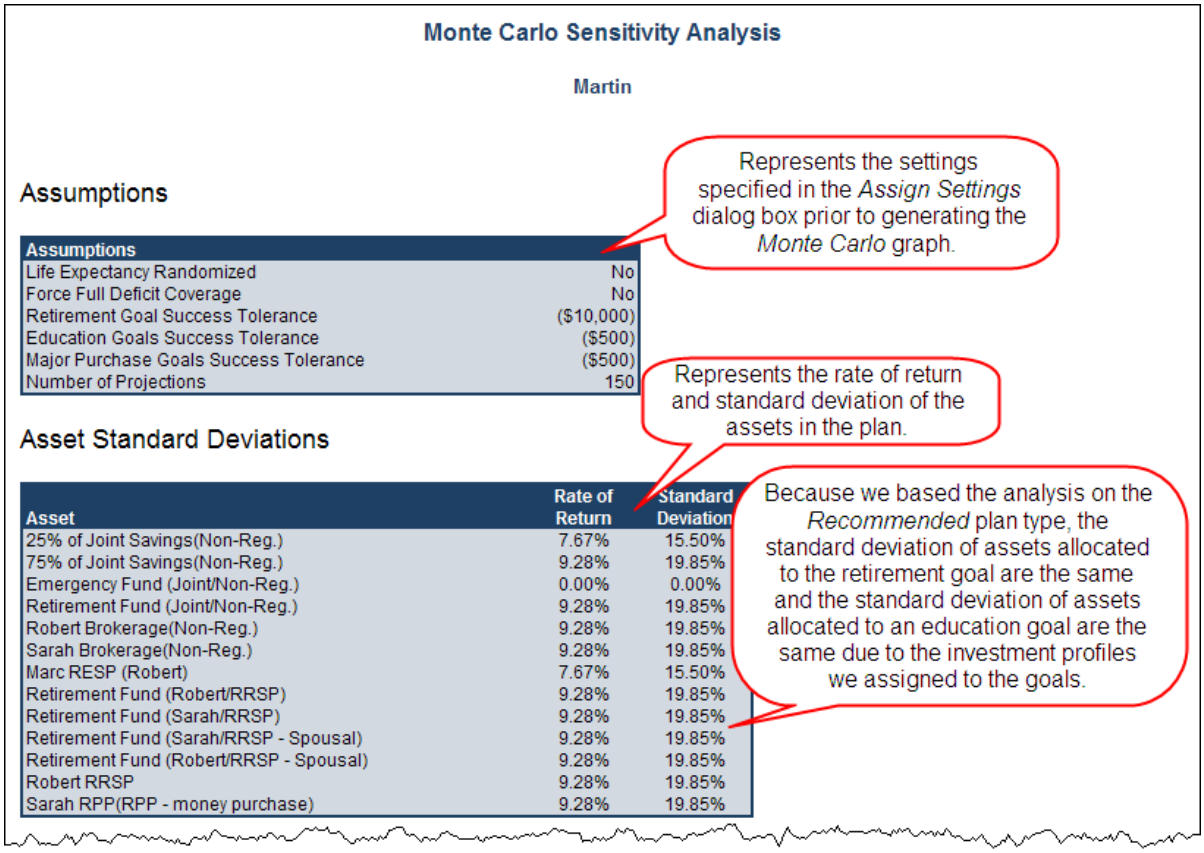
Learning objective:
Analyze Monte Carlo Sensitivity Analysis results

Monte Carlo Sensitivity Analysis results generated from the Reports menu

The *Monte Carlo Sensitivity Analysis* results generated from the *Reports* menu differ from the results displayed when including Monte Carlo as part of the client report, as follows:

- Includes only the details you require for your analysis (excluding text) to allow you to focus on the numbers
- Displays specific asset returns and standard deviations, rather than asset class returns and standard deviations used in the analysis
- Allows you to control all settings
- *Number of Projections* – 100 to 1,000
- Analyzes only one plan type, based on the selection you make in the *Assign Settings* dialog box (*Current* or *Recommended*); however, you can compare both analyses side by side within the *Monte Carlo* report window, by following these steps:
    1. Click the **Duplicate** button.
    2. Select the other plan type in the duplicated copy.
    3. Click **Apply Settings.**

Assumptions and Asset Standard Deviations tables



Assumptions	
Life Expectancy Randomized	No
Force Full Deficit Coverage	No
Retirement Goal Success Tolerance	($10,000)
Education Goals Success Tolerance	($500)
Major Purchase Goals Success Tolerance	($500)
Number of Projections	150

