Robbie Jones

Quantitative Finance

Professor Franzel

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Momentum / MinVar TAA Portfolio

Introduction

The portfolio that will be discussed in this paper is a tactical asset allocation portfolio based on two market factors: Momentum and MinVar. The asset class that is used is the entirety of the SP500 ranging from 2000 to 2024. In this paper, discussions will be made about the background and reliability of both factors, the background of VIX pricing as an indicator, data sourcing and cleaning, the implementation of the factors, the performance of the portfolio, analysis of the performance, and finally improvements that could be made to optimize the portfolio.

Firstly, a momentum factor at it's core is the theory that when a stock moves in a positive direction, it will continue to move in that direction, and vice versa. The concept of a momentum portfolio can be rooted back to the 1990's in which Jegadeesh and Titman published a research paper on the subject. They highlighted that an investor should buy a stock with high past returns and sell a stock with low past returns. The driving influences behind this theory are human biases such as herding, confirmation biases, and slow or late reactions to new information. This factor was extremely popular when the world did not process data quickly. Investors were able to generate alpha consistently. Fast forward to the present day, the investor does not generate large or any alpha due to information being processed very quickly by institutional investors.

The momentum of a stock is calculated in many different ways. A relative momentum factor compares the performance of different securities against each other. Typically this involves the simple price returns over a certain period (3, 6, or 12 months). Absolute momentum looks at the performance against its own past performance. A moving average convergence divergence (MACD) is a method of using two moving averages (ex: 10 day and 30 day) and the momentum is calculated by finding the distance between these averages. Lastly, an RSI (relative strength index) is the momentum factor that is used in this portfolio. This factor compares the magnitude of recent gains and recent losses to determine if a stock is overbought or oversold. This factor ranges from 0 to 100.

The MinVar or Minimum Variance factor is a strategy in which an investor selects a portfolio of stock that will achieve the lowest possible volatility while still capturing returns. This strategy traces back to principles of modern portfolio theory, which was introduced by Markowitz in 2952. This theory stated that diversification leads to maximized returns for the risk an investor is willing to take. A MinVar factor is typically used in market conditions that exhibit high volatility or uncertainty. The strategy typically experiences lower drawdowns and is used for pension funds and insurance companies in which their goal is to minimize risk.

Minimum Variance can be calculated in a few different ways. One popular way is to build a covariance matrix. This matrix helps the investor understand how different stocks are related to each other and influence each other. Given this, the investor that is looking to minimize their risk will allocate to stocks that are decorrelated from each other. The MinVar strategy that is used in this portfolio is a historical volatility strategy. Past volatility performance is the indicator that will be selected when the MinVar strategy is in place.

The VIX, or Volatility Index, is a market index that represents the market's expectations of volatility in the form of a forward 30-day measurement. This index is derived from the price inputs of SP500 options. The VIX is a great indicator to use in factor investing because it is a sentiment indicator. This sentiment can be used to better predict large drawdowns in the market and can help investors reallocate their portfolio to a low-volatility portfolio prior to this happening. This portfolio captures the changes in VIX pricing to better allocate to a momentum strategy for bull markets and a minimum variance strategy for bear markets.

