



Good morning and thank you for joining us today.

I'm Carrie Little. My partner, Ian Lucas and I will walk you through our financial portfolio proposal titled  
**The Risky Business of Safe Investing: Optimizing Conservative Portfolios**

Today, we will examine how we've designed this portfolio to balance risk, maximize returns, and align with the customer's financial goals.

# Agenda

- **Introduction**
- **Data Overview**
- **Data Analysis**
- **Portfolio Strategies**
- **Key Findings**
- **Recommendations**
- **Conclusion**
- **Next Steps**

[https://github.com/littlecl42/AAA500\\_FinalProject\\_CL\\_IL](https://github.com/littlecl42/AAA500_FinalProject_CL_IL)

Here's a quick overview of our agenda for this presentation.

We will begin with an Introduction where I'll provide some background on our approach and key objectives.

Next, we'll look at a Data Overview, focusing on the sources and types of data we've used.

Following that, we'll dive into Data Analysis, covering insights such as correlations, risk characteristics, and volatility metrics of different assets.

We'll then explore the Portfolio Strategies that include different approaches, such as Risk Parity, Minimum Variance, and Maximum Diversification, and how these strategies align with the customer's financial goals.

Afterwards, we'll discuss the Key Findings from our analysis, including return distributions, risk profiles, and the benefits of diversification.

Based on these findings, we'll present our Recommendations for optimizing the customer's portfolio structure.

We'll then conclude with a Conclusion summarizing the key points and a Next Steps section to outline how we can move forward.

This agenda will ensure everyone gets a complete picture of our portfolio design and why it's suited to meet our customer's financial goals.



# Introduction

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- **Background**

Significant client losses in 2022 prompted a shift to safer Treasury Bills. With rate cuts now likely, clients are looking for alternative strategies that return over 4% with reduced risk.

- **Goal**

Explore new investment strategies using liquid funds, comparing Risk Parity, Minimum Variance, and Maximum Diversification approaches to provide enhanced returns while managing risks.

[https://github.com/littlecl42/AAA500\\_FinalProject\\_CL\\_IL](https://github.com/littlecl42/AAA500_FinalProject_CL_IL)

First, let's talk about the Background.

In 2022, we experienced significant client losses due to market volatility, which led many investors to shift their focus towards safer options like Treasury Bills.

With potential rate cuts on the horizon, clients are now seeking alternative investment strategies that can deliver returns above 4% while minimizing risk.

This brings us to our Goal. Today, we'll explore innovative investment strategies that utilize liquid funds.

Specifically, we'll compare three approaches: Risk Parity, Minimum Variance, and Maximum Diversification.

The aim is to find ways to enhance returns while keeping risk levels manageable.

Each strategy has unique strengths, and our objective is to determine which best meets the client's financial needs in this evolving environment.

With that in mind, let's move on to the details.



# Data Overview

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- **Dataset**

Monthly returns from 15 ETFs and mutual funds from November 2014 to August 2024.

Assets - Vanguard LifeStrategy (benchmark), Bitcoin, Treasury ETFs, Gold, VIX, commodities, market neutral, long-short equity, etc.

- **Sources**

From Portfolio Visualizer; standardized with no missing values.

<https://www.portfoliovisualizer.com/backtest-portfolio?s=y&sl=5M8RhWX2CyedGtfIDJRlyP>

[https://github.com/littlecl42/AAA500\\_FinalProject\\_CL\\_IL](https://github.com/littlecl42/AAA500_FinalProject_CL_IL)

I'd like to provide an overview of the data that forms the foundation of our analysis.

Let's start with the Dataset. We used monthly returns data from 15 different ETFs and mutual funds, spanning from November 2014 to August 2024.

This dataset includes a diverse range of assets, such as Vanguard LifeStrategy, which serves as our benchmark, along with Bitcoin, Treasury ETFs, Gold, VIX, commodities, market-neutral funds, and long-short equity strategies.

This variety allows us to analyze both traditional and alternative investments, providing a comprehensive perspective on portfolio performance.

The Sources of our data are from Portfolio Visualizer, a robust platform for financial analysis.

We ensured that the data was standardized, with no missing values, so that our analysis is both reliable and accurate.

If you would like more detailed information, you can find the full dataset at the link provided at the bottom of this slide.