Asset	Rate of Return	Standard Deviation
25% of Joint Savings(Non-Reg.)	7.67%	15.50%
75% of Joint Savings(Non-Reg.)	9.28%	19.85%
Emergency Fund (Joint/Non-Reg.)	0.00%	0.00%
Retirement Fund (Joint/Non-Reg.)	9.28%	19.85%
Robert Brokerage(Non-Reg.)	9.28%	19.85%
Sarah Brokerage(Non-Reg.)	9.28%	19.85%
Marc RESP (Robert)	7.67%	15.50%
Retirement Fund (Robert/RRSP)	9.28%	19.85%
Retirement Fund (Sarah/RRSP)	9.28%	19.85%
Retirement Fund (Sarah/RRSP - Spousal)	9.28%	19.85%
Retirement Fund (Robert/RRSP - Spousal)	9.28%	19.85%
Robert RRSP	9.28%	19.85%
Sarah RPP(RPP - money purchase)	9.28%	19.85%

Figure 11: Reports menu – Monte Carlo – Monte Carlo – Monte Carlo Sensitivity Analysis graph (showing the Assumptions and Asset Standard Deviations tables)

Goal Summary graph

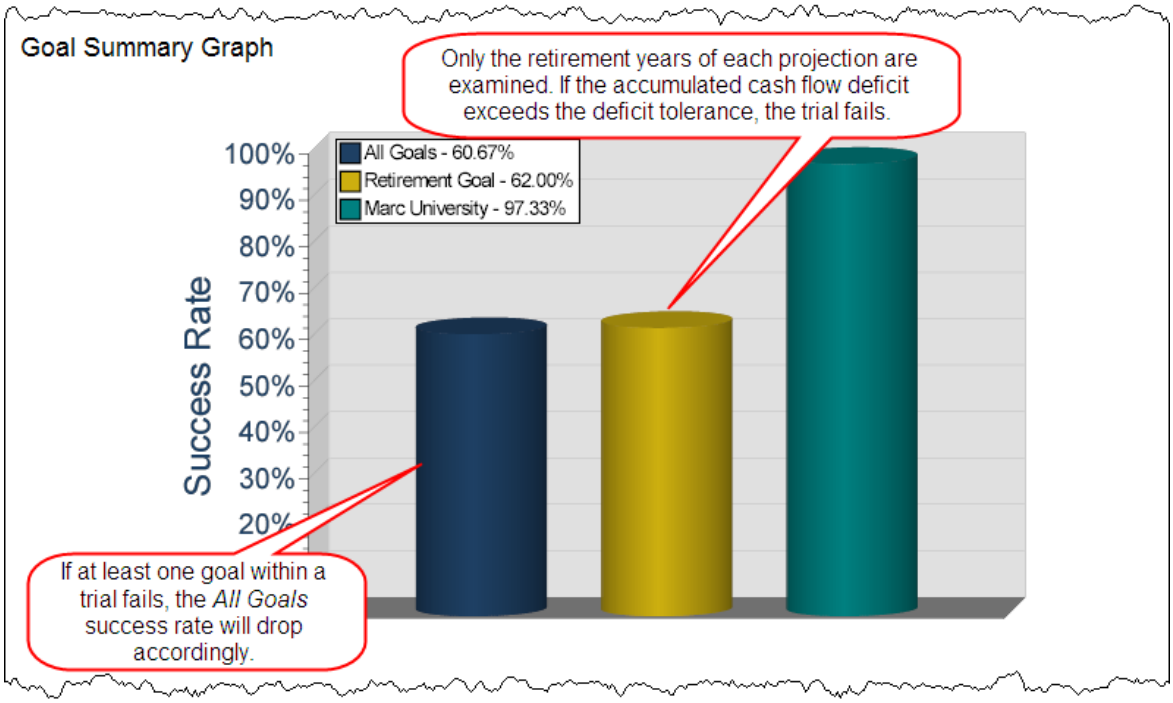


Figure 12: Reports menu – Monte Carlo – Monte Carlo – Monte Carlo Sensitivity Analysis graph (showing the Goal Summary graph)

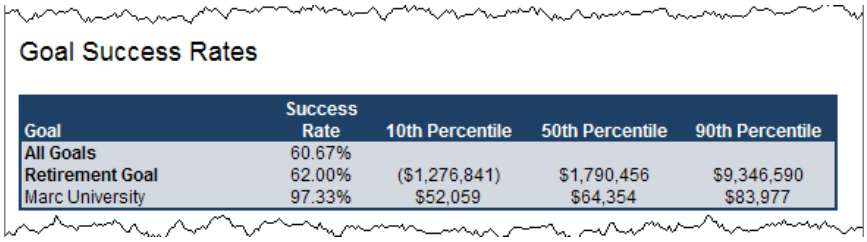
This graph shows the success of each goal in your clients' plan; success is determined differently for each goal

- Retirement goal – Only retirement years are tested for success or failure
  - All cash flow sources (incomes and accounts) are compared to the retirement goal expenses
- Education goal – A deficit in any of the years that the education goal applies (for example, four years) means the trial has failed
  - If multiple education goals are in the plan, each goal will be isolated and will have its own individual results
  - Only cash flow related to education expenses and funding account redemptions are considered
- Major purchase goals – The trial must be successful at the goal's purchase date
  - If multiple major purchase goals are in the plan, each goal will be isolated and will have its own individual results
  - Only cash flow related to major purchase expenses and funding account redemptions are considered

- All goals – All goals must succeed in a given trial to achieve success

If a plan is not fully funded when assuming fixed return rates, it will very likely have a low *Monte Carlo Sensitivity Analysis* success rate because even without the risk of randomized returns, the plan is failing.

