ADVANCED ASSET MANAGEMENT

Long / Short Equity Strategies

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1 Part I : Replication of a Momentum/Value Strategy

1.1 Strategy Rationale

The Strategy is based on two factors: the fundamental value and a technical momentum factor. The Strategy also relies on market neutrality to generate returns independent of market movements.

Value Factor - P/B ratio Price-to-Book is the price of the stock divided by the book value of common equity per share. Stocks with high P/B ratios are referred to as "growth stocks", and stocks with low P/B ratios are referred to as "value stocks". It has been documented that low P/B ratios tend to outperform stocks with high ones. One explanation is that stocks with low P/B have experienced a significant decline, which could lead many investors to shy away from them or demand a high risk premium for holding them.

Momentum Factor A positive return of a stock over a specified time horizon. The idea can be stated as the following : stocks that have performed well recently tend to continue performing well in the near future. There is, however, evidence of a negative autocorrelation in individual stock returns over periods of one week and one month [1]. A possible explanation is that investors under-react to new information, and that there is therefore some inertia in stock prices.

Market-Neutral Principle - L/S Equity To achieve Market Neutrality, a manager must buy and sell stocks, using an indicator like the Z-Score to determine which stocks he will trade. Dollar Neutrality involves constructing a Long/Short Portfolio where the Short position finances the Long position[2].

1.2 Portfolio Construction Rules

This section presents the methodology used for a momentum and value-based stock selection strategy. It includes exploratory data analysis and the computation of momentum and value scores based on historical returns and P/B ratios. The stock selection and portfolio construction are also explained.

Exploratory Data Analysis The Dataset is divided into three parts: the historical monthly returns of 47 European stocks[3], the historical monthly P/B ratios for the same 47 European stocks and the historical performance of the STOXX Europe 50 Index (representing 50 large, blue-chip companies from 18 European countries). The NaNs have been filled using the cross sectional mean across the universe of Stocks, regarding both the Momentum and the P/B ratio. Using the cross sectional mean, instead of the historical mean of one stock, helps avoid the "look ahead bias" and gives a fair approximation.

Momentum Score, Value Score & Global Score Regarding the momentum score, each stock is given a "Momentum score", computed as the cross-sectional Z-score [4] of their average monthly return over the last 12 months but the last one. Regarding the value score, each stock is given a "Value score", computed as the cross-sectional Z-Score of the inverse of their P/B ratio as measures at the end of the previous month [5]. Z-Scores are rounded at 3 standard deviation to winsorize the impact of extreme values. The "Global score" of each stock is computed as the arithmetic average of the previous scores.

[1] Jegadeesh(1990). That short term mean reversion is taken into consideration within the strategy suggested.
[2] Therefore, the sum of the weights in both the Long Portfolio and the Short Portfolio is equal to 1.
[3] From 2007-03-30 to 2023-03-31.
[4] To compute the Z-Score for each stock we subtract the universe's mean factor exposure from the stock's individual factor exposure and divide the difference by the standard deviation of factor exposures for the universe.
[5] The Rationale for both factors is explained in the previous section

Stock Selection & Portfolio Construction The Long Portfolio is composed of the 15 stocks that display the highest Global scores. The Short Portfolio is composed of the 15 stocks that display the lowest Global scores. In both Long and Short Portfolios, stocks are weighted proportionally to the absolute values of their Global scores. The Strategy invests 100% in the Long and 100% in the Short Portfolios respectively and thus ends up with a Dollar neutral position.

2 Part II : Strategy Evaluation and Improvements

2.1 Strategy results

Summing the returns over all the long and short positions, we construct a monthly as well as a cumulative monthly PnL: The PnL of month m_t is computed as the product of the monthly returns $[m_{t-1} : m_t)$ of the selected stocks and their respective weights of month $[m_{t-1} : m_t)$. As such, it is necessary to shift the weighting scheme from $[m_t : m_{t+1})$ to $[m_{t-1} : m_t)$.

