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Factor Selection: The factors selected for our analysis are Market, Size and Momentum. These three factors represent a blend of both old and new factors of return, the time-tested factors of size and market with the factor of momentum.

Investor Profile: Investors who seek high exposure to 3 factors Market, Size and Momentum. The investor is willing to accept substantial fluctuations in the portfolio value for higher potential return in the long-term compared to returns from investing in the market portfolio.

ETF selection: Exchange Traded Funds or ETFs allow us to gain exposure to market factors both cheaply and efficiently. We selected 10 ETF's per factor and ran regressions to determine the efficiency of the ETF in tracking a given factor. Using our regression outputs we developed the following formula $\frac{Beta\ of\ the\ ETF}{Tracking\ error\ of\ the\ ETF}$ or factor exposure for each unit of tracking error to pick an ETF for our portfolio. For each factor we picked the ETF which had the highest factor exposure for a given unit of tracking error. The ETF's selected are VTI, VIOO and PTF for Market, Size and Momentum factors respectively.

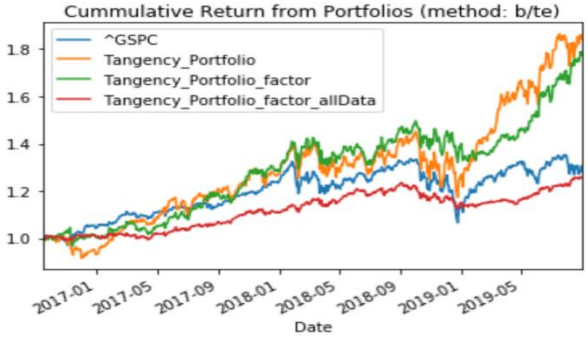
Portfolio Weights: The weight of each ETF in our portfolio was determined through mean-variance optimization where short selling was allowed, with the only constraint being that ETF weights must add up to 1. Based on the output of our analysis we got the following weights for each ETF in our portfolio:

ETF	Factor	Weight
VTI	Market	150.36%
VIOO	Size	-112.41%
PTF	Momentum	61.95%

Or for every $100 of investment we would buy $150.36 worth of Market, sell $112.41 worth of Size and buy $61.95 worth of Momentum factors.

Results: Upon constructing the portfolio and back testing it with the given ETF and factor price data, we got the following returns:

	Tangency Portfolio	Factor Portfolio
Mean annual return	22.68%	20.61%
Standard deviation	19.59%	15.05%
Sharp ratio	1.16	1.37
Daily tracking error	0.6%	N/A



Observations: Due to the lack of available data for certain ETF's we shorted the time period of the regressions to correspond with that of the ETF with the least number of data points. On running the regressions for longer periods of time for ETF's with available data, we observed that the market factor is tracked best by the ETF's. On the other hand, momentum is tracked the worst. This is probably because momentum is a new factor and ETF's haven't developed sustainable trading strategies for it. We observed mixed results for ETF's tracking SMB.