Goal Success Rates table



Goal Success Rates

Goal	Success Rate	10th Percentile	50th Percentile	90th Percentile
All Goals	60.67%			
Retirement Goal	62.00%	($1,276,841)	$1,790,456	$9,346,590
Marc University	97.33%	$52,059	$64,354	$83,977

Figure 13: Reports menu – Monte Carlo – Monte Carlo – Monte Carlo Sensitivity Analysis graph (showing the Goal Success Rates table)

- Retirement goal – The percentile values represent the terminal net worth or net worth at last death (after estate expenses) which includes investment and lifestyle assets
- High retirement percentile values combined with a low success rate suggests that a portion of your clients' net worth is unavailable to cover retirement deficits because lifestyle assets represent a large portion of the net worth
- Education goals – The percentile values represent the total after-tax asset values accumulated as of Dec. 31 of the year prior to the beginning of the goal (includes residuals)
- Major purchase goals – The percentile values represent the total after-tax asset values accumulated as of the end of the month prior to the beginning of the goal (includes residuals)

Percentile values represent the following:

- 10^{th} percentile reports that 10% of the results are lower than this amount; 90% of results are higher
- 50^{th} percentile reports that 50% of the results are lower than this amount; 50% of results are higher
- 90^{th} percentile reports that 90% of the results are lower than this amount; 10% of results are higher

<goal details> graphs

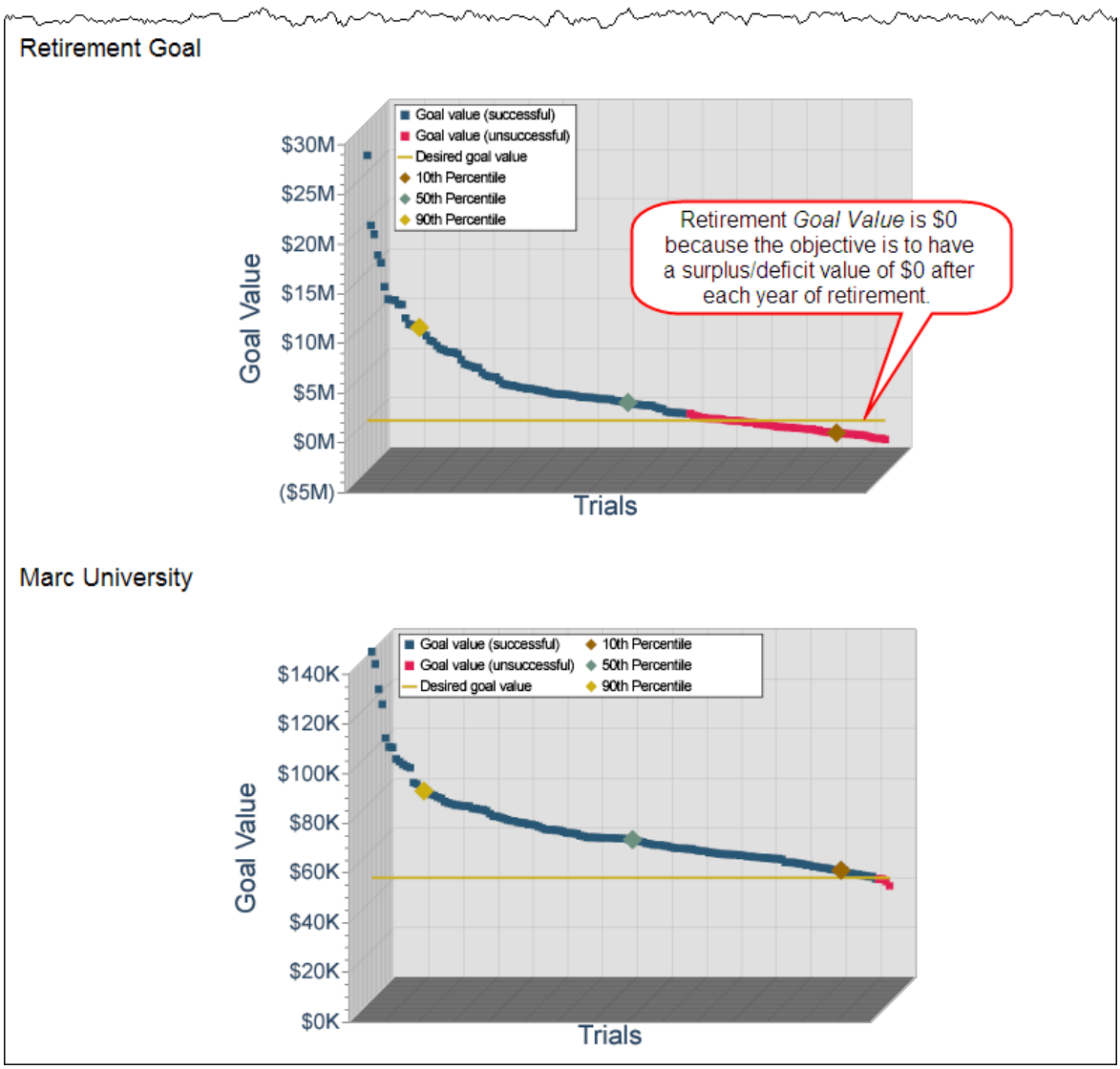


Figure 14: Reports menu – Monte Carlo – Monte Carlo – Monte Carlo Sensitivity Analysis graph (showing the <goal details> graphs)

