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Minimum Variance Factor Study

Broad Overview

Minimum Risk seeks to optimize a portfolio's risk/return by taking long positions in stocks measured to be low risk, and short positions in stocks measured to be high risk. For our measure of quantifying a stocks risk, we calculated its beta with respect to the overall market. High Beta illustrated higher risk, and lower beta illustrated lower risk, so our proxy for minimum risk is a stocks Beta calculated with differing methods and loopback periods.

Rationale

Fear:
Investors and Firms that have the capability to deploy leverage often don't, leading to them increasing their weight in high-beta assets. This is how they can capture the returns they want without deploying leverage. (Black)

Security Market Line:
According to the Capital Asset Pricing model, an assets expected return has a linear relationship with its Beta value, but In reality, this relationship does not consistently hold. Different economic periods can change this relationship, in which low-beta assets may outperform high-beta assets, given their level of risk(Ex: 1931-1965). The minimum risk factor seeks to take advantage of this inconsistent relationship between beta and asset return, investing in assets with lower risk. A flatter than expected security market line decreases the expected return for higher risk assets.

Margin:
Ease of accessing margin is impacted by the nature of a portfolio, where lower risk portfolios are easier to gain access to margin than higher risk portfolios, incentivizing leveraging a low beta portfolio. An inability to access margin impedes the ability to generate higher returns, so an investor looking to accomplish this without leverage may be pushed towards more volatile, risky stocks. Such stocks would likely have high beta values with inflated pricings.

"Winner's Curse":
Stocks that earn abnormal returns over short time frames can earn the attention of uninformed investors. Such investors may be inadequately able to evaluate these stocks, but a desire to "jump on the bandwagon" can cause irrational investing in such situations. This further exacerbates short-term overpricing.

Stocks that earn abnormal returns over short time frames often earn excessive media attention, earning the eye of unlikely investors(Ex: GameStop). Uninformed investors looking to "jump on the bandwagon" may flock to such investments, further exacerbating short-term overpricing.

Backtest Results:

1)

Start Date: 12/31/2009 End Date: 03/06/2023

Beta Lookback Options:

6 Months (126 Days)

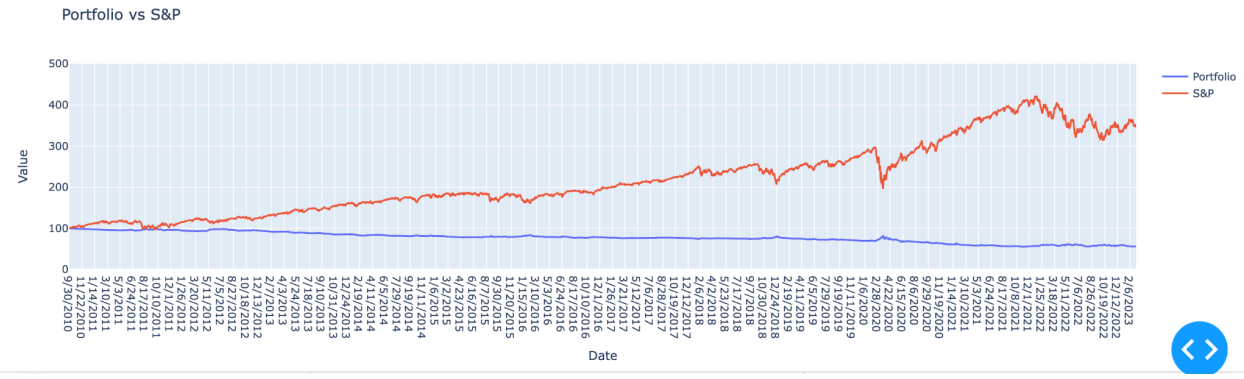
Beta grouping options:

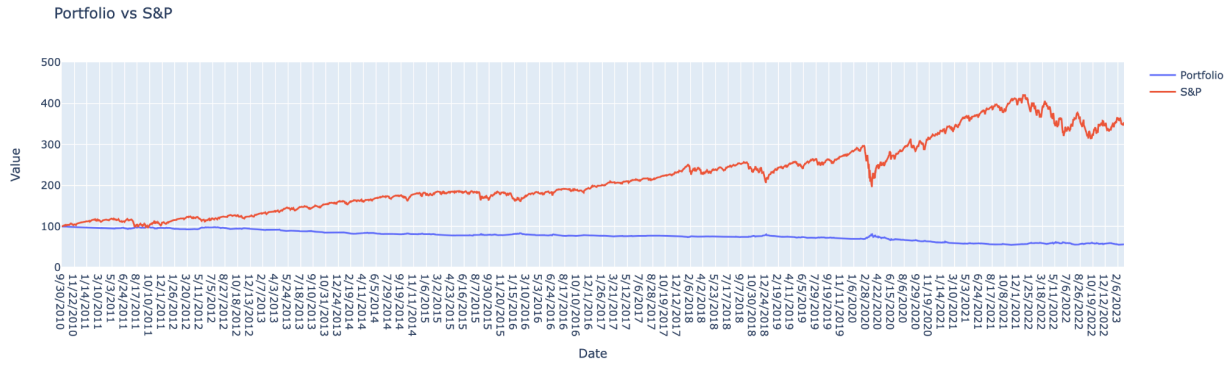
Monthly

Investment Strategy:

Contrarian

Run





Measures	Our Portfolio	Benchmark
Sharpe Ratio	-0.7194972664004629	0.6223703891451451
Max Drawdown	0.4528908685751059	0.3392495902426059
Volatility	0.07769984396685077	0.17668419461008938
Yearly Return	-0.04536808734423148	0.10737[illegible]8736
Beta	0.0026726611439708108	1
Alpha	-0.15273986317101884	0.15273986317101884

2)

Start Date: 08/16/2018 End Date: 11/15/2022

Beta Lookback Options:

6 Months (126 Days)

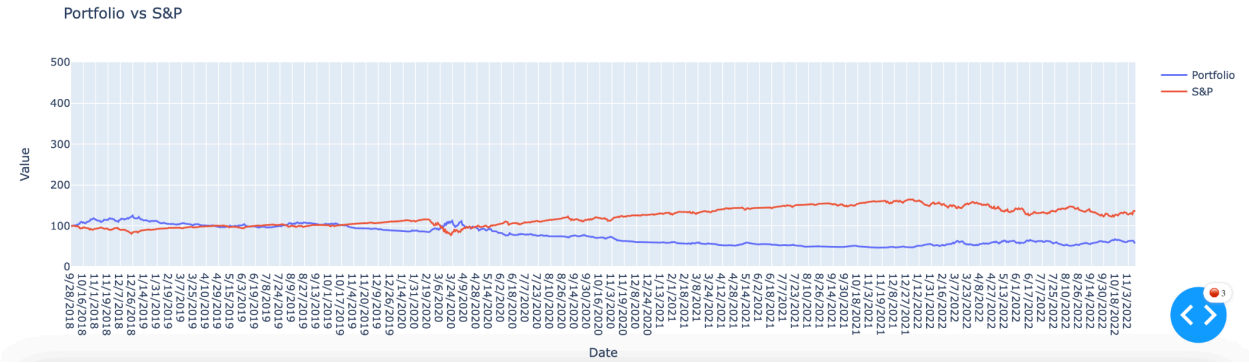
Beta grouping options:

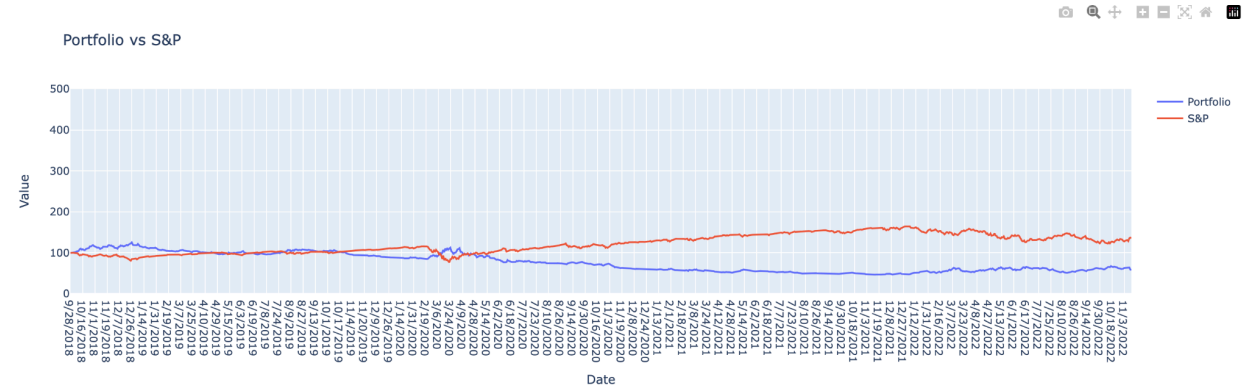
Daily

Investment Strategy:

Short

Run





Measures	Our Portfolio	Benchmark
Sharpe Ratio	-0.7025085496591589	0.26936664167652685
Max Drawdown	0.6319497795742989	0.3392495902426059
Volatility	0.2669804414217938	0.230809458026512
Yearly Return	-0.12189535950243846	0.0769718 /47
Beta	-0.057898765552781596	1
Alpha	-0.19886725296767593	0.19886725296767593

Conclusions:

Our backtest results reinforce the idea that the minimum risk portfolio can actually outperform the market during downturns. This gives it a potential use case as a risk mitigation strategy, but likely not as a primary investing strategy, as illustrated by its extremely low beta values and outperformance during downturns. Also, the strong yearly performance of the S&P over the last decade, and the strong performance of highly volatile stocks made the minimum risk factor perform poorly in comparison. The data set used also weakens the performance of the factor portfolio, due to survivorship bias and the phenomenal performance of high volatility stocks over the data set, so a more robust backtest could improve the quality of these conclusions.