

MCIT 591 Investment Planning Statement (IPS) Planner

PART I PROGRAM DETAILS

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PART II USER INSTRUCTIONS

MCIT 591 Investment Planning Statement (IPS) Planner (“ the Program ”) is to help the user understand the investment return and risk objectives, as well as providing recommended asset allocation and corresponding portfolio return and risks based on the user’s risk tolerance. During the use of the Program, the user is able to perform the following functions with the buttons below.

“Start” to go back to the first panel of the Program

“Next” to go to the next panel

“Previous” to go to the previous panel

“Exit” to end the program during any step

Step 1: the user can read and accept the terms and agreements in order to use the Program.

Welcome

Investment Policy Statement (IPS) Planner

Welcome to Investment Policy Statement (IPS) Planner!

TERMS AND CONDITIONS

The purpose of this Investment Policy Statement (IPS) generator is to help you understand the investment goals and objectives and management policies applicable to your investment portfolio ("Portfolio").

This Investment Policy Statement will:

1. Establish reasonable expectations, objectives and guidelines in the investment of your Port assets;
2. describing an appropriate risk posture for the investment of your Portfolio; and
3. specifying the target asset allocation policy.

- This IPS is not a contract. This investment policy has not been reviewed by any legal counsel.
- This IPS is intended to be a summary of an investment philosophy and the procedures that provide guidance for you.
- The investment policies described in this IPS should be dynamic.
- These policies should reflect your current status and philosophy regarding the investment of the Portfolio.
- These policies should be reviewed and revised periodically to ensure they adequately reflect any changes related to your Portfolio, to you, or to the capital markets.
- It is understood that there can be no guarantee about the attainment of the goals or investment objectives outlined herein.
- This IPS generator DOES NOT collect or share any data you provided.

By clicking 'Next' you agree to the **TERMS AND CONDITIONS** above.

Start Next Previous Exit

Step 2: the user can enter the personal investment information including the user name, user occupation, desired investment horizon, user annual income, user current asset, user annual income and expense, and the desired investment target amount at the end of the investment horizon.

The screenshot shows a window titled "Investment Policy Statement (IPS) Planner". The main title bar says "Personal Information". The window contains several input fields for personal and financial information:

- Your Name
- Occupation
- Investment Horizon
- Annual Income \$
- Current Assets \$
- Annual Expenses \$
- Investment Target \$

Below these fields, there are three explanatory labels:

- Investment Horizon: Years between Today and Desired Retirement Year
- Investment Target: Desired Asset Amount at Retirement
- Annual Income – Annual Expense: Fund available to invest each year

A red error message is displayed below the labels:

- Your name can't be empty.
- Occupation Goal can't be empty.
- Investment Horizon can't be empty.
- Annual Income can't be empty.
- Current Asset can't be empty.
- Annual Expense can't be empty.
- Investment Goal can't be empty.

At the bottom of the window are four buttons: "Start", "Next", "Previous", and "Exit".

Step 3: the user can answer six questions. These questions determine the user's overall investment risk tolerance, the willingness and ability to tolerate investment risks. When there are inconsistency between the willingness and ability, the Program will generate an alert. Such as alert will not stop the user to proceed to the next steps, because in reality, many investors do not have consistent willingness and ability to tolerate risk.

Investment Policy Statement (IPS) Planner

Risk Tolerance

The following questionnaire can help assess your risk tolerance in investing activities. Your risk tolerance has two parts: willingness to take risk and ability to take risk. You did not select all the options, please select them all for proceeding.

Q1: When deciding how to invest your money, which do you care about more?

- Maximizing gains
- Minimizing losses
- Both equally

Q2: The global stock market is often volatile. If your entire investment portfolio lost 10% of its value in a month during a market decline, what would you do? Your behavior during a market downturn is important to understanding your risk tolerance.

- Sell all of your investments
- Sell some
- Keep all
- Buy more

Q3: How much short-term investment risk are you willing to take in order to achieve larger long-term investment returns?