- <goal details> graphs only appear if the *Show Goal Details Graphs in Report* check box is selected in the *Assign Settings* dialog box prior to generating the *Monte Carlo* graph. These graphs do not appear in the client reports.
- The graphs build on the *Goal Success Rate* table discussed on page 24 by plotting the terminal net worth (retirement) and total

after-tax assets accumulated prior to the beginning of the goal (education and major purchase) for each projection in the analysis.

  - For example: If you have 150 projections, there will be 150 squares plotted on each graph.

- All projections are plotted from highest goal value on the left, to the lowest goal value at the right.
- Blue squares represent a successful projection while red squares represent a failed projection.
- In some cases, unsuccessful plots may appear above the *Desired goal value* line. This occurs when there are insufficient funds during the trial, but the goal recovers later in the same projection.

  - For example, if a client retires at age 55 and their non-registered assets run out in the early years, a failure is triggered. As they get older, registered assets, CPP/QPP and other pensions become available to fund needs. If the remaining registered assets have favorable investment returns, there may be an excess of funds at the end of the goal, creating the higher plot.

Financial Needs Analysis client report

The *Monte Carlo Sensitivity Analysis* results are included in the *Financial Needs Summary* and the *Financial Needs Analysis* client reports by default. If you do not want to share the *Monte Carlo Sensitivity Analysis* results with your clients, you must clear the *Monte Carlo* check box in the *Select Document Sections* dialog box.

Select Document Sections dialog box

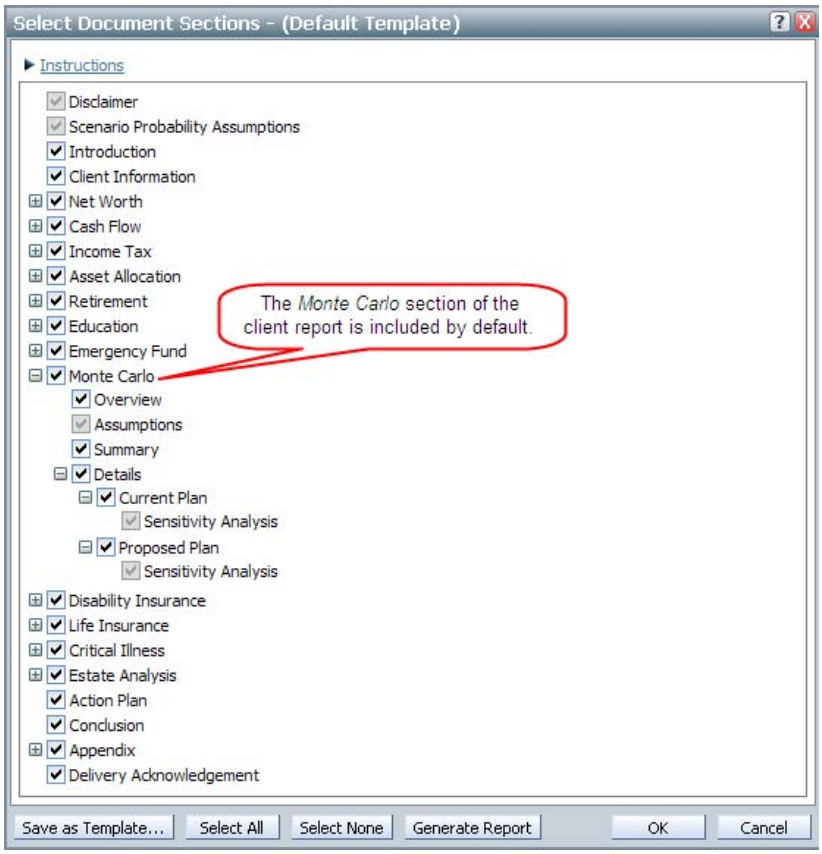


Figure 15: Results section – Client Reports category – Client Report page – Select Document Sections button – Select Document Sections dialog box

Use the *Select Document Sections* dialog box to customize the order and content of the *Financial Needs Summary* or the *Financial Needs Analysis* client reports.