# Individual Assets



|  | Count |
|--|-------|
| Vanguard LifeStrategy Income Fund (VASIX)        | 118   |
| Vanguard Total World Stock ETF (VT)              | 118   |
| PIMCO 25+ Year Zero Coupon US Trs ETF (ZROZ)     | 118   |
| AQR Diversified Arbitrage I (ADAIX)              | 118   |
| iShares Gold Trust (IAU)                         | 118   |
| Bitcoin Market Price USD (^BTC)                  | 118   |
| AQR Risk-Balanced Commodities Strategy I (ARCIX) | 118   |
| AQR Long-Short Equity I (QLEIX)                  | 118   |
| AQR Style Premia Alternative I (QSPIX)           | 118   |
| AQR Equity Market Neutral I (QMNIX)              | 118   |
| AQR Macro Opportunities I (QGMIX)                | 118   |
| AGF U.S. Market Neutral Anti-Beta (BTAL)         | 118   |
| AQR Managed Futures Strategy HV I (QMHIX)        | 118   |
| ProShares VIX Mid-Term Futures (VIXM)            | 118   |
| Invesco DB US Dollar Bullish (UUP)               | 118   |

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Let's take a closer look at the individual assets included in our dataset.

The table on this slide shows the list of assets we analyzed, along with the count of monthly data points available for each one.

As you can see, we have 118 months of data for each asset, spanning from November 2014 to August 2024, providing us with a comprehensive time frame for analysis.

The assets include a diverse mix of investment options:

- Vanguard LifeStrategy Income Fund (VASIX) serves as our benchmark, offering a low-risk, conservative approach.
- Vanguard Total World Stock ETF (VT) provides global equity exposure.
- PIMCO 25+ Year Zero Coupon US Treasury ETF (ZROZ) and iShares Gold Trust (IAU) add an element of fixed income and precious metals, respectively, providing stability and hedging benefits.
- Bitcoin (BTC) adds a layer of higher-risk, high-reward potential, which helps balance other more conservative elements of the portfolio.
- We also included several AQR funds, such as AQR Diversified Arbitrage (ADAIX), AQR Risk-Balanced Commodities Strategy (ARCIX), and AQR Managed Futures Strategy HV I (QMHIX), each adding unique dimensions of strategy-based investing.
- The AGF U.S. Market Neutral Anti-Beta (BTAL) and Invesco DB US Dollar Bullish (UUP) provide defensive characteristics and a hedge against market downturns.
- The wide variety of assets—including equities, fixed income, commodities, currencies, and alternative strategies—ensures we have a well-rounded dataset that captures a broad spectrum of market conditions.
- This diversity helps us understand the behavior of different asset classes and their contributions to a balanced portfolio.
- This detailed data enables us to evaluate risk, return, and correlation metrics effectively, giving us deeper insights into how these assets perform both individually and as part of a cohesive strategy.



# Data Analysis

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- **Risk and Return Characteristics**

Bitcoin has the highest risk with significant volatility. Market-neutral assets (ADAIX, QMNIX) show stability.

Gold and commodities provide moderate volatility, while Bitcoin offers the highest return with significant downside risk.

[https://github.com/littlecl42/AAA500\\_FinalProject\\_CL\\_IL](https://github.com/littlecl42/AAA500_FinalProject_CL_IL)

Next, let's dive into the Risk and Return Characteristics of the individual assets in our portfolio.

To start, Bitcoin stands out as the asset with the highest risk, which is characterized by significant volatility. While it has demonstrated substantial return potential, it also comes with considerable downside risk, making it suitable for investors willing to tolerate this level of uncertainty for the chance of outsized returns.

On the other end of the spectrum, we have market-neutral assets such as AQR Diversified Arbitrage (ADAIX) and AQR Equity Market Neutral (QMNIX).

These assets are designed to minimize market exposure, which helps in providing more stable returns.

They play a critical role in mitigating overall portfolio risk, particularly during volatile market periods.

Gold and other commodities provide moderate volatility, which means they offer a middle ground—less risky compared to Bitcoin but still with the ability to provide a hedge against inflation and market downturns.

These assets are valuable for maintaining balance within the portfolio.

Overall, this analysis helps us understand the role of each asset in achieving a diversified risk-return profile. High-risk, high-reward assets like Bitcoin are balanced with more stable, market-neutral assets, while gold and commodities provide both moderate returns and risk reduction.

This balanced approach is key to managing both growth and risk for the portfolio.

