



Retirement Portfolio and Planning

FinTech Bootcamp Project 3 by Duke Boger



Project Overview

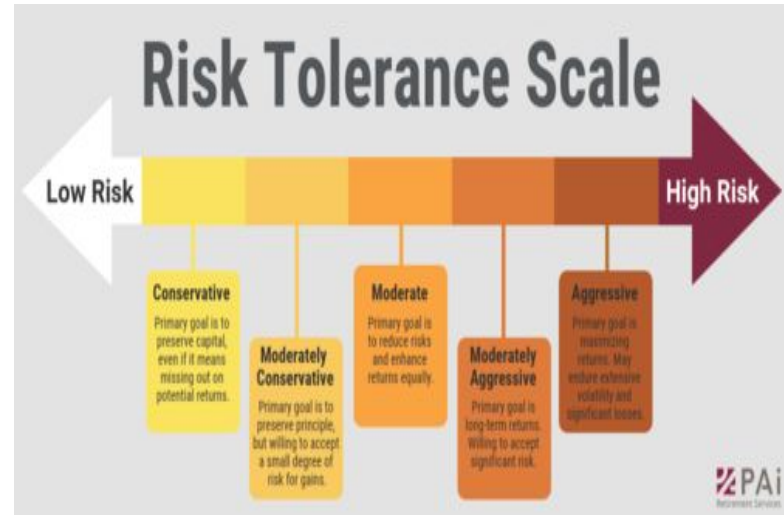
- Create a case study for a potential client at my financial planning firm to lay out an investment portfolio, optimize the portfolio for the benefit to of the client, and run simulations to project potential success for the client in means of investment return.
- Build a Portfolio optimization code to analyze the portfolio and make necessary changes based on results of analyzation.
- Use optimized portfolio and run Monte Carlo Simulations to project the probabilities for success over the given timeframe for the client.
- Take findings and make recommendation based on the results of the simulation.

Case Study: Overview

- John Doe is a 30 year old male looking to plan for his retirement in 35 years.
- John Doe currently earns \$150,000 per year or \$12,500 on a monthly basis.
- John Doe wants to open an investment account and have a portfolio built for him to invest.
- To start, John Doe would like us to run a piece of code to show the optimal portfolio for him.
- While doing this he wants to know which of his investments are the most volatile and could be exchanged in the future as his risk tolerance changes as he nears retirement.
- To finalize John Doe's retirement plan, he would like to see the optimal portfolio, projected out over his remaining working years.
- To accomplish we will drop the most volatile stocks from his portfolio and then run Monte Carlo simulations to project the returns of his portfolio over the next 10 years.

Case Study: Risk

- Before we build John Doe's portfolio we needed to assess his risk tolerance.
- Let's look at John Doe's current situation:
 - Age: 30
 - Income: \$150,000/year
 - Years to Retire: 35
- Those factors usually include the investor's current age, employment status and income, years to retirement or necessity to access funds.
- Based on John Doe's current situation, he falls into the Aggressive Risk Tolerance.



Risk Tolerance

- Risk tolerance can be defined as the amount of market volatility and loss an investor is willing to accept. There are five levels of risk tolerance.
- Conservative - Lowest level of risk. Primary goal is to preserve capital even if it means investor is missing out on potential returns.
- Moderately Conservative - Step up in level of risk. Primary goal is to preserve principle but willing to accept a small degree of risk for gains.
- Moderate - Primary goal is reduce risk and enhance returns equally; typical in investors who do not plan to use funds for 5-10 years.
- Moderately Aggressive - Primary goal is longer term returns and is willing to accept significant risk.
- Aggressive - Highest level of risk. Primary goal is to maximize returns but investor may endure extensive volatility and significant losses. Best suited for younger investors who do not plan to use funds for more than 10 years.

Case Study: Portfolio Construction

- For John Doe, we are going to build a portfolio that consists of 88% Equity positions and 12% Fixed Income positions
- For his aggressive risk tolerance acceptable ranges of breakdown between equity is between 80% and 100% equities and 10 to 20% fixed income.
- I have built John Doe's portfolio using a combination of stocks, mutual funds and ETF's.
- Stocks - Stocks are a type of security that gives an investor a share of ownership in a company. Investors often referred to as "stockholders"
- Mutual Funds - a financial vehicle that pools assets from shareholders to invest in securities like stocks, bonds, money market instruments, and other assets. Usually operated by professional money managers who allocate the assets of the fund and attempt to produce capital gains or income.
- Exchange-Traded Fund - Pooled investment that will track a particular index, sector, commodity or other asset and can be bought and sold on a stock exchange

