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Introduction

In this experiment, I develop a strategy with simple momentum signals based on tactical asset allocation to select the potential factors from barra factors framework under different market circumstance.

Strategy

Under the barra model, we can treat the country factor as the market performance of the China A-stocks market. Therefore, in order to obtain the excess market return, I don't allocate my positions on the country factor. Instead, I use the market factor to help me define the market state. Then, based on the different market states, I use the momentum strategy differently to allocate my positions.

As for the market state, I use the 20 days moving average and 50 days moving average. To be specific, if the MA(20) is above the MA(50), I define the market as a bull market. Otherwise, I define the market as a bear market.

As for the style factors, under the bull market, I will long the top 3 style factors with large momentum in the bull style factors list with positions (0.2, 0.1, 0.1) , and short the bottom 2 style factors with low momentum in the bear factors list with positions (-0.2, -0.1) .
Then in the bear market, I will long the top 2 style factors with large momentum in the bear style factors list with positions (0.2, 0.1) , and short the bottom 3 style factors with low momentum in the bull factors list with positions (-0.2, -0.1, -0.1). Therefore, the total risk exposure on style factors are 70%

As for the industry factors, under the bull market, I will long the top 5 industry factors with large momentum with positions (0.05, 0.05, 0.025, 0.025, 0.025) , and short the bottom 3 industry factors with low momentum with positions (-0.05, -0.05, -0.025) .
Then in the bear market, I will long the top 3 industry factors with large momentum with positions (0.05, 0.05, 0.025) , and short the bottom 5 industry factors with low momentum with positions (-0.05, -0.05, -0.025, -0.025, -0.025) . . Therefore, the total risk exposure on industry factors are 30%

Explanation

This strategy is under the assumption that the style of the market and the popular industry in the market will rotate during long period of time. Besides, the market is also changing its state between Bull and Bear (definitely there will be more states, for this project I just consider these two).
Under the bull market, the momentum factor, growth factor and leverage factor tends to behave better than others since people are more positive about the market and willing the take the risk to earn further return.
Under the bear market, the book to price ratio factor, non_linear_size factor and earnings_yield factor tends to perform better since people are more conservative and trust those safe company with good quality and stable financial situation.
Besides, Since the beta factor and residual_volatility factors tend to be stable in different market state, I will put these two factors in both the bull market list and bear market list. Therefore, the bull market list and bear market list come as:

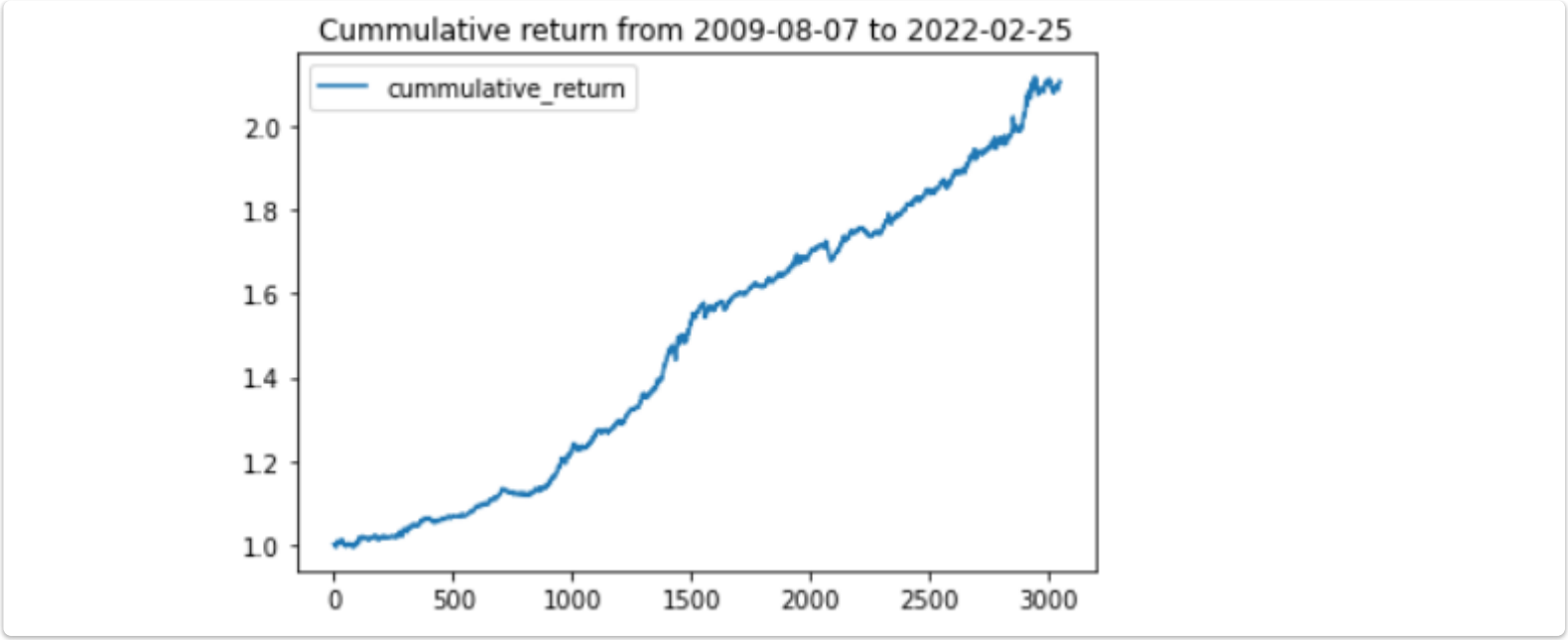
- bull market factor list = (beta, residual_volatility, momentum, growth, leverage)
- bear market factor list = (beta, residual_volatility, earnings_yield, book_to_price, non_linear_size)

The momentum factor is simple as $Mom_t = \frac{\sum_{i=t-151}^{t-1} return_i}{150}$

Experiment Implementation

To give a better understanding of the code, I give some explanation here.
In the code, I define two class trader and brain for better implement the strategy. Then, since I am using momentum signals based on 150 looking back windows, the start date of our backtesting period is '2009-08-07' and end on '2022-02-25'. For each 20 days, we will allocate our positions based on the current market state and momemtum signals.

The cummulative curve of the porfolio from '2009-08-07' to '2022-02-25' is as follows:



And the annualized sharpe ratio is 2.437 (here I assume the risk free return rate = 0)