# Asset Performance Summary



| Risk and Return Characteristics for All Assets |   |          |                        |               |                |                  |
|--|---|----------|------------------------|---------------|----------------|------------------|
|  | Asset   | CAGR (%) | Annualized Std Dev (%) | Best Year (%) | Worst Year (%) | Max Drawdown (%) |
| 0  | Vanguard LifeStrategy Income Fund (VASIX)       | 3.35     | 5.63                   | 12.05         | -13.93         | -16.72           |
| 1  | Vanguard Total World Stock ETF (VT)             | 9.29     | 15.06                  | 26.82         | -18.02         | -25.53           |
| 2  | PIMCO 25+ Year Zero Coupon US Trs ETF (ZROZ)    | -0.52    | 21.06                  | 24.52         | -41.31         | -61.73           |
| 3  | AQR Diversified Arbitrage I (ADAIX)             | 5.19     | 5.86                   | 25.25         | -4.87          | -8.15            |
| 4  | iShares Gold Trust (IAU)                        | 7.75     | 14.01                  | 25.02         | -10.59         | -17.86           |
| 5  | Bitcoin Market Price USD (^BTC)                 | 68.78    | 76.62                  | 1271.14       | -71.76         | -73.82           |
| 6  | AQR Risk-Balanced Commodities Strategy I (ARCI) | 5.40     | 16.25                  | 39.60         | -19.50         | -30.09           |
| 7  | AQR Long-Short Equity I (QLEIX)                 | 10.50    | 11.45                  | 31.09         | -16.33         | -33.67           |
| 8  | AQR Style Premia Alternative I (QSPIX)          | 5.76     | 13.44                  | 30.61         | -21.96         | -39.58           |
| 9  | AQR Equity Market Neutral I (QMNIX)             | 6.08     | 9.95                   | 27.21         | -19.52         | -38.28           |
| 10   | AQR Macro Opportunities I (QGMIX)               | 3.24     | 7.55                   | 29.27         | -4.55          | -10.00           |
| 11   | AGF U.S. Market Neutral Anti-Beta (BTAL)        | 1.16     | 14.85                  | 20.49         | -15.09         | -35.41           |
| 12   | AQR Managed Futures Strategy HV I (QMHIX)       | 2.99     | 16.43                  | 49.99         | -14.44         | -36.26           |
| 13   | Invesco DB US Dollar Bullish (UUP)              | 3.15     | 6.63                   | 9.46          | -9.12          | -12.07           |
| 14   | ProShares VIX Mid-Term Futures (VIXM)           | -13.84   | 32.43                  | 72.39         | -50.05         | -79.79           |

[https://github.com/littlecl42/AAA500\\_FinalProject\\_CL\\_IL](https://github.com/littlecl42/AAA500_FinalProject_CL_IL)

- Correlation with VASIX**

Vanguard Total World Stock ETF (VT) has the highest positive correlation with VASIX (0.80), indicating a similar return behavior.

PIMCO 25+ Year Zero Coupon US Trs ETF (ZROZ) also has a relatively strong correlation with VASIX (0.62).

AGF U.S. Market Neutral Anti-Beta (BTAL) and Invesco DB US Dollar Bullish (UUP) have negative correlations with VASIX, suggesting they could provide effective diversification.

- Risk Characteristics (Std Dev)**

Bitcoin (^BTC) has the highest standard deviation (22.12%), indicating the highest risk and volatility.

AGF U.S. Market Neutral Anti-Beta (BTAL) and PIMCO 25+ Year Zero Coupon US Trs ETF (ZROZ) have relatively low standard deviations (4.29% and 6.08%, respectively), suggesting they may be less volatile.

Vanguard LifeStrategy Income Fund (VASIX) itself has a low standard deviation (1.63%), reflecting its conservative nature.

- Skewness and Kurtosis**

Bitcoin (^BTC) and ProShares VIX Mid-Term Futures (VIXM) have high positive skewness, implying occasional extreme positive returns.

AGF U.S. Market Neutral Anti-Beta (BTAL) and AQR Managed Futures Strategy HV I (QMHIX) exhibit negative skewness, suggesting a propensity for extreme negative returns.

PIMCO 25+ Year Zero Coupon US Trs ETF (ZROZ) shows notable positive kurtosis, indicating the presence of extreme return events or outliers.

- Return Distribution**

Vanguard LifeStrategy Income Fund (VASIX) has a mean monthly return of 0.29%, reflecting stable performance with moderate risk.

Bitcoin (^BTC) has the highest mean return (6.67%) but also the highest volatility, illustrating a risk-return trade-off.

AGF U.S. Market Neutral Anti-Beta (BTAL) has one of the lowest mean returns (0.29%) with moderate skewness and high kurtosis, showing its defensive characteristics.

- Min and Max Returns**

Bitcoin (^BTC) has the widest range of returns, with a minimum of -40.60% and a maximum of 72.00%, underscoring its high risk profile.

Vanguard LifeStrategy Income Fund (VASIX) and AGF U.S. Market Neutral Anti-Beta (BTAL) have narrow ranges, reflecting lower risk exposure and limited potential for extreme outcomes.



