Colin Powell School
for Civic and Global Leadership

The City College of New York

Quantitative Finance - ECO 41552-ONL (Fall 2022)
Tue/Thu 11am – 12:15pm, Aug 25 – Dec 21, 2022

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Final Project Assignment

DUE Dec 21, 2022

Primary Objective: Use Berry Cox's price momentum factors to select basket of assets for a long-short portfolio. Backtest your algorithm for 5 years to check for performance of algorithm.

Background: The use of computers and coding allows finance professionals to identify new alpha factors – Alpha factors are ways of quantifying where alpha is being generated by an asset. You will be responsible for using Berry Cox's list of alpha factors to determine the long/short baskets for your portfolio. But in order to test your code and its asset selections, back-testing must be performed.

The Requirements:

Step 1: Choose an ETF with a minimum of 100 assets, identify those assets
Step 2: Retrieve historical data for your chosen ETF
Step 3: Calculate the price momentum factors for each asset in your ETF
Step 4: Using the price momentum factors, calculate the monthly z-factor score for each asset
Step 5: Identify long and short baskets (10 to 15 assets in each) using calculated z-factors
Step 6: Create a backtest to validate performance of your algorithm based on monthly restructuring over the previous 5 years.
Step 7: Chart:

1. Monthly portfolio return bar chart (pos/neg coloring) vs ETF
2. Monthly return for long picks vs short picks vs ETF
3. Cumulative portfolio return vs ETF

Extra Credit: Calculate the optimized weighting of the monthly restructuring and include in backtesting of algorithm. Make sure the weighting is performed each month when the portfolio is restructured.

Parting Thoughts: Remember, we'll work through all the Python and finance steps you need to understand to be able to calculate alpha factors. That being said, I'm not going to just give you everything – you'll be responsible for determining the actual function for each factor and whether it's a positive or negative factor.

Berry Cox's Alpha Generators are on the next page. I recommend beginning on this project sooner rather than later so you have time to experiment and research how to calculate the specific factors correctly as well as build your backtest.

Good luck and try to have fun!

Category	Description of Individual Factor
Traditional Value	Price / Leading 12 Month Earnings (Weighted Avg of FY1 and FY2)
	Price / Trailing 12 Month Sales
	Price / Trailing 12 Month Cash Flow
	Price / Book Value
	Leading Dividend Yield
Relative Value	Industry Relative Price / Trailing Sales - Current Spread vs. 5 Year Avg
	Industry Relative Price / Trailing Earnings - Current Spread vs. 5Yr Avg
	Industry Relative Price / Trailing Cash Flow - Current Spread vs. 5Yr Avg
	Industry Relative Price / Trailing Sales
	Industry Relative Price / Forward Earnings
	Industry Relative Price / Trailing Cash Flow
Historical Growth	Consecutive Quarters of Positive Changes in Trailng 12 Month Cash Flow
	Consecutive Quarters of Positive Change in Quarterly Earnings
	12 Month Change in Quarterly Cash Flow
	3 Year Average Annual Sales Growth
	3 Year Average Annual Earnings Growth
	Slope of Trend Line Through Last 4 Quarters of Trailing 12M Cash Flows
Expected Growth	5 Year Expected Earnings Growth (First Call & I/B/E/S Consensus)
	Expected Earnings Growth: Fiscal Year 2 / Fiscal Year 1 (First Call & IBES)
Profit Trends	Consecutive Qrtrs of Declines in (Receivables+Inventories) / Sales
	Consecutive Qrtrs of Positive Change in Trailing 12M Cash Flow / Sales
	Consecutive Qrtrs of Declines in Trailing 12 Month Overhead / Sales
	Industry Relative Trailing 12 Month (Receivables+Inventories) / Sales
	Industry Relative Trailing 12 Month Sales / Assets
	Trailing 12 Month Overhead / Sales
	Trailing 12 Month Earnings / Sales

Category	Description of Individual Factor
Small Size	Log of Market Capitalization
	Log of Stock Price
	Log of Trailing 12 Month Sales
	Log of Total Assets
Accelerating Sales	3 Month Momentum in Quarterly Sales
	6 Month Momentum in Trailing 12 Month Sales
	Change in Slope of 4 Quarter Trend Line through Quarterly Sales
Earnings Momentum	Change Since Last Report in Current Quarter (Q1) Estimate / Price
	4 Week Change in Leading 12 Month Consensus Estimate / Price
	8 Week Change in Leading 12 Month Consensus Estimate / Price
	Last Earnings Surprise / Current Price
	Last Earnings Surprise / Standard Deviation of Quarterly Estimates (SUE)
Price Momentum	Slope of 52 Week Trend Line (20 Day Lag)
	Percent Above 260 Day Low (20 Day Lag)
	4/52 Week Price Oscillator (20 Day Lag)
	39 Week Return (20 Day Lag)
	51 Week Volume Price Trend (20 Day Lag)
Price Reversal	5 Day Industry Relative Return
	5 Day Money Flow / Volume
	10 Day MACD - Signal Line
	14 Day RSI (Relative Strength Indicator)
	14 Day Stochastic
	4 Week Industry Relative Return
	Last Month's Residual Return from CAPM Model