- Click ⊞ beside a section to expand the list and view additional sections
- Click ⊟ beside a section to collapse the section

- Click **Save as Template** to save your selections as a template for this type of report so that you can quickly access the template on the *Client Report* page for future use with all clients

The Monte Carlo analysis section in the client report differs from the results displayed when generating the *Monte Carlo* graph from the *Reports* menu, as follows:

- Includes additional text to help explain the results to your clients
- Displays the asset class returns and standard deviations used in the analysis, rather than the specific asset returns and standard deviations
- Compares the current and proposed (data from the *Recommended* scenarios) plans (see Figure 16)
- Uses the following default settings which cannot be modified:
  - *Randomize life expectancy* – No
  - *Force full deficit coverage* – No
  - *Show Goal Details Graphs in Report* – No
  - *Retirement Goal Success Tolerance* – ($10,000)
  - *Education Goal Success Tolerance* – ($500)
  - *Major Purchase Goal Success Tolerance* – ($500)
  - *Number of Projections* – 150

The *Financial Needs Analysis* client report combines text and graphs to provide a comprehensive view of the clients' current financial position and the alternative scenario marked as *Recommended*. Typically, this report is used when the recommended plan has been finalized and is ready for the final presentation to the clients.

Monte Carlo Summary page

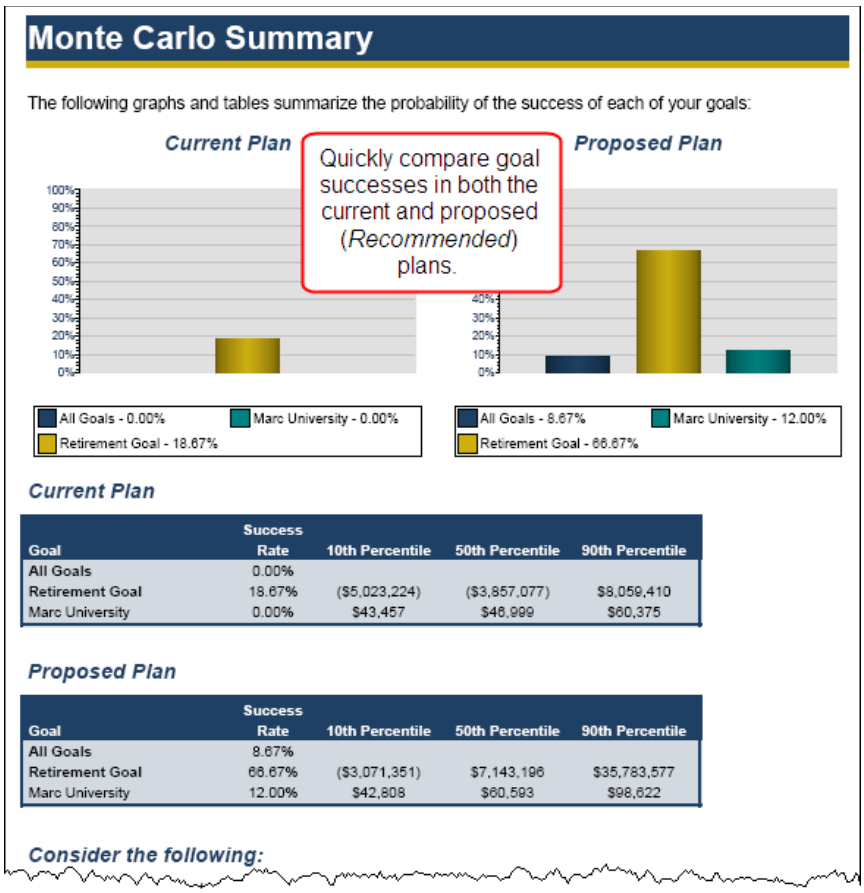


Figure 16: Financial Needs Analysis client report – Monte Carlo Summary page

HANDS-ON EXERCISES

Exercises

The exercises have been designed specifically for this module and assume that you are working with the original data in the plan named *Comprehensive Plan* in the *Martin (English), Robert, Sarah* client file. Before starting the exercises, duplicate the **Comprehensive Plan**, rename the duplicate with a meaningful name (e.g., *Monte Carlo and Scenario Probability Analysis training*), and then use it to complete the following exercises.

Hint: All copies of plans are managed in the *Plan Management* section – *Plan List* category.

To find the answers, see "Answers to exercises" on page 40.

Exercise 1: Identify the purpose and key concepts of scenario probability and sensitivity analysis

1. Using fixed assumptions when evaluating a financial plan is not entirely realistic because variables, such as return rates, may change in real life. Is this statement true or false?

   a) True

   b) False

2. Sensitivity analysis is . . .

   a) The study of problems in which one seeks to minimize or maximize a result by choosing values from within an allowed set of data

   b) A procedure designed by EISI for NaviPlan

   c) A mathematical method which assumes that an outcome can be predicted when all of its variables are known and applied in a formula

   d) A method of examining the risks of changing variables and their effects on a plan

3. Which of the following risks cannot be analyzed with the simulation tools in NaviPlan? That is, which plan assumption(s) will not be varied?