# Data Analysis

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- **Correlation Matrix Heatmap (Lower Triangle)**
  - Visually represents how each asset in the portfolio correlates with the others
  - Helps identify opportunities for diversification
  - Optimize the asset mix to minimize risks
- **12 Month Rolling Cross Correlations**
  - Fluctuations in correlation
  - Outlier Analysis
- **Correlation Summary Table**
  - Compares VASIX and other assets
  - Summary of Average Positive And Negative Correlations

[https://github.com/littlecl42/AAA500\\_FinalProject\\_CL\\_IL](https://github.com/littlecl42/AAA500_FinalProject_CL_IL)

Next, we'll be discussing some key Correlation Insights derived from our analysis.

First, the Correlation Matrix Heatmap, visually represents how each asset in the portfolio correlates with the others. This heatmap helps us identify opportunities for diversification and optimize the asset mix to minimize risks while maintaining growth potential.

This matrix provides insight into visualizing a portfolio that balances risk and return by leveraging assets with low or negative correlations for increased diversification while considering similar assets for targeted exposure.

Rolling Correlations and Outlier Analysis.

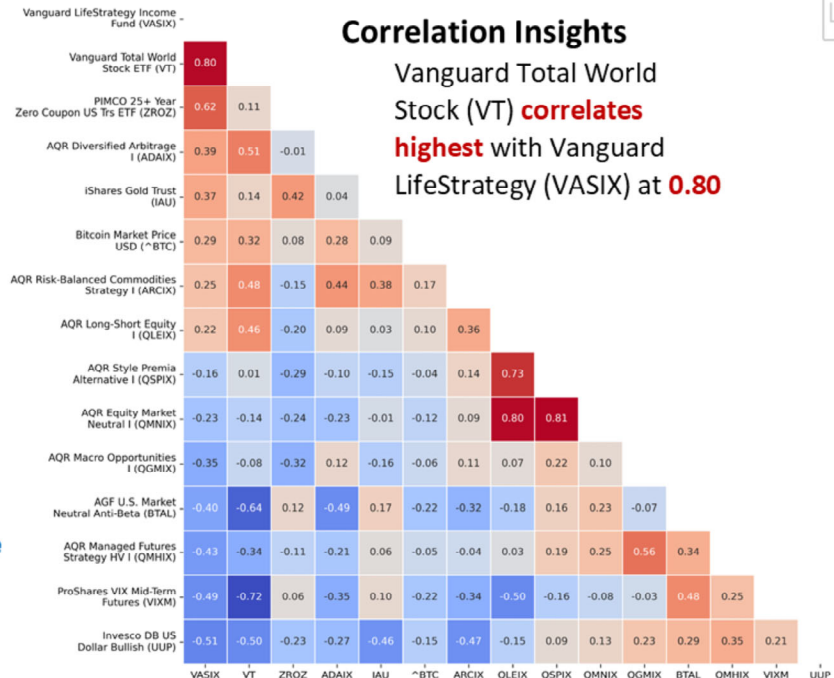
The rolling correlation analysis and the correlation summary table help us understand how the relationships between assets change over time and which assets are most effective in reducing overall risk.

We can see fluctuations in correlation, which highlight the importance of maintaining a flexible investment strategy.



## Correlation Matrix Heatmap (Lower Triangle)

**Correlation Insights**  
Numerous assets have **negative cross-correlations**, indicating diversification potential.



First up, the Correlation Matrix Heatmap, which visually represents how each asset in the portfolio correlates with the others. This heatmap helps us identify opportunities for diversification and optimize the asset mix to minimize risks while maintaining growth potential.

It provides insight into visualizing a portfolio that balances risk and return by leveraging assets with low or negative correlations for increased diversification while considering similar assets for targeted exposure.

First, we observed that Vanguard Total World Stock (VT) correlates highest with Vanguard LifeStrategy. The high positive correlation of 0.80 indicates that they tend to move in the same direction. While this means they share similar return behavior, it also implies limited diversification benefits between these assets. This is important to consider when examining how to achieve portfolio balance.

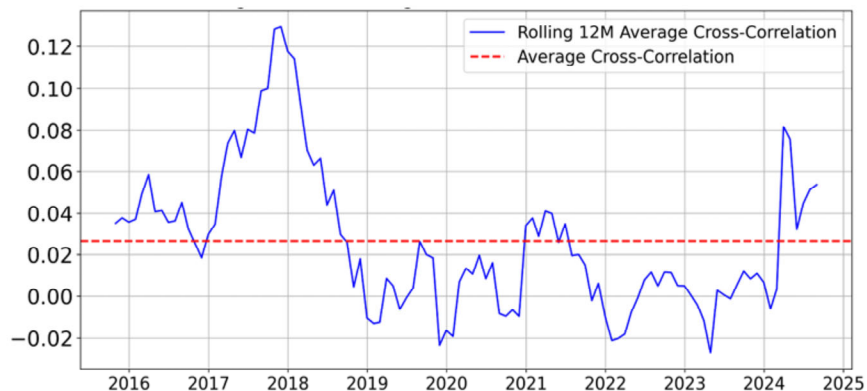
On the other hand, we also found that numerous assets have negative cross-correlations. This is a positive finding from a diversification standpoint because negative correlations mean that when some assets are underperforming, others are likely to be performing well, thus stabilizing the portfolio.