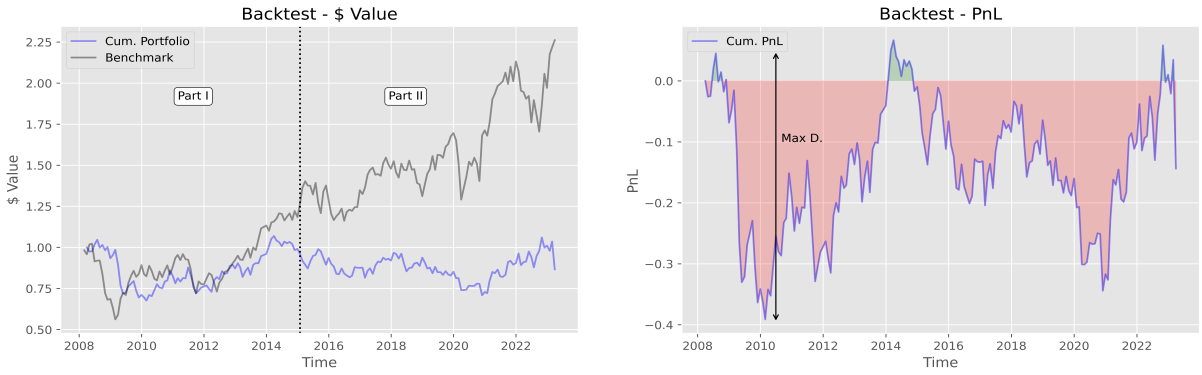

Figure 1: Backtest Performance

We can see from Figure 1 the difference between the performance of the Strategy versus the Benchmark. We can notice two different periods: Part I and Part II. The returns of the Strategy during the first period (before 2015) appear to be very close to the Benchmark, following both its upward and downward movements. During this period, we think that by tweaking our Strategy correctly we might be able to beat the Benchmark. However, during the second period (after 2015), we can observe a divergence in the behavior of the Strategy compared to the Benchmark, and therefore any hopes of beating the Benchmark are lost. The results are surprising: not only we do not beat the Benchmark performance, but we also end up with a negative alpha for the Strategy (around -0.0005). During the 2008-2023 period, we observe only three brief periods where the Strategy yields excess capital. Therefore, as we can see from Figure 1, investing 1$ in a Buy-and-Hold Strategy (Benchmark) across the 2008-2023 period returns a gain of 1.25$, whereas investing the same amount in the L/S Strategy results in a loss of 0.13$.

	Alpha	Sortino R.	Sharpe R.	Max. Drawdown
L/S Strategy	-0.0005	-0.083	-1.642	-40.155%

Table 1: L/S Strategy Key Figures

2.2 "Lucky" Long/Short Strategy

To challenge our Strategy, we constructed a "Lucky" one, where the weights of the Long and the Short legs are simulated as Standard Normal distributions [6] (rounded at 3 standard deviations). Doing this allows us to have randomly selected stocks and weights, which will correspond to our "Lucky" L/S Portfolio. We then proceed to create 10K different "Lucky" Portfolios through dictionaries to have more stable results but also to compare them to those of the Strategy above. The alphas generated by the "Lucky" Portfolios follow a Normal distribution. Without any surprise, the "Lucky" L/S Portfolios return an alpha of approximately 0 [7]. Comparing the alphas of the "Lucky" Portfolios to the one from the Strategy, no significant difference can be mentioned.

2.3 Improvements

The strategy must be refined if we want to generate positive alpha. Indeed, building a L/S Portfolio on Value and Momentum factors is a too common strategy and therefore can't generate alpha especially since we didn't consider transaction fees. One way to do that is by increasing the Data we're dealing with: the universe of stocks as well as the number of observations. Having more stocks allows for a better and more accurate stock selection which will later on have positive impact on the performance[8]. A greater number of observations could help determine the robustness of such a Strategy. The use of more features or the implementation of feature engineering could help generate stronger signals (ie, the introduction of economic factors such as GDP or Unemployment rate, other fundamental factors such as ROE or Market Cap, or technical factors such as Bollinger Bands or SMA ...). Finally, we can also add a mapping by sector within the selected stocks and make sure that one specific sector is not over represented and won't have too much impact on the results.

[6] As Momentum Score can be associated to a Normal Distribution, the Global Score will not necessarily follow a Normal Distribution because of the Value score, however after careful considerations it appeared that using a Normal assumption for the Global Score would not be too far-fetched.

[7] A p-value test would confirm that intuition.

[8] In the context of this project, we invest in 30 stocks within a universe of 47 stocks which amounts to about 60% of the stocks of the given universe of stocks. If we were to have a larger universe of stocks, say a universe of 100 stocks, we would only use 30% of the given universe of stocks.