   a) Life expectancy – Risk of clients living longer than expected and outliving resources or dying earlier than expected and not accumulating enough resources

   b) Market fluctuations – Risk of market volatility and poor asset performance resulting in not enough resources to fund goals

   c) Inflation risk – Risk of inflating costs reducing the purchasing power of money

   d) None of the above

Exercise 2: Compare the two simulation tools in NaviPlan: Scenario Probability vs. Monte Carlo Sensitivity Analysis

1. Which of the following is *not* one of the simulation tools available in NaviPlan?

   a) *Scenario Probability*

   b) *Monte Carlo Sensitivity Analysis*

   c) *Stochastic randomization*

2. Complete the table below. If the feature listed is available in the *Scenario Probability* or *Monte Carlo Sensitivity Analysis* tool, place a check mark (✓) in the appropriate cell.

Features	Scenario Probability	Monte Carlo
Runs multiple trials		
Varies rates of return		
Varies life expectancy (optional)		
Analyzes multiple goals at once		
Allows you to define tolerance limits		
Assesses overall goal coverage		
Assesses annual cash flow		
Displays pass/fail results		
Analyzes only a single goal at once		

Exercise 3: Analyze Scenario Probability results

1. You can generate *Scenario Probability* results for all of the following goals except:

   a) Retirement goals

   b) Education goals

   c) Major purchase goals

   d) Insurance goals

2. The *Goal Coverage* percentage values plotted on the *Scenario Probability* graph are calculated as follows.

   a) The ability to cover the total needs (total resources) divided by the totals needs (fixed and discretionary expenses)

   b) The ability to cover the total needs (total resources) divided by the fixed needs (fixed expenses only)

   c) a) or b), depending on the selection you make

   d) None of the above

3. If you calculate 150 trials of the scenario probability analysis for a goal, and then calculate a second set of 150 trials for the goal, the results will be identical. Is this statement true or false?

   Hint: Generate 150 trials of the graph, click the ? button, record the results, repeat the steps, and then compare the results.

   a) True

   b) False

Figure 17 shows sample output for two retirement scenarios titled *Current Plan* and *Custom Scenario*. Without randomizing returns, the goal coverage for each scenario was 60% and 100% respectively. Use this information to answer the following questions.

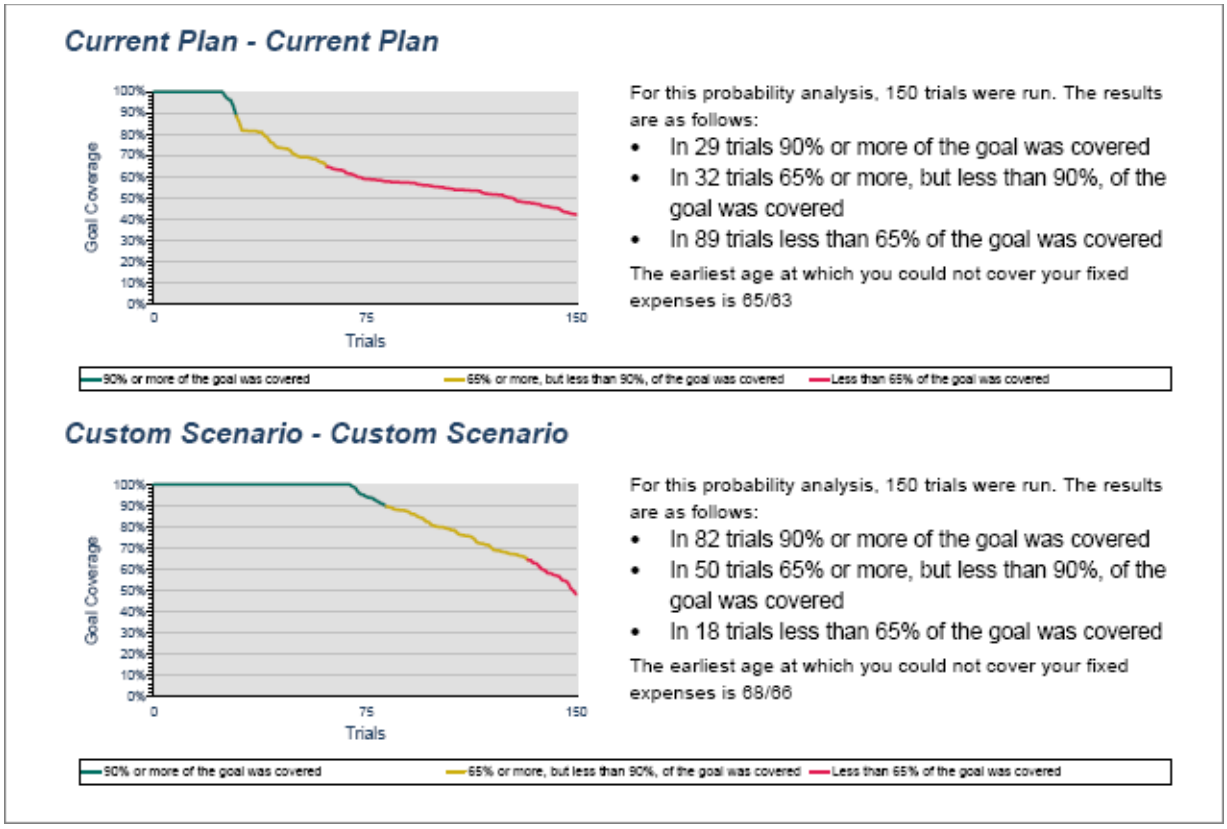


Figure 17: Financial Needs Summary client report – Retirement Probability Scenario page

4. If the *Current Plan* scenario only had 60% goal coverage, why are there trials that display goal coverage higher results than 60%?