By including these negatively correlated assets, we can enhance diversification and reduce the portfolio's overall risk.

Understanding these correlations allows us to make more informed decisions about asset allocation, ensuring we optimize risk and return for a well-balanced investment strategy.

Some assets, such as AGF U.S. Market Neutral Anti-Beta (BTAL) and ProShares VIX Mid-Term Futures (VIXM), correlate negatively with many other assets. For instance, BTAL has a correlation of -0.80 with VASIX, meaning it moves in the opposite direction. This provides substantial diversification benefits and reduces overall portfolio risk.

# Rolling Correlations & Outlier Analysis



|                  | VASIX Return (%) | VT    | ZROZ  | ADAIX | IAU   | ^BTC   | ARCIX | QLEIX | QSPIX | QMNIX | QGMIX | BTAL  | QMHIX | UUP   | VIXM  |
|------------------|------------------|-------|-------|-------|-------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Average Positive | 3.88             | 8.54  | 8.21  | 2.07  | 2.45  | 20.40  | 2.51  | 1.95  | -1.47 | -1.29 | 0.09  | -6.93 | -4.85 | -1.57 | -8.92 |
| Average Negative | -3.21            | -6.69 | -6.28 | -1.42 | -2.04 | -13.94 | -2.63 | -0.12 | 3.01  | 2.49  | 3.29  | 4.79  | 7.03  | 2.72  | 9.84  |
| Correlation      | 1.00             | 0.94  | 0.80  | 0.61  | 0.56  | 0.68   | 0.48  | 0.30  | -0.32 | -0.34 | -0.64 | -0.80 | -0.95 | -0.86 | -0.59 |

[https://github.com/littlecl42/AAA500\\_FinalProject\\_CL\\_IL](https://github.com/littlecl42/AAA500_FinalProject_CL_IL)

This slide provides an overview of Rolling Correlations and Outlier Analysis.

The rolling correlation analysis and the correlation summary table help us understand how the relationships between assets change over time and which assets are most effective in reducing overall risk.

The chart above shows the rolling 12-month average cross-correlation of the portfolio over time.

We can see fluctuations in correlation, which highlight the importance of maintaining a flexible investment strategy.

There have been periods, like 2018 and 2024, where average correlations spiked, indicating that most assets were moving together, reducing the benefits of diversification.

During these times, it's especially critical to have assets like market-neutral funds that offer stability and diversification.

The table below provides a summary of average positive and negative correlations between VASIX and other assets.

Notably, ProShares VIX Mid-Term Futures (VIXM) and AGF U.S. Market Neutral Anti-Beta (BTAL) have high negative correlations, emphasizing their value as effective diversifiers within the portfolio.



# Portfolio Optimization Strategies

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- **Risk Parity**  
Balances risk across all assets, resulting in lower concentration and a balanced risk profile.
- **Minimum Variance**  
Prioritizes reducing risk in the form of standard deviation, often excluding higher-risk assets and leading to concentration in lower-risk instruments.
- **Maximum Diversification**  
Aims to maximize portfolio diversification, including assets with low correlation to reduce risk.

[https://github.com/littlecl42/AAA500\\_FinalProject\\_CL\\_IL](https://github.com/littlecl42/AAA500_FinalProject_CL_IL)

Lets discuss the different Portfolio Optimization Strategies we have considered for designing a balanced investment portfolio.

Each of these three strategies serves a unique purpose in managing risk and enhancing return potential.

First, we have **Risk Parity**. The Risk Parity approach aims to balance risk evenly across all assets in the portfolio.

This results in a lower concentration in any one asset, creating a more balanced risk profile.

By ensuring that each asset contributes an equal amount of risk, we can reduce the likelihood that a single asset dominates the portfolio, thus enhancing overall stability.

The next approach is **Minimum Variance**.

This strategy is focused on minimizing risk, specifically in terms of standard deviation.

By prioritizing lower-risk assets, Minimum Variance portfolios tend to exclude higher-risk components, which leads to a concentration in safer instruments.

This makes the portfolio less volatile, but it may also limit the potential for higher returns.

Essentially, this strategy is all about achieving stability, even if it means sacrificing some growth.