- I am not willing to take any risk
- I am willing to take a small amount of risk with my investments
- I am willing to take a moderate amount of risk with my investments
- I am willing to take as much risk as is needed with my investments

[Start](#) [Next](#) [Previous](#) [Exit](#)

Step 4: the Program displays a screen with the analysis of the user's risk tolerance profile, including the overall risk score, willingness and ability to tolerate investment risks.

Investment Policy Statement (IPS) Planner

Risk Objective

Here is your risk profile, including your willingness to tolerate risk and your ability to tolerate risk.

Your overall risk score is 8 out of 10.

Your willingness to take risk is Above Average. Your ability to take risk is Below Average.

Your ability to take investment risk is not consistent with your willingness to take investment risk. We recommend you to balance these two options.

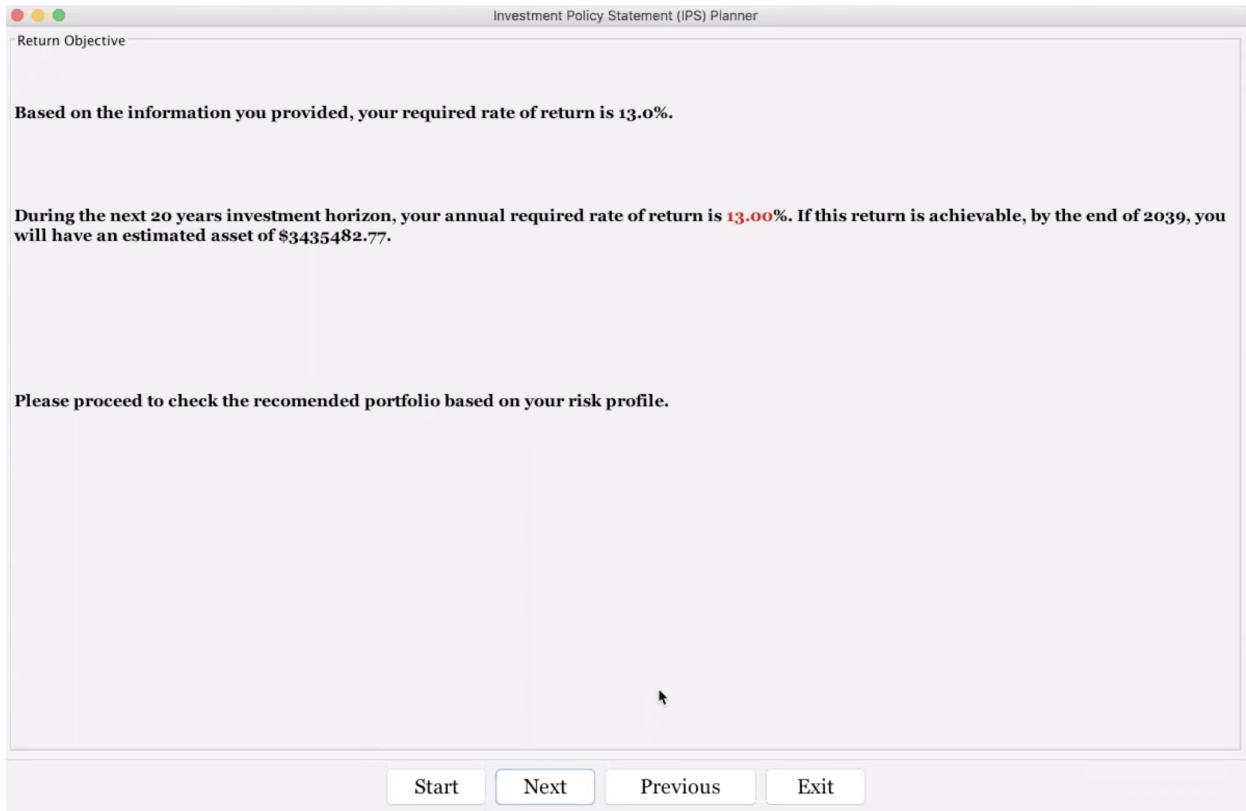
Factors that impact your recommended risk score:

More risk usually means higher expected returns over the long term, but bigger ups and downs along the way. Too much risk could leave you at a loss when you need the money, but too little may mean slower growth. We calculate the right balance for you based on:

- (1) How long you have to invest:
The younger you are, the longer you have for your portfolio to rebound from a significant downturn.
- (2) Your financial capacity for risk:
The more comfortable your finances, the more risk you can afford to take, and vice versa.
- (3) Your personal comfort zone:
Ups and downs come standard in long-term investing, but not everyone is comfortable riding out the downturns. Since the best long-term plan is one you can stick with, we consider your willingness to take risk and endure the ups and downs of the market.

