Bloomberg

Bloomberg Factor BackTesting FTST <GO>

Methodology Guide

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Table of Contents

EXECUTIVE SUMMARY

Bloomberg's Factor Backtester (FTST<GO>) is designed to provide analysis of one or more factor's ability to predict future returns for a universe of publicly traded equities. The essential concept of FTST is to understand the relationship between the relative values of securities' factors and the relative forward returns of those securities.

FTST <GO>provides access to a Bloomberg developed Point-in-Time historical database that provides global fundamental company data without survivorship, restatement, or lagging bias and which represents fundamentals as they were known in the market at each observation point historically. FTST allows users to run backtests on any one of the ~2,000 Bloomberg Point-in-Time fundamental and estimate fields or an endless number of custom factors. Quantitative Portfolio Managers may use it to identify factors to combine into their trading model. Fundamental Portfolio Managers and sell side analysts may use factor backtests to determine new ways to value securities in different economic cycles or to identify the performance of different investment styles.

The universe of companies covered by FTST <GO> includes both active and inactive global equities. The earliest coverage is 1991 for US companies and varies by country according to when Bloomberg initiated fundamental data collection.

METHODOLOGY OVERVIEW

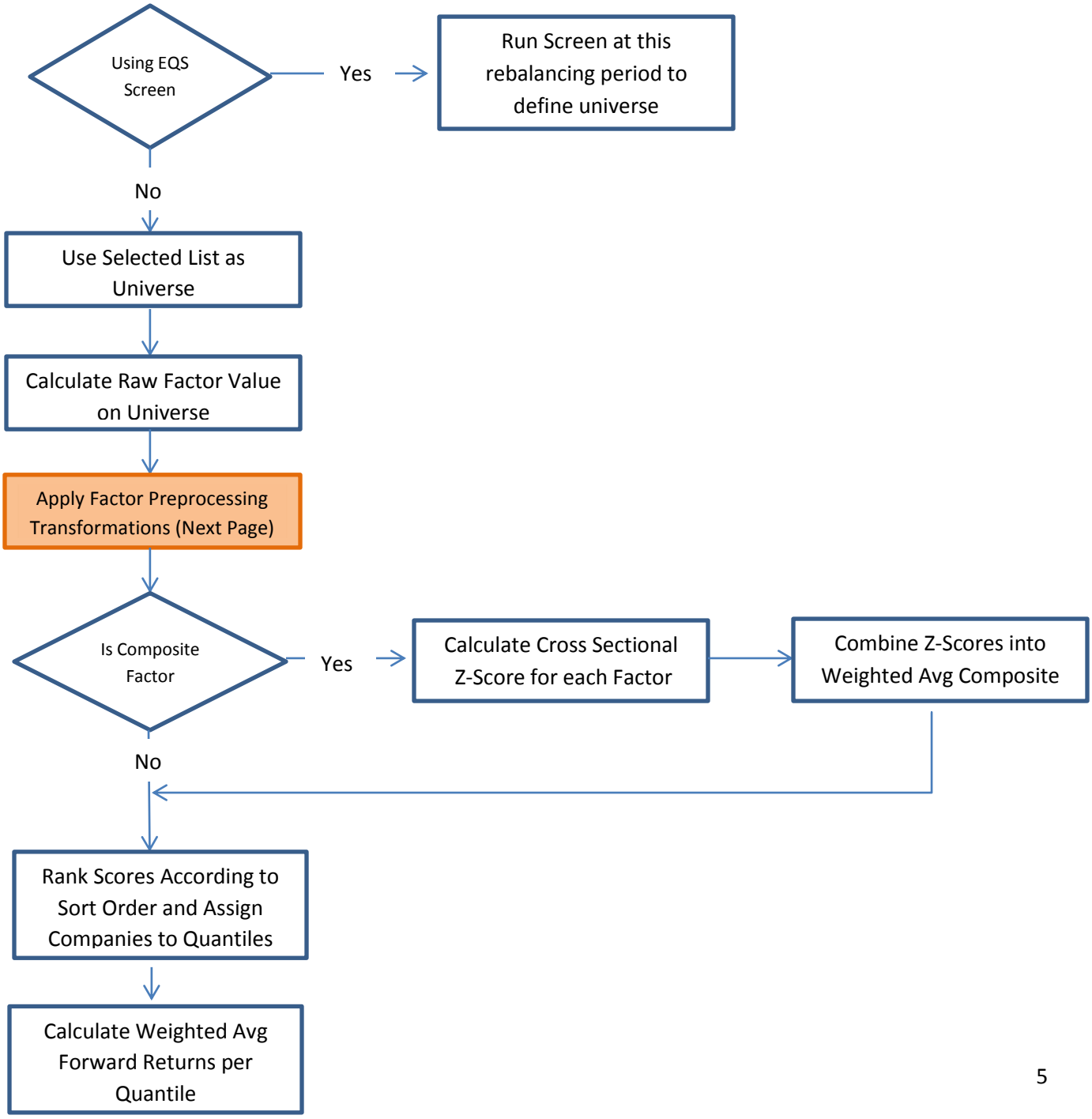
Between the defined start and end dates for the test, at each time period ***t*** as defined by the Rebalancing Frequency, the selected Universe of equities is ranked by the value of the factor at time ***t***. FTST includes **factor preprocessing** steps that can be optionally applied to the factor scores in order to replace N