UNIVERSITY OF PENNSYLVANIA
The Wharton School

Investments — Project 3: Stock Screening
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Goal: Use historical data to explore the potential profits from momentum strategies within segments of the equity market stratified by book-to-market and market capitalization.

Setting and Analysis: An endowment is currently invested 100% in a market-index fund. The endowment's investment committee is considering the potential benefits of adding a long-short momentum position. In particular, the investment committee is considering strategies that rank stocks on their cumulative returns over the previous 12 months, skipping the most recent month (as is commonly done in such strategies). The long "leg" of the strategy is the portfolio of stocks in the top third of this ranking (the past winners), and the short leg of the strategy is the portfolio of stocks in the bottom third (the past losers).

The momentum strategies that the committee is considering differ with respect to the segment of stocks being sorted by previous returns. Specifically, the committee is considering momentum strategies within each of the following stock segments, defined by a range of book-to-market ratios and market capitalizations within the overall universe of stocks on the NYSE, AMEX, and Nasdaq:

segment	Book/Market	Market Capitalization
1	All	All
2	Bottom Third	All
3	Middle Third	All
4	Top Third	All
5	Bottom Third	Bottom Half
6	Middle Third	Bottom Half
7	Top Third	Bottom Half

For segments 5–7, the market-cap screen is applied first, and then the book-to-market ordering is applied within that range of market capitalization. (So, for example, segment 7 contains stocks with the highest book-to-market ratios within the bottom half of market capitalization.)

For the momentum strategy in each of the above segments of the stock market, estimate:

1. The difference in expected returns between the long and short legs.
2. The Sharpe ratio of the long-short momentum strategy.
3. The information ratio (IR) of the long-short momentum strategy.

If the endowment committee were to select only one of the seven long-short momentum strategies to combine with a position in the market index fund, which one would allow the fund to achieve the highest overall Sharpe ratio?

For each dollar of the endowment invested in the market index fund, how much of the endowment would you invest in the momentum strategy you selected in order to obtain the highest Sharpe ratio?

Can you think of an explanation or hypothesis that could explain your findings about the market segments (market cap and book/market) in which momentum effects have been the strongest?

Guidelines:

1. The Wharton Backtester can be used to construct the historical returns on the long and short legs of each momentum strategy. The "Download to Spreadsheet" feature can then be used to analyze returns further with another program, such as Excel.

2. You should be able to produce the required return series with three runs of Backtester if you combine screening, applied to market cap, with two-way partitioning, applied to book-to-market and then (i.e., not independently) lagged 12-month return. It is advisable to perform this initial portion of the analysis well before the due date in order to avoid peak-load issues. Recall that you can submit a run, log out, and then log in later to retrieve the results of that run.

3. Re-sort stocks at a quarterly frequency.

4. Within each of the long and short portfolios, weight stocks in proportion to market capitalization.

5. Note that the "Lag Return - 12-month" metric in Backtester skips the most recent month (as specified above).

6. At the beginning of each month, the position size (dollar amount) of the long portfolio is equal to the position size of the short portfolio.

7. Assume zero short-sale costs for simplicity. (In other words, the rebate rate earned on the proceeds of short sales equals the T-Bill rate.)

8. There are no margin limits.

9. Base your estimates on 35 years of data, using returns on the momentum strategies from the end of December 1981 through the end of December 2016.

10. A file containing monthly returns on the market index and one-month Treasury Bills for January 1982 through December 2016 is available on Canvas (returns_market_tbill.xls).