Lastly, we have **Maximum Diversification**. This strategy aims to achieve the highest possible level of diversification by including assets that have low correlations with each other.

By maximizing diversification, we can effectively reduce the overall portfolio risk, ensuring that various assets respond differently to market events, which helps in smoothing returns and minimizing downturns.

Each of these strategies brings a unique perspective on balancing risk and return, and by evaluating them, we can decide on the optimal approach to best meet your financial objectives while keeping risk in check



# Key Findings

## Optimal Strategy

Risk Parity offers the best balance between risk and return.

## Performance

Risk Parity shows the highest Compound Annual Growth Rate (CAGR) (5.38%) among the models with a modest maximum drawdown (-2.87%) without excluding any assets (doesn't "play favorites")

Performance Metrics Table:

|                        | Risk Parity | Minimum Variance | Maximum Diversification | VASIX (Benchmark) |
|------------------------|-------------|------------------|-------------------------|-------------------|
| CAGR (%)               | 5.38        | 4.66             | 4.71                    | 3.38              |
| Standard Deviation (%) | 2.93        | 2.35             | 2.61                    | 5.63              |
| Maximum Drawdown (%)   | -2.87       | -2.21            | -2.77                   | -16.72            |

[https://github.com/littlecl42/AAA500\\_FinalProject\\_CL\\_IL](https://github.com/littlecl42/AAA500_FinalProject_CL_IL)

This slide summarizes the Key Findings from our portfolio optimization analysis.

We'll start with the Optimal Strategy.

Based on our analysis, the Risk Parity approach offers the best balance between risk and return.

This strategy effectively spreads risk across all assets, leading to a well-diversified and stable portfolio.

The Risk Parity strategy showed the highest Compound Annual Growth Rate (CAGR) at 5.38% compared to the other models.

This demonstrates its strong growth potential while maintaining risk at manageable levels.

Additionally, Risk Parity had a standard deviation of 2.93%, which is modest and indicates a relatively stable level of volatility.

One of the standout metrics here is the maximum drawdown for Risk Parity, which was -2.87%.

This figure suggests that the strategy has a limited downside during market downturns, helping to protect the portfolio without excluding high-risk assets, unlike Minimum Variance, which tends to concentrate on lower-risk instruments.

Comparatively, the Minimum Variance strategy achieved a CAGR of 4.66% with the lowest standard deviation of 2.35%, making it the least volatile but also more conservative in its growth potential.

Maximum Diversification showed a CAGR of 4.71%, but with a slightly higher drawdown of -2.77%, reflecting a more moderate approach between growth and risk mitigation.

The benchmark—Vanguard LifeStrategy Income Fund (VASIX)—had a CAGR of 3.38% but a much higher standard deviation of 5.63% and a significant drawdown of -16.72%, highlighting the benefits of using optimized strategies over traditional funds.

Risk Parity delivers the highest growth rate while keeping risk levels balanced and drawdowns minimal, making it the optimal strategy for achieving both stability and returns.

# Model Analysis

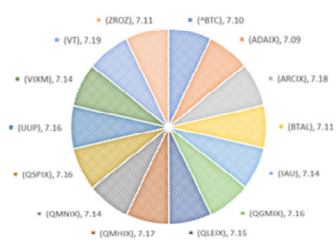


## Limitations

Minimum Variance and Maximum Diversification portfolios exclude too many assets

- (^BTC)
- (ADAIX)
- (ARCIK)
- (BTAL)
- (IAU)
- (QGMIX)
- (QLEIX)
- (QMHIX)
- (QMNIX)
- (QSPIX)
- (UUP)
- (VIXM)
- (VT)
- (ZROZ)

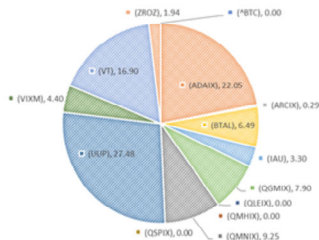
RISK PARITY



### Risk Parity:

Balances risk across all assets, resulting in lower concentration and a balanced risk profile.

MINIMUM VARIANCE



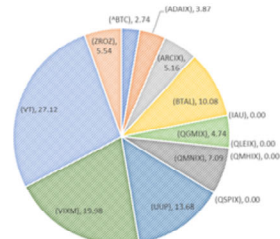
### Minimum Variance Excludes:

Bitcoin Market Price USD (^BTC)  
AQR Long-Short Equity I (QLEIX)  
AQR Style Premia Alternative I (QSPIX)  
AQR Managed Futures Strategy HV I (QMHIX)

### Maximum Diversification excludes:

- iShares Gold Trust (IAU)
- AQR Long-Short Equity I (QLEIX)
- AQR Style Premia Alternative I (QSPIX)
- AQR Managed Futures Strategy HV I (QMHIX)

MAXIMUM DIVERSIFICATION



[https://github.com/littlecl42/AAA500\\_FinalProject\\_CL\\_IL](https://github.com/littlecl42/AAA500_FinalProject_CL_IL)

In this slide, we're analyzing the characteristics of three portfolio models: Risk Parity, Minimum Variance, and Maximum Diversification.

