To Diversify or Not?

Portfolio Performance Presentation

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The Goal

- To choose a portfolio that maximizes performance while considering an appropriate level of risk.

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- The Scenario: In order to achieve our goal, we will consider a $5,000,000 portfolio invested one of two ways: a mix of Vanguard Total Bond Market Index Fund (VBTLX) and Vanguard 500 Index (VFIAX), or in a single stock: Apple (AAPL).

A few stats on the potential assets:

- The Vanguard Total Bond Market Index Fund (VBTLX) is intended to provide exposure to a broad mix of bonds. Total assets of the bond are worth $259.3 billion as of 03/31/2020.
- The Vanguard 500 Index (VFIAX) intended to be a low cost vehicle to invest in broadly in the US equity markets. Total assets of the fund are $443.6 billion as of 03/31/2020.
- Apple Inc. (AAPL) is a technology company headquarted in Cupertino, California, that makes consumer electronics, software, and online services. Apple’s market capitalization is $1.264 trillion as of 05/01/2020.

More on the goal:

- We want to maximize our expected performance, but we want to do so in a way that carefully considers the risk involved. While calculating the expected returns (based on historical returns), we also consider the variability of those returns. The more variable or volatile those returns are, the riskier the stock. Therefore, we need a measure that includes the performance while weighing the risk.

The Sharpe Ratio

- The Sharpe Ratio measures the performance of an investment compared to a risk-free asset, after adjusting for its risk. It is calculated by dividing the expected return of the stock, less the best available risk free investment, by the standard deviation of returns.

- Therefore, the Sharpe Ratio is a better overall measure of performance than returns alone because it is adjusted for risk.

Our Two Potential Portfolios

- Option A.) A mix of VBTLX and VFIAX, bonds and equities, respectively, optimally weighted in order to achieve the maximum possible Sharpe Ratio.
- Option B.) Investing entirely in AAPL

Option A: The Diversified Portfolio, VBTLX & VFIAX

- Based on the returns from January 2012 through December 2015, we calculated the optimal weighting of each stock that would maximize the expected Sharpe Ratio to get the following:
- Weighting of VBTLX: 67.8%
- Weighting of VFIAX: 32.2%
- Expected Monthly Return: 0.51%
- Sharpe Ratio: 0.48

Option A: The Diversified Portfolio, VBTLX & VFIAX

- When applied to the period from January 2016 through July 2016, we get the following:
- Monthly Return: 0.95%
- Sharpe Ratio: 0.92

Option B: AAPL

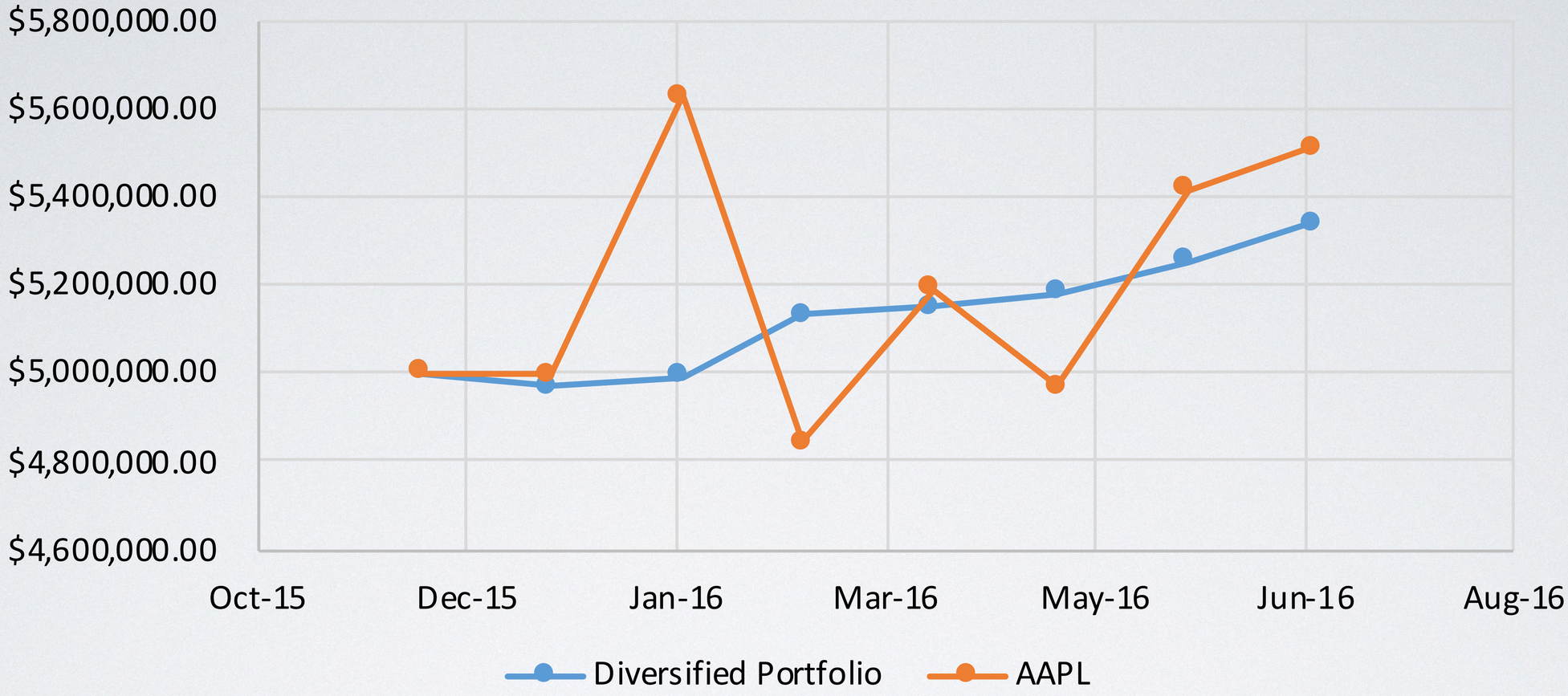
- For comparison, we consider investing solely in AAPL over the same period, which gives us the following:
- Monthly Return: 1.76%
- Sharpe Ratio: 0.21

Statistics For Each Portfolio

	VBTLX & VFIAX	AAPL
Monthly Return:	0.95%	1.76%
Sharpe Ratio:	0.92	0.21

Note that AAPL gives us a higher monthly return. Let's consider how those returns came.

Portfolio Performance, January 2016 - July 2016



	VBTLX & VFIAX	AAPL
Monthly Return:	0.95%	1.76%
Sharpe Ratio:	0.92	0.21

- Note that the AAPL portfolio provided the greatest overall return for the time period, but notice the story told by the volatility. Just looking at the graph, the variation in monthly returns are easy to see. Despite finishing higher, AAPL crossed over the balance of the other portfolio four times in only 7 months. And if the next month is similar to either May or March, the AAPL portfolio would no longer be the winner.

- This is the same story told by the Sharpe Ratio. The Diversified Portfolio has a much higher Sharpe Ratio because the returns are much more consistent. It is more likely that the portfolio returns as expected month after month. In reaching for the higher returns of the single stock, it becomes less likely that those returns are achieved.

- In conclusion, the diversification achieved through the mix of VBTLX and VFIAX provides a better likelihood for the gains we want, as demonstrated by the Sharpe Ratio.