[Start](#) [Next](#) [Previous](#) [Exit](#)

Step 5: the Program displays a screen with the analysis of the user's desired return objective. If the objective is too challenging to achieve, the Programs will generate an alert. Such as alert will not stop the user to proceed to the next steps, because the Program will recommend a realistic return based on the user's profile.



Step 6: the Program displays a screen with the recommended portfolio allocation to each class based on the user's risk score. The Program also shows the portfolio return and standard deviation based on the user's risk profile. Please note that the recommended portfolio return and standard deviation may be different from the user's desired return and standard deviation. However, the recommended portfolio return can be more realistic.

Investment Policy Statement (IPS) Planner

Recommend Portfolio

Based on your current risk tolerance, below is the suggested portfolio allocation.

Your risk tolerance:
8
 out of 10

Based on your risk score, the portfolio allocation recommendation and breakdown with allocation percent is as below. The suggested asset allocation portfolio will generate a return of 7.30% and the risk of the portfolio measured by the portfolio standard deviation iso.10%, which means your portfolio return can range from 7.40% to 7.20%. This data is calculated based on the historical performance data of the following ETFs during 04/06/2009 - 05/07/2019.

US Stock	15.0	Vanguard Total Stock Market ETF
US Mid Cap	15.0	Vanguard Mid-Cap ETF
US Small Cap	15.0	Vanguard Small-Cap Index Fund
Treasury 1-3 years	5.0	Barclays 1-3 Year Treasury Bnd
Total Bond	5.0	Vanguard Total Bond Market ETF
20 year long-term bond	5.0	iShares 20+ Year Treasury Bond ETF
TIPS	0.0	iShares TIPS Bond ETF
Municipal Bonds	5.0	iShares National Municipal Bond ETF
Foreign Market	10.0	Vanguard FTSE All-World ETF (no ...)
Foreign Market Small...	10.0	Vanguard FTSE All-World Small Cap...
Emerging Market	5.0	Vanguard Emerging Markets Stock F...
Real Estate	5.0	Vanguard Real Estate Fund
Gold Community	5.0	SPDR Gold Shares

↗

Start **Next** **Previous** **Exit**

Step 7: the user can end the program by clicking on “Exit” or “Next” in the last panel.

PART III CLASSES (to code reviewers)

1. Classes for User Interface Design:

(1) IpsFrame

This class designs the panels structure and the buttons of the entire program.

(2) WelcomePanel

This class is the 1st screen the user encounters. This page displays the terms and conditions as a disclaimer of the product function from a legal perspective.

(3) FormPanel

This class sets the display of the 2nd screen the user encounters. This class focuses on the format and display of the text boxes.

(4) PersonalInfoPenel (Error Check for User Input)

This class incorporates the error check to validate the user's input format for "Personal Info"

(5) FormEvent

This class sets the events and collect the user's input information needed for further analysis.

(6) FormListener

This class sets interface for form event listener

(7) RiskTolerancePanel

This class designs the first part (Question 1, 2, 3) of questionnaire that the user needs to answer for the risk assessment.

(8) RiskTolerancePanel2

This class designs the second part (Question 4, 5, 6) of questionnaire that the user needs to answer for the risk assessment.

(9) RiskObjectivePanel

This class designs the display of the user's risk tolerance analysis.

(10) ErrorControl (Error Check for User Input)

This class incorporates the error check to validate the user's input format for "Risk Tolerance Multiple Choices". It also passes errors from the Personal Infopanel to the Panel display control to display any errors in user input.

(11) ReturnObjectivePanel

This class designs part of the display on the return objective panel. The algorithms below process the user personal information input and generated return results. The results are passed to ReturnObjectivePanel and display for the user.