Look at how these strategies balance the portfolio and understand their respective limitations.

Starting with Risk Parity: The pie chart on the left shows how Risk Parity distributes risk evenly across all assets.

Each segment is similar in size, which indicates that this model aims to lower concentration risk and maintain a balanced risk profile. By spreading risk evenly, it minimizes the influence of any one asset on the overall portfolio, leading to a more stable performance over time.

Now, let's discuss minimum variance, shown in the middle pie chart. The goal of Minimum Variance is to minimize risk, which often leads to excluding riskier assets. As a result, some assets, such as Bitcoin (BTC) and certain AQR funds (like AQR Long-Short Equity (QLEIX) and AQR Managed Futures Strategy (QMHIX)), are not included in this model. This leads to a high concentration of fewer, lower-risk instruments. For example, you can see that Vanguard Total World Stock ETF (VT) takes up a large proportion of the portfolio, while some assets have no allocation. While this model reduces overall volatility, it lacks the inclusion of diverse assets, limiting growth potential.

For Maximum Diversification, represented by the pie chart on the right, the focus is on maximizing diversification by including assets with low correlations. However, this approach also has its limitations. Some assets, like iShares Gold Trust (IAU) and AQR Style Premia Alternative (QSPX), are excluded to reduce correlations and diversify risk. The result is a highly diversified portfolio with more equal allocation than Minimum Variance, but it still excludes several assets that could contribute to overall returns.

The key takeaway from this analysis is that both Minimum Variance and Maximum Diversification tend to exclude too many assets, which can limit the portfolio's ability to fully leverage growth opportunities. In contrast, Risk Parity maintains a broader inclusion, balancing risk across the board, making it the optimal choice for combining stability and growth potential.

Each model has its advantages and drawbacks. However, the Risk Parity strategy strikes the best balance between maintaining broad diversification and minimizing concentration risk, making it the most robust option for achieving consistent returns with controlled risk.



# Recommendations

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- **Risk Management**

Focus on Risk Parity for balanced risk exposure, while Maximum Diversification can enhance potential returns.

- **Extend Data Collection**

More historical and macroeconomic data would provide robustness to capture different market cycles.

- **Machine Learning Techniques**

Consider clustering assets based on risk-return characteristics for a streamlined portfolio.

[https://github.com/littlecl42/AAA500\\_FinalProject\\_CL\\_IL](https://github.com/littlecl42/AAA500_FinalProject_CL_IL)

We'd like to share some key Recommendations based on our findings. These recommendations are designed to help enhance the robustness and effectiveness of the portfolio.

First, let's talk about Risk Management. We recommend focusing on the Risk Parity strategy as the primary approach for balanced risk exposure.

Risk Parity allows for an even distribution of risk across all assets, ensuring that no single asset has an outsized impact on the overall portfolio.

However, to enhance potential returns, we also suggest incorporating elements of Maximum Diversification.

This strategy can provide added growth potential by leveraging low-correlation assets, creating a more diversified portfolio.

Next, we recommend Extending Data Collection. Adding more historical and macroeconomic data to our analysis would provide further robustness.

By incorporating data from different market cycles, we can better capture the full range of possible market conditions, ensuring our portfolio strategies are well-prepared for future economic shifts.

This would allow for a more thorough understanding of asset behavior during periods of market stress and growth.

Lastly, we suggest using Machine Learning Techniques. By considering methods like clustering assets based on their risk-return characteristics, we could create a more streamlined portfolio.

Machine learning algorithms can help identify hidden patterns and relationships within the data, allowing for more sophisticated asset allocation strategies that are optimized for both risk and return.

These recommendations are aimed at creating a resilient, well-diversified portfolio that can adapt to varying market conditions while maximizing return potential.



# Conclusion

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- **Balanced Approach**

Using Risk Parity with a mix of high and low-risk assets provides robust returns with controlled volatility.

- **Client Alignment**

The recommended portfolio strategy aligns with client goals for moderate risk and returns exceeding 4%.

[https://github.com/littlecl42/AAA500\\_FinalProject\\_CL\\_IL](https://github.com/littlecl42/AAA500_FinalProject_CL_IL)

To wrap up our presentation, let's summarize our key points.

First, we advocate for a Balanced Approach. We can achieve robust returns while maintaining controlled volatility by utilizing the Risk Parity strategy with a mix of high-risk and low-risk assets. This combination ensures that we capitalize on growth opportunities while mitigating downside risk, thereby achieving a balanced performance over time.

Secondly, it is crucial to highlight Client Alignment. The recommended portfolio strategy has been designed to perfectly align with the client's financial goals—specifically, a moderate risk level with returns exceeding 4%.

By incorporating diverse asset classes and using advanced strategies like Risk Parity, we believe we can meet these objectives effectively while keeping risk within their comfort zone. This balanced strategy aims to give confidence that the financial goals are achievable with a focus on sustainable growth and effective risk management.



## Next Steps

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- Implement the proposed Risk Parity allocation strategy.
- Broaden the dataset and leverage advanced statistical models for better predictions.
- Regularly review asset performance, especially under changing market conditions, to ensure ongoing alignment with client goals.

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To move forward with our plan, here are the Next Steps we recommend:

First, we'll begin by implementing the proposed Risk Parity allocation strategy.

This strategy will provide balanced risk exposure across the portfolio, ensuring that each asset contributes proportionally to the overall risk.

Next, we plan to broaden the dataset and leverage advanced statistical models to enhance our predictions.

By incorporating more historical data and additional macroeconomic indicators, we can improve the accuracy of our models, which will help us better anticipate future market movements and optimize the portfolio accordingly.

Finally, we will regularly review asset performance, especially as market conditions change, to ensure ongoing alignment with the client's financial goals.

This will allow us to make timely adjustments, keeping the portfolio on track to meet objectives while managing risk effectively.

These steps are crucial to maintaining a well-balanced and adaptive portfolio that remains aligned with the client's investment strategy and goals.





# Division of Labor

|        |   |            |
|--------|---|------------|
| Week 3 | Form Teams, Choose Project/Dataset            | Ian/Carrie |
|        | In-Person Meeting, Create Collab Files/Folder | Ian/Carrie |
|        | Formulate Research Questions                  | Ian        |
|        | Generate Business Objective                   | Carrie     |
| Week 4 | Review Dataset, Generate Data Descriptives    | Carrie     |
|        | Outline Data Analysis Plan                    | Ian        |
|        | Develop Preliminary Models                    | Ian/Carrie |
|        | In-Person Meeting, Analyze Models             | Ian/Carrie |
|        | Develop Conclusions and Recommendations       | Ian/Carrie |
| Week 5 | Submit Final Project Check-in                 | Ian        |
|        | Draft Report                                  | Ian        |
|        | Draft Presentation                            | Carrie     |
|        | In-Person Meeting, Review Drafts              | Ian/Carrie |
| Week 6 | Review Tables/Figures/Visualizations          | Ian/Carrie |
|        | Review References/Sources/Links               | Ian/Carrie |
|        | In-Person Meeting - Presentation Review       | Ian/Carrie |
| Week 7 | Finalize Presentation                         | Ian        |
|        | Record Project Presentation                   | Ian/Carrie |
|        | Finalize Final Report                         | Carrie     |
|        | Finalize GitHub                               | Carrie     |
|        | Submit Final Report /Presentation             | Ian        |

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Now for our division of labor for the project.

Teams were assigned in week two. We began week three by communicating on Slack and setting up our first meeting. We came into the 1<sup>st</sup> meeting with dataset suggestions and direction for the project.

We discussed and selected our dataset at our 1<sup>st</sup> meeting. In the meeting, Ian was chosen as “Team Leader” and was responsible for submitting any singular forms and reports to Canvas.

Our collaboration folders were set up with Ian taking the lead by creating a Google Share Drive, and I, in turn, established and maintained our GitHub Repository.

We met in person each week in the library group study spaces, which allowed us to work back and forth, share, and compare our progress throughout the project. Additionally, there was back-and-forth communication via Slack.

Ian drafted the Technical Report, which I reviewed and finalized. I then created the presentation based on the draft.

Ian reviewed the draft presentation and made changes where warranted.

I finalized the report, which included outputting our Jupyter notebooks to PDF and combining them into the final report in Adobe.

After recording this presentation, Ian will submit the final report and finalized presentation and upload the recorded presentation into Canvas. I will ensure the final push to GitHub so that the final report and presentation, as submitted, are up to date.



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# The Risky Business of Safe Investing Optimizing Conservative Portfolios

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FA24-AAI-500 FINAL PROJECT

PRESENTED BY CARRIE LITTLE

AND IAN LUCAS

This concludes our presentation. Thank you for your attention to our presentation on **The Risky Business of Safe Investing  
Optimizing Conservative Portfolios**