

## Pinnacle Scholars Summer 2020 Research Proposal

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Project Title: Implementing Volatility into Investor's Portfolios

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I have discussed the possibility of conducting the research in this proposal remotely (away from the Stevens campus) and my mentor has agreed to work out a way to do this so that I can complete the work during the summer of 2020.

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## Overall Project Goal:

Our goal is to find a way to safely implement volatility to protect investor's portfolios in times of crisis, while still maximizing returns. I will be collaborating with Greg Giordano, and our advisor Professor Simaan, we will be using Python to construct investment portfolios that include volatility in them to hedge against extreme market events. **We spoke to Professor Simaan and he will allow us to work remotely for this project.**

Investing in volatility means to include assets that track the VIX index, which we will explore in our project. Most portfolios stay away from volatility products due to the risk they pose; however, we would like to test if we can safely implement volatility to protect investors from downside risk and maximize returns on the upside.

## List of specific tasks to be accomplished to reach the goal:

- Research ways to include volatility in portfolios
  - o The main volatility index is the VIX, we must see research how this is calculated and find various ways to invest in it. We will use the VIX index and VXX ETF as a baseline for volatility.
- Data collection
  - o To find ways to implement volatility in investor portfolios, we must gather stock data and volatility data from financial databases to test our methodologies.
  - o We also plan to gather data on other various assets, to build well diversified portfolios.
- Finding different portfolio optimization techniques
  - o To create various optimal portfolios, such as mean variance optimization, maximize the Sharpe ratio, our overall goal is to maximize returns and minimize risk. We can also accomplish this through machine learning and linear algebra.
- Creating robust portfolio back tests
  - o In order to test the portfolios we generate through our models, we must create a portfolio back testing system to evaluate the

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effectiveness of the portfolios that we created. This will show how well they perform in the market as well as the statistical significance of the tests.

Approximate timeline to accomplish the specific tasks (remember you have 10 weeks to complete your project)

May – Start data collection and figuring out the asset allocation among our portfolios. Then we begin building portfolio optimization models in Python to build portfolios and look to research ways to implement the volatility.

June – Start building portfolio backtesting code to test the performance of our portfolios, with and without volatility, and find the statistical significance of our findings, and find methods to evaluate the portfolios. Also, we will look to find dates of various crisis events to test our portfolios in.

July – Gather concluding results from our work and begin to create visuals that highlight our findings and can distinguish between portfolios. Begin work on the final poster.

August – Finishing touches on the poster.

List of special skills you will have to develop or special equipment you will have to learn to use

Our project will primarily be done in Python using libraries such as Pandas and NumPy. We need to develop strong data collection skills to use the data from financial databases. On top of this, we will develop our numerical linear algebra skills as our models will be constructed from applied matrix algebra to our financial datasets. Lastly, we will develop machine learning skills that will help us determine optimal ways to implement volatility in our portfolios.