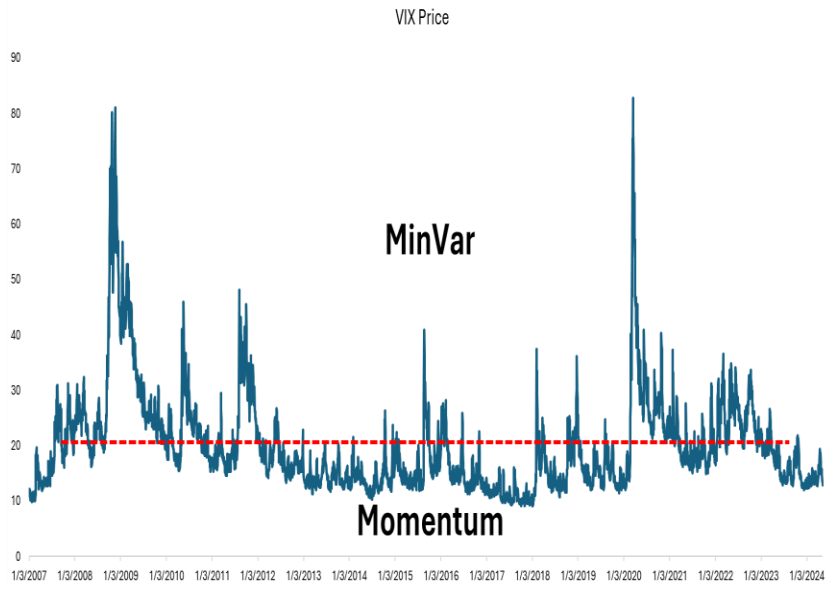
In the initial research phase, an article by Larry Swedroe was sourced for inspiration. This paper delves into a fundamental principle of finance, established by Fischer Black in his 1976 research, which talks about the inverse relationship between market volatility and expected returns. Black's theory suggests that unexpected surges in volatility depress equity returns as investors demand a higher risk premium to compensate for increased uncertainty. This elevated risk premium raises the discount rates on future cash flows, leading to diminished stock values. To navigate and mitigate the risks associated with sudden spikes in volatility, the VIX index was introduced. Jim Campasano's work, highlighted in the 2021 issue of The Journal of Alternative Investments, explores the strategic employment of the VIX in portfolio management. His research advocates for an Enhanced Portfolio strategy that adjusts its allocations between the S&P 500 Index and VIX futures based on the VIX premium, which is defined as the difference between the 30-day constant maturity VIX future and the actual VIX Index. Campasano's analysis, spanning from April 2007 to 2018, demonstrates that strategically allocating investments in VIX futures according to the VIX premium can significantly optimize portfolio performance. This approach effectively minimizes

losses during market downturns by taking long positions in VIX futures and captures gains during more stable periods through short positions. This research from the article sparked inspiration for a factor based tactical asset allocation that focuses on achieving alpha in low volatility environments but more importantly, reduces the downside risk when the markets take a turn.

The data that is used in this portfolio is sourced from Bloomberg. The SPX index was broken down into the individual securities that are in in and the cumulative returns gross dividends were extracted. The main problem with sourcing data this way is the survivorship bias. Bloomberg only sources the current SP500 and does not incorporate stocks that fell out of the index, and more importantly the stocks that entered at a specific time. A great example of this is NVIDIA. The stock is currently in the SP500 but was not always.