(12) RiskObjectivePanel

This class designs part of the display on the risk objective panel. The algorithms below processed the user multiple choices restyles and generated risk score. The analysis are passed to RiskObjectivePanel and display for the user.

(13) RecommendPortfolioPanel

This class designs the display the recommended allocation and the corresponding return and standard deviation. The algorithms below processed the user's overall information and produce a more realistic recommended investment portfolio. Additionally, the algorithms below also calculates the expected return and standard deviation

2. Classes for Finance Algorithms:

(1) TimeValueOfMoney

This class contains the methods to generate the user's return objective, which is the minimum return required to realize the user's desired retirement goal, based on the information user entered related to the goals.

Present Value = Current Asset Holding entered by the user;

Future Value = Desired Retirement Amount entered by the user;

Annuity = Annual Income - annual expense entered by the user;

Number of Years = Desired Retirement Age - User's Current Age entered by the user;

Internal Rate of Return (IRR) = Minimum Portfolio Return can achieve the user's desired retirement goals.

Method "calculateIRR" gives the final IRR output and Method "analyzeReturnObjective" tests whether the user's investment objective is realistic.

(2) RiskScore

This class returns the user's risk objective based on the survey taken by the user.

Question 1 to Question 4 returns the risk score for the user's willingness to tolerate risks.

Question 5 and Question 6, together with the user's investment time horizon, which was denoted as Question 7, determine the user's ability to tolerate investment risks. All seven questions as a whole determine the user's overall risk tolerance.

Method "analyzeRisk" interprets the risk preference behind the user's risk score.

(3) SuggestedAllocation (Note 1 and Note 4)

This class returns the suggested asset allocation based on user's risk objective. Please note that this allocation is not based on the user's return objective.

The algorithm is based on publications of several financial institutions, such as Charles Schwab and Wealthfront.

(4) FinanceEquations (Note 2, Note 3, and Note 4)

This class contains the algorithm to return the Portfolio Return and Risk with the suggested asset allocation from the class Suggested Allocation. The portfolio return is weighted average

return of each individual asset in the portfolio. The portfolio risk is measured by the portfolio standard risk.

Please note the suggested portfolio return and risk may not be consistent with the user's desired return and risk. However, the suggested portfolio return and risk are more realistic based on the analysis from the financial institutions.

(5) FutureValueCalc

This class contains the method to calculate the future portfolio value based on the current asset holding, annuity, investment horizon, etc.

3. Classes for Integration between design and algorithm

(1) DataManager

This class handles the data transfer between logic and UI. It uses static variables and methods to set, retrieve and change declared variables. This class collects value and passes value between user inputs and algorithms classes. It also contains a few validation test for some results generated by the algorithms.

(2) ErrorControl

This class handles the error checking between the user input and UIview. It ensures that the textfields/radiobuttons in panels that require user input is properly filled-in/selected. It ensures that proper strings are used for the textfields.

4. JUNIT Tests Classes

15 JUNIT tests across 7 classes have been implemented. Due to the lack in the number of methods we decided to test method "AnalyzeRisk" with different input parameters to ensure it proper functions with different parameters.

1. TimeValueMoneyTest.java

Methods Tested (2)

Methods Names:

- A) testCalculatePresentValue
- B) testCalculateIRR

2. SuggestedAllocationTest.java

Methods Tested (1)

Methods Names:

- A) testGetBenchmarkCoefficient

3. RiskScoreTest.java

Methods Tested(7)

Methods Names:

- A) testGetQ7Score
- B) testGetOverallRiskScore
- C) testGetWillingnessRiskScore
- D) testGetAbilityRiskScore

- E) testAnalyzeRisk
- F) testAnalyzeRisk2 (different input parameters)
- G) testAnalyzeRisk3 (different input parameters)

4. PortfolioAllocation.java

Methods Tested(1)

Method Names:

- A) testGetPortfolioStandardDeviation

5. FutureValueCalcTest.java

Methods Tested(1)

Method Names:

- A) testCalculateFutureValue

6. FinanceEquationsTest.java

Methods Tested(2)

Method Names:

- A) testGetPortfolioReturn
- B) testGetPortfolioStandardDeviation

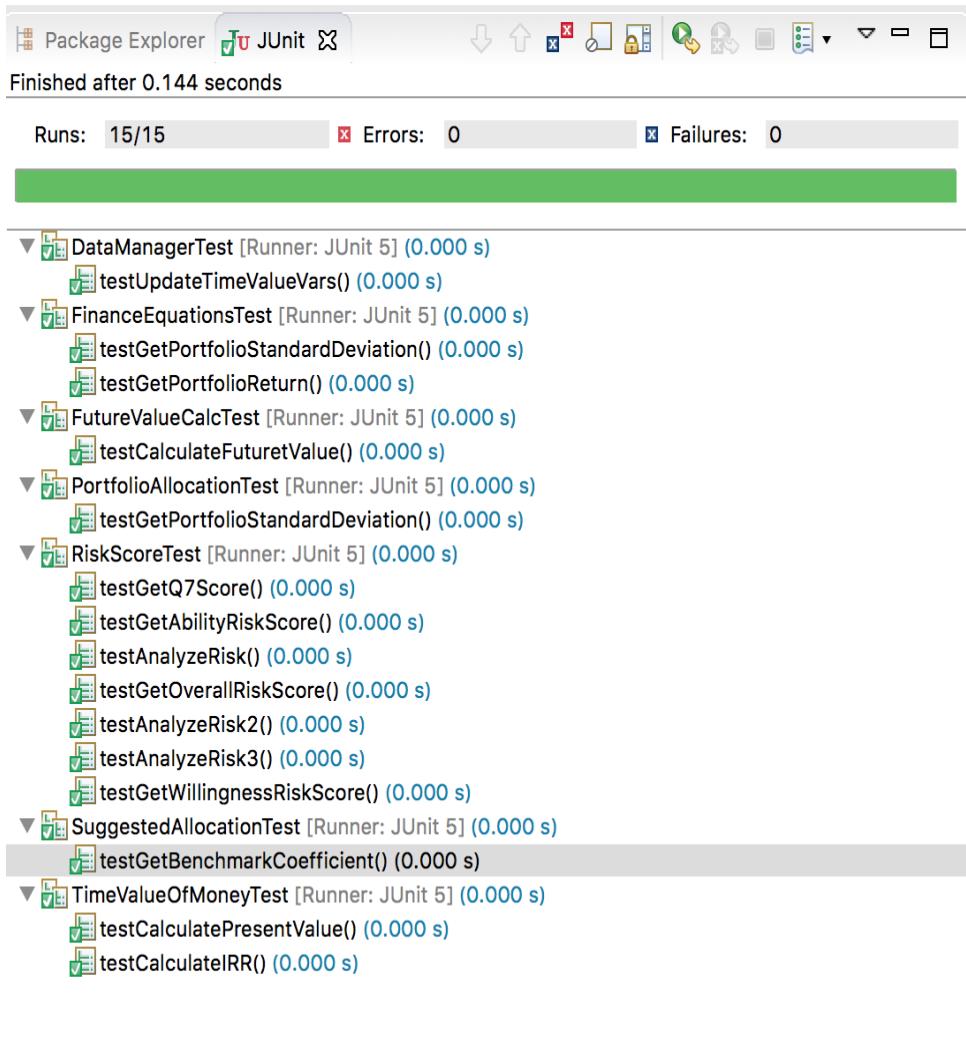
7. DataManagerTest

Methods Tested(1)

Method Names:

- A) testUpdateTimeValueVars

Result of Junit Tests:



PART IV DATA SOURCES AND REFERENCES (to code reviewers)

Note 1: Schwab Center for Financial Research with data provided by Morningstar, Inc.
<https://www.schwab.com/public/file/P-778947/InvestorProfileQuestionnaire.pdf>

Note 2: Asset class correlations for time period 04/06/2009 - 05/07/2019 based on daily returns.

<https://www.portfoliovisualizer.com/asset-class-correlations>

Note 3: Finance Algorithm demonstration example for the reviewer to understand
<https://www.wallstreetmojo.com/portfolio-standard-deviation/>

Note 4: Wealthfront Investment Methodology White Paper
https://research.wealthfront.com/whitepapers/investment-methodology/#2-finding_asset_classes