5. If the custom scenario had 100% goal coverage, why are there trials that display goal coverage results less than 100%?

_____

_____

_____

_____

_____

6. List at least two possible reasons why the lowest goal coverage value plotted for the custom scenario (approximately 50% goal coverage) is higher than the lowest goal coverage value plotted for the *Current Plan* scenario (approximately 40%)?

_____

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_____

Exercise 4: Identify Monte Carlo Sensitivity Analysis settings

1. To access the *Monte Carlo Sensitivity Analysis* tool from the *Reports* menu, you must ensure that the *Monte Carlo Analysis* option is selected on which one of the following pages?

   a) *Reports* menu – *Options* category – *Report/Graph Options* page

   b) *Plan Management* section – *Modules* category – *Modules* page

   c) *Plan Management* section – *Assumptions* category – *General* page

   d) None of the above – Monte Carlo is always available from the *Reports* menu

2. Complete the following table regarding *Monte Carlo Sensitivity Analysis*. Is the statement true or false? If false, indicate why.

Statement	True or false?
a) Success for the retirement goal is based on the clients' terminal net worth.	
b) Deficit tolerance is the amount the clients are willing to spend.	
c) *Force Full Deficit Coverage* implies that non-registered assets are available for redemption in pre-retirement if necessary.	
d) Assets with low standard deviation indicate more risk than assets with high standard deviation.	
e) It is strongly recommended that you generate Monte Carlo for a recommended plan with 100% goal success rates for all goals. Otherwise, Monte Carlo results will generate high failure rates.	

3. Which factors should be considered when defining the deficit tolerance for a goal?

   a) The clients' overall risk tolerance

   b) The clients' net worth and ability to meet goal shortfalls by other means

   c) The clients' cash flow

   d) All of the above

4. *Monte Carlo Sensitivity Analysis* determines a goal's success based on which of the following?

   a) Cash flow deficit tolerance

   b) The plan's terminal net worth

   c) All of the above

   d) None of the above

Exercise 5: Analyze Monte Carlo Sensitivity Analysis results

Use the *Monte Carlo Sensitivity Analysis* sample below to answer the following questions.

Assumptions

Assumptions	
Life Expectancy Randomized	No
Force Full Deficit Coverage	No
Retirement Goal Success Tolerance	($10,000)
Education Goals Success Tolerance	($500)
Major Purchase Goals Success Tolerance	($500)
Number of Projections	150

Goal Success Rates

Goal	Success Rate	10th Percentile	50th Percentile	90th Percentile
All Goals	4.67%			
Retirement Goal	52.67%	($3,390,180)	$1,314,170	$17,523,841
Marc University	7.33%	$43,481	$57,967	$95,811

1. What might the *Success Rate* column suggest to you about this plan?

2. The *90th Percentile* value for the retirement goal is relatively high, yet the success rate is not 100%. What might this suggest to you about the plan?

_____

_____

_____

_____

_____

3. What might be done to improve the Monte Carlo results?

_____

_____

_____

_____

_____

Conclusion

Upon successful completion of this module, you are now able to

- Identify the purpose and key concepts of scenario probability and sensitivity analysis
- Compare the two simulation tools in NaviPlan: *Scenario Probability* vs. *Monte Carlo Sensitivity Analysis*
- Analyze *Scenario Probability* results
- Identify *Monte Carlo Sensitivity Analysis* settings
- Analyze *Monte Carlo Sensitivity Analysis* results

Answers to exercises

Exercise 1: Identify the purpose and key concepts of scenario probability and sensitivity analysis

1. a) This statement is true. Using fixed assumptions when evaluating a financial plan is not entirely realistic because variables, such as return rates, may change in real life.
2. d) Sensitivity analysis is a method of examining the risks of changing variables and their effects on a plan.
3. c) Inflation risk – Risk of inflating costs reducing the purchasing power of money cannot be analyzed with the simulation tools in NaviPlan.

Exercise 2: Compare the two simulation tools in NaviPlan: Scenario Probability vs. Monte Carlo Sensitivity Analysis

1. c) Stochastic randomization is *not* one of the simulation tools available in NaviPlan.
2. If the feature listed is available in the *Scenario Probability* or *Monte Carlo Sensitivity Analysis* tool, a check mark appears in the appropriate cell.