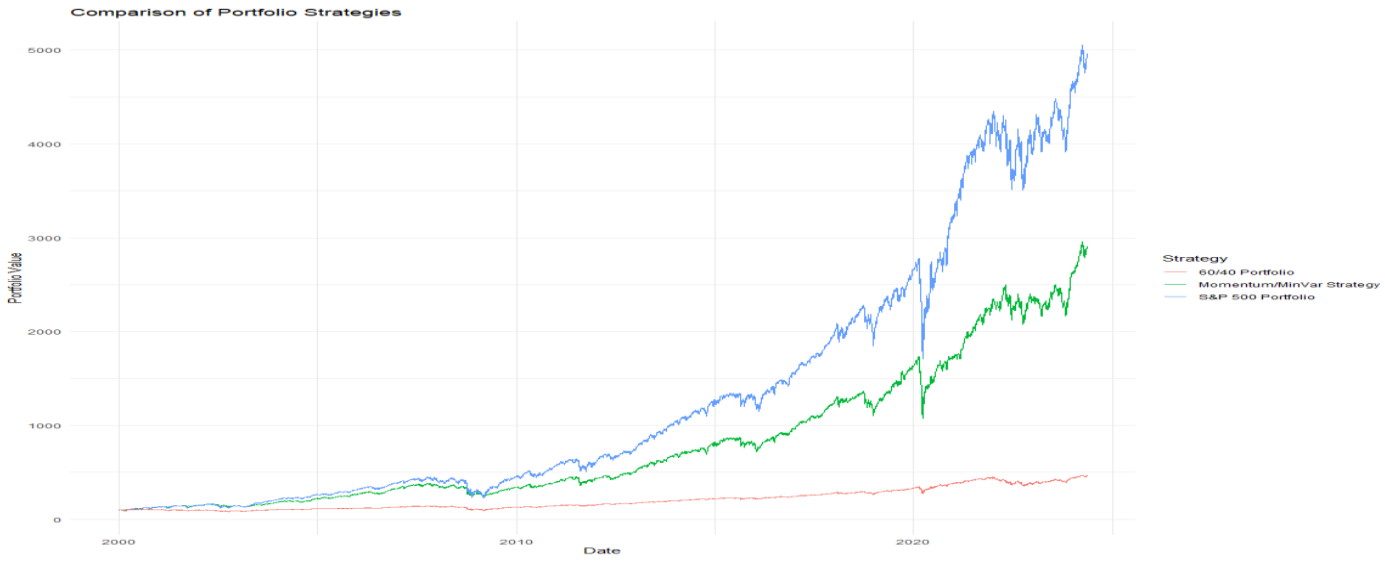
Implementation

The Momentum / MinVar portfolio is a tactical asset allocation portfolio that allocates equities to the momentum factor when the VIX is below 20 and allocates equities to the MinVar factor when the VIX is above 20. Based on sentiment research from TD Bank, a VIX index below 20 is considered to be low levels of volatility and a price above 20 is considered to be heightened volatility. For each month in the time period, metrics are calculated for the RSI score and the Volatility that each individual stock experienced over that month. When implementing the strategy, the top 20% of RSI values in the previous month are allocated to the portfolio when the VIX is below 20. On the other hand, the bottom 20% of Volatility values are allocated to the portfolio when the VIX is above 20, represented by the graph to the right. The strategy is a long-only portfolio, which will experience better returns considering the survivorship bias. If data were to be provided of stocks that were once in the SP500 but are no longer, a short would be implemented to capture the gains from stocks that fall out of the SP500. The portfolio starts on January 1st 2000 with $100 and ends present day.



Performance / Analysis

The portfolio (Green) was compared against the SP500 (Blue) as well as the traditional 60/40 portfolio (Red). As seen below, the implemented portfolio considerably outperforms the traditional 60/40 but falls slightly short of the SP500 when looking at the entire timeline. It is important to note the bear markets in this graph though. When the Sp500 falls sharply, the implemented portfolio does not fall as far. This is due to the portfolio being allocated to the Minimum variance strategy during these periods.