Portfolio

- Apple - AAPL
- Amazon - AMZN
- Microsoft - MSFT
- Walmart - WMT
- SPDR S&P 500 ETF - SPY
- T Mobile - TMUS
- AT&T - T
- Tesla - TSLA
- Vanguard 500 Index Fund - VFIAX
- Dodge & Cox Stock Fund - DODGX
- Bank of America - BAC
- iShares Core U.S. Aggregate Bond ETF - AGG
- Vanguard Short-Term Treasury Index Fund - VGSH
- Invesco QQQ Trust - QQQ
- Coca Cola - KO
- General Motors - GM
- iShares Core High Dividend ETF - HDV
- iShares 1-5 Year Investment Grade Corporate Bond ETF - IGSB
- iShares 0-5 Year Investment Grade Corporate Bond ETF - SLQD
- Nike Inc - NKE

Sharpe Ratio Defined

- Sharpe ratio compares the return of an investment with its risk.
- The mathematical expression is of the insight that excess returns over a period of time may signify more volatility and risk as opposed to skill
- Excess returns are those above an industry benchmark.
- Higher Sharpe ratio is better when comparing similar portfolios

Sharpe Ratio Formula

$$\text{Sharpe Ratio} = \frac{R_p - R_f}{\sigma_p}$$

R_p = return of portfolio

R_f = risk-free rate

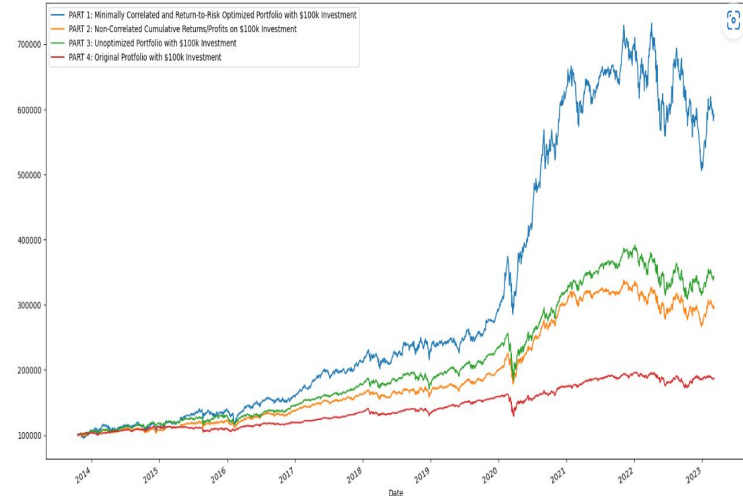
σ_p = standard deviation of the portfolio's excess return

Correlation

- Stock correlation describes the relationship that exists between two stocks and their respective price movements.
- Scale runs from -1 to 1 and is calculated by looking at a pair of stocks over a time and figuring out their average movement.
- Meant to be measured over a period of months or years rather than days
- Correlation of 1 = perfect positive correlation
- Correlation of 0 = no correlation and stocks are considered to move independently of each other
- Correlation of -1 = perfect negative correlation
- Correlation is an analysis tool that can help show investors might not be as diversified in their investments as they thought

Results of Portfolio Analysis

- By running the analysis I have some great analysis to take back to the client.
- Being so far away from retirement we can discuss our original portfolio. This portfolio displays the most risk as we have not made modifications.
- By using our analytics, we can modify the client's portfolio and produce a variety of potential outcomes.



Case Study Results

- We will take these results back to John Doe and lay out the following strategy with him for his retirement planning.
- For the next 5-10 years of his working career, we will utilize the Minimally Correlated portfolio.
- We decided to show John 2 projections of a retirement portfolio. One with an equally weighted portfolio and one with a 90/10 Equity/Fixed income split to fit his aggressive risk tolerance.
- We derived a portfolio of 10 holdings from the original 20.
- For the equally weighted portfolio, we can estimate John Doe's possible portfolio value will be between \$110,00 and \$258,000.
- However using his aggressive risk tolerance and a 90/10 portfolio, we can estimate that John's portfolio value will be between \$118,000 and \$450,000.

Case Study Results Continued

- Using the portfolio optimizer code and analytics, we were able to take a pool of 20 investments, narrow them down to the 10 that showed to have the best potential for success and run analysis showing the probability for client success.
- Using the monte carlo simulation we were able to show the client that due to his age and risk tolerance if he uses his funds to invest in the aggressive model of the portfolio he has a chance at higher returns.



Resources

- <https://www.pai.com/blog/how-to-talk-to-clients-about-their-risk-tolerance>
- <https://www.investopedia.com/terms/m/mutualfund.asp>
- <https://www.investor.gov/introduction-investing/investing-basics/investment-products/stocks>
- <https://www.investopedia.com/terms/e/etf.asp>
- <https://finance.yahoo.com/>
- <https://www.investopedia.com/terms/s/sharperatio.asp>
- <https://smartasset.com/investing/stock-correlation#:~:text=Stock%20correlation%20describes%20the%20relationship,as%20bonds%20or%20real%20estate.>