Features	Scenario Probability	Monte Carlo Sensitivity Analysis
Runs multiple trials	✓	✓
Varies rates of return	✓	✓
Varies life expectancy (optional)		✓
Analyzes multiple goals at once		✓
Allows you to define tolerance limits		✓
Assesses overall goal coverage	✓	

Features	Scenario Probability	Monte Carlo Sensitivity Analysis
Assesses annual cash flow		✓
Displays pass/fail results		✓
Analyzes only a single goal at once	✓	

Exercise 3: Analyze Scenario Probability results

1. d) Insurance goals –You can generate *Scenario Probability* results for retirement goals, education goals, and major purchase goals, but not for insurance goals.
2. c) The goal coverage percentage values plotted on the *Scenario Probability* graph are calculated depending on the selection you make by:
   a) the ability to cover the total needs (total resources) divided by the total needs (fixed and discretionary expenses)

   OR by

   b) the ability to cover the total needs (total resources) divided by the fixed needs (fixed expenses only)
3. b) This statement is false. If you calculate 150 trials of the scenario probability analysis for a goal, and then calculate a second set of 150 trials for the goal, the results may be completely different because the variations are random.
4. If the *Current Plan* scenario only had 60% goal coverage, there are trials that display goal coverage higher than 60% because of randomized return rates. By randomizing return rates, it's possible that the accounts in the plan generate favourable (higher) return rates, the account balances are higher, and the accounts can cover more of the needs in some of the trials as compared to the scenario with a static return year over year.
5. If the *Custom Plan Scenario* had 100% goal coverage, there are trials that display goal coverage lower than 100% because of randomized return rates. By randomizing return rates, it is possible that the accounts in the plan generate unfavourable

(lower) return rates, the account balances available are lower, and the accounts can cover less of the needs in some of the trials, as compared to the scenario with a static return year over year.

6. Two reasons why the lowest goal coverage value plotted for the custom scenario (approximately 50% goal coverage) is higher than the lowest goal coverage value plotted for the current plan (approximately 40%) may be any two of the following (answers will vary):
   - Assets may be reallocated to a lower risk asset mix so the range of return results is smaller
   - Assets may be reallocated to a higher average return so the account balances on average will be higher and cover more needs
   - Additional savings result in higher account values that will be able to cover more needs
   - Reduced retirement needs result in an easier goal to reach

Exercise 4: Identify Monte Carlo Sensitivity Analysis settings

1. b) To access the *Monte Carlo Sensitivity Analysis* tool from the *Reports* menu, you must ensure that the *Monte Carlo Analysis* option is selected on the *Plan Management* section – *Modules* category – *Modules* page.

2. See the answers in the *True or false?* column.

Statement	True or false?
a) Success for the retirement goal is based on the clients' terminal net worth.	False – Success is based on cash flow
b) Deficit tolerance is the amount the clients are willing to spend.	False – Deficit tolerance is the amount clients are willing to borrow
c) *Force Full Deficit Coverage* implies that non-registered assets are available for redemption in pre-retirement if necessary.	True
d) Assets with low standard deviation indicate more risk than assets with high standard deviation.	False – Higher standard deviation indicates more risk
e) It is strongly recommended that you generate Monte Carlo for a recommended plan with 100% goal success rates for all goals. Otherwise, Monte Carlo results will generate high failure rates.	True

3. d) All of the above — The clients' overall risk tolerance, the clients' net worth and ability to meet goal shortfalls by other means, and the clients' cash flow should all be considered when defining the deficit tolerance for a goal.
4. a) Cash flow deficit tolerance – *Monte Carlo Sensitivity Analysis* determines a goal's success based on the cash flow deficit tolerance.

Exercise 5: Analyze Monte Carlo Sensitivity Analysis results

1. The *Success Rate* column in the *Monte Carlo Sensitivity Analysis* sample results suggests that all goals are coming up short. Although the clients have a high net worth, the plan fails because it is susceptible to market fluctuations and life expectancy changes. Increasing the amount of income that is fixed or safer from market fluctuations may improve the plan.

2. The *90th Percentile* value for the retirement goal is relatively high, yet the success rate is not 100% because these percentiles represent terminal net worth, not the success rate of the plan which is determined by the cash flow deficit tolerance. The success rate may also be low in this sample because non-liquid assets, such as lifestyle assets, or unavailable investment assets make up a large portion of the clients' net worth. The clients' liquid assets may not be sufficient to meet their goals.

3. To improve the *Monte Carlo Sensitivity Analysis* results, your answer might include any two of the following:
   - Change the assumption to force full deficit coverage. Assets are redeemed to cover the goal in pre-retirement.
   - Increase the deficit tolerance and success tolerance. An annual cash flow deficit tolerance of $10,000 and a $500 success tolerance for the education and major purchase goals may be too small if the clients are easily able to borrow much more than this to cover shortfalls.
   - Increase the amount of fixed incomes in the plan.
   - Assume that investment assets are less risky, i.e., have a lower standard deviation.