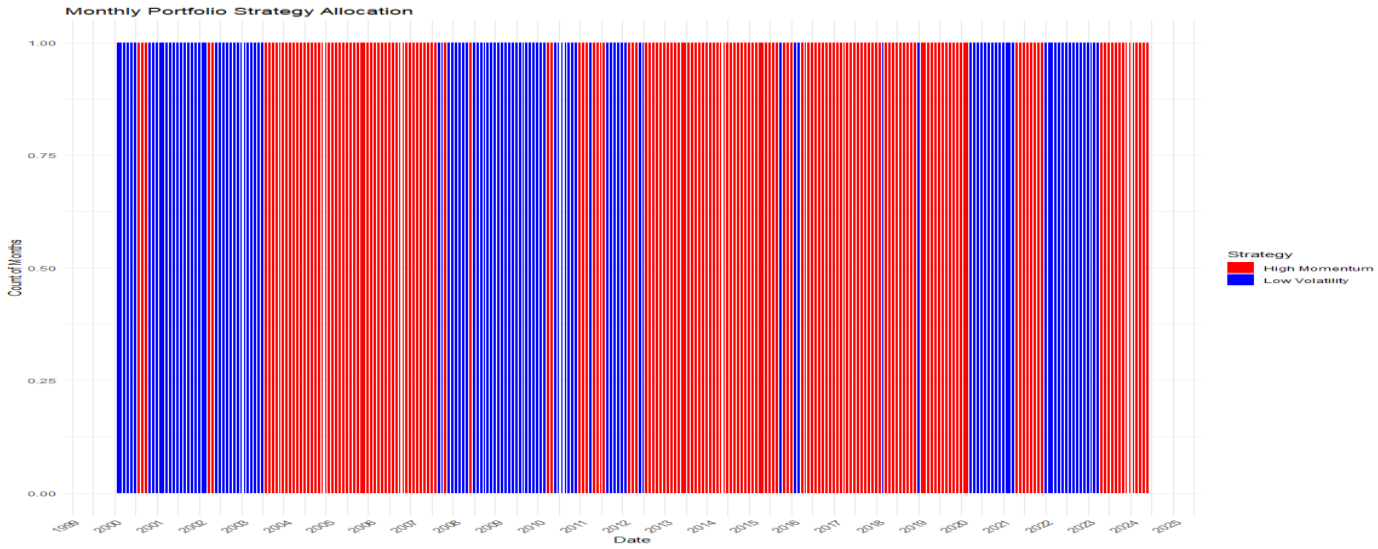
The shifts in our portfolio's strategy are clearly shown in the graph below. During the early 2000s, amidst the dot com crash, the VIX, was very high. This signaled a lot of market volatility and unease among investors. We responded by leaning into the MinVar strategy, which focuses on stocks that are less volatile. This move was key in keeping our losses in check while many tech stocks were tumbling.

This approach was crucial again during the 2008 financial crisis, a time marked by deep financial disturbances and the failure of major banks. The VIX shot up, showing how scared and risk-averse investors had become. By shifting to the MinVar strategy, our portfolio was better insulated against the market's dramatic dips.

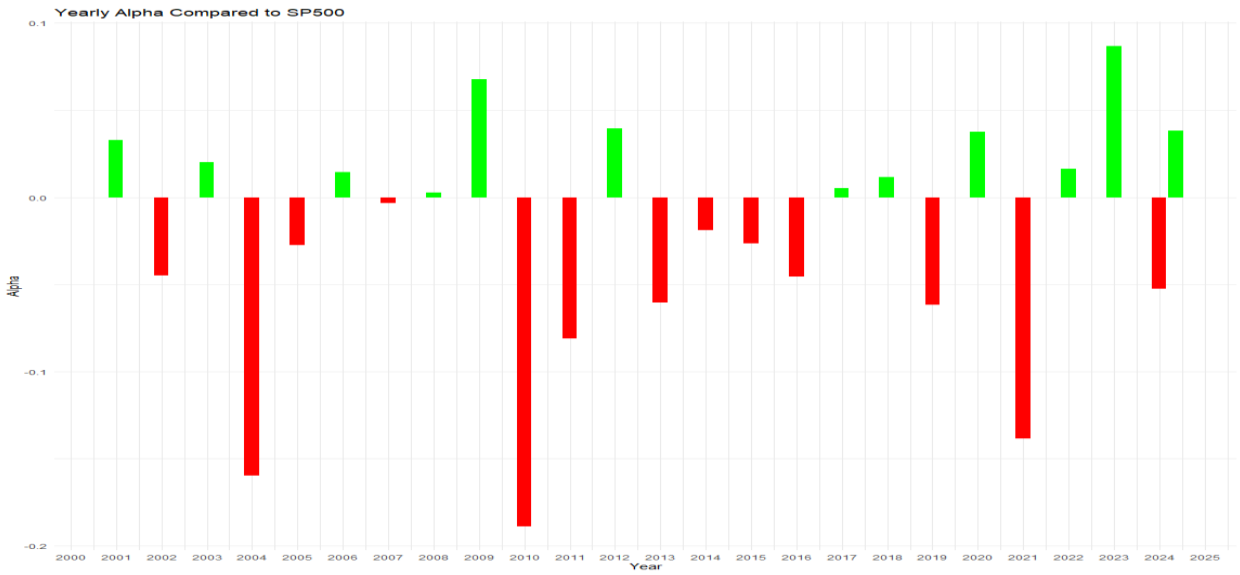
We saw this scenario unfold once more during the COVID-19 crash in early 2020, when the world faced massive economic shutdowns and uncertainties. The VIX spiked as investors worried about the fast-spreading virus and its impacts. Switching to the MinVar

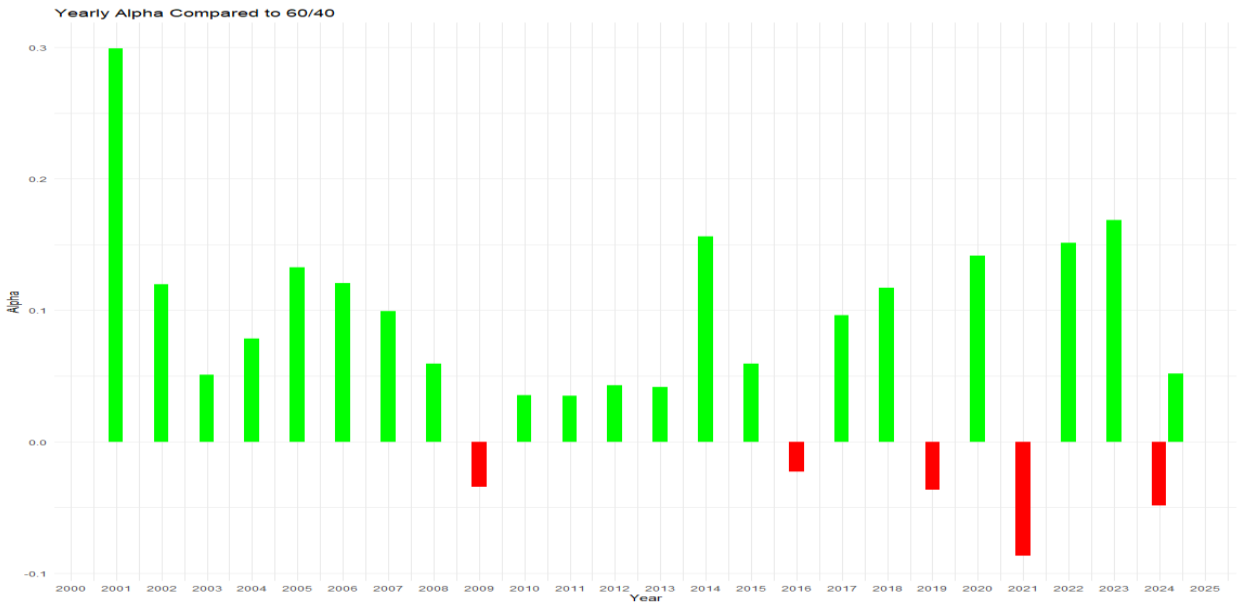
strategy helped us reduce our exposure to the wild market fluctuations, especially in the hardest-hit sectors.

In each of these downturns, moving the investments to focus on minimizing volatility through the MinVar factor proved to be a smart move. It captured minimal losses during the recessionary periods which allowed the portfolio to stay higher than the sp500. This shows the power of having a flexible asset allocation strategy that can adapt based on changes in market conditions, using the VIX as a reliable proxy for when to switch from chasing momentum to protecting against losses.



To note on alpha generation, the implemented portfolio achieved alpha versus the SP500 during all of these period. Although this is true, it significantly underperformed the rebound from the crashes in 2004, 2010, and 2021 respectively. Although the vix is a great indicator of potential bear markets, it does not perform well for predicting when those markets will turn into a bull market due to the elevated VIX. As for the alpha compared to the traditional 60/40 portfolio, it consistently outperforms except for years when bonds outperformed equities.





As for annual return metrics, the Momentum / MinVar portfolio outperformed the 60/40 by roughly 8%. The annual return for the 60/40 was 6.29% and 14.20% for the constructed portfolio. Although it beat the 60/40, it underperformed the sp500 by 2.5% (Sp500 annual return was 16.74%. Volatility for the momentum / MinVar portfolio was 15.90% while the volatility for the SP500 was 20.05%. This is the metric that is most significant in the findings. Because of this drop in volatility, the sharpe ratio for the Momentum / MinVar portfolio was 0.89 while the Sharpe ratio for the SP500 was 0.84. The metric that did not hold up to the thesis was the max drawdown. The max drawdown for the SP500 was 49.92% which was seen during the 2008 financial crisis. The max drawdown for the momentum / minvar portfolio was 40.50%. Although this is a drop, it does not significantly change. This may be due to the lookback period that was assigned when

looking at historical volatility. The beta for the momentum / minvar portfolio was 1.28 compared to the traditional 60/40 portfolio and it was 0.73 for the Sp500.

Overall, the portfolio performs very well in uncertain times, allocating to the minvar strategy prior to economic downturns. It is clear from the major economic crises that the correct equities are bought, strategically allocating to less risky investments. The portfolio does not perform well right at the time when those crashes start to turn into bull markets. It is widely known that some of the best gains in the stock market immediately follow crashes. This portfolio unfortunately misses out on those gains as it is still allocated to the minvar strategy and not the momentum factor. This is due to the elevated VIX level during the expansion phase, making the portfolio allocate to the minvar strategy and not the momentum strategy.

Improvements

Given the high max drawdown that was experienced in this portfolio, it may be beneficial to incorporate other asset classes. A research paper by Fidelity Investments outlines the four phases of the economic cycle. This is early, mid, late and recession. The paper outlines the asset classes that perform well in each of these. In the early stages, there is tremendous growth, the best investments are industrials, consumer discretionary, real estate, financials, and materials. In this phase, the momentum factor achieves great gains as the top 20% of performing stocks are typically in these sectors. During the peak/mid phase, everything seems to level out and not much alpha is generated. The highest-performing sectors in this are technology and communication services, while the lowest-performing sectors tend to be materials and utilities. During this phase, the momentum portfolio may switch to a minvar portfolio depending on the volatility that is seen in this market. To better encapsulate the performance of the market during this phase, another indicator should be implemented like unemployment or CPI to better understand the economy as a whole. Next is the late phase. This phase is where the markets take a downturn. In this phase, the sectors that take a hit are technology and consumer discretionary. The best-performing sectors in this phase are Energy, real estate, consumer staples, and utilities. These sectors are typically seen as lower risk, and the minvar portfolio tends to be the best factor in this time. Lastly, the recession phase is when the markets hit a bottom. The VIX is typically heightened in this phase as there is a lot of uncertainty in the market. The best-performing sectors in this phase are consumer staples, healthcare, and utilities. The portfolio handles this well, but problems start to arise when the markets exit the recession phase and go into the expansion phase. As stated before, the VIX is heightened and the minvar strategy is still implemented. Because of this problem, other asset classes need to be explored.

Gold is typically a great investment to be in during the 3rd phase of the economic cycle (the late phase), as investors are typically uncertain about the markets and want to be in a safe haven asset. Incorporating gold into the portfolio in tranches depending on the

VIX pricing could potentially help volatility, returns, and reduce the max drawdown. Another asset class that performs well in US recessions is bonds. As seen in the 60/40 portfolio, the max drawdown is significantly lower than the implemented portfolio or the SP500. Before recessions happen, the yield on rates typically increases significantly. In the average US Recession, US Treasury bonds experience a max drawdown of 3.6%, in contrast to the average equity maximum drawdown of 38.4%, a fixed income strategy proves to be a superior investment in uncertain times. The recovery period for a US Treasury bond is around 10 months, comparing this to an average recovery period of 44 months with equities, total returns and volatility will be greatly enhanced with the incorporation of a fixed income investment. This is a great indicator of upcoming recessionary environments and should be taken into account in order to outperform equities and cash during recessionary periods.

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Data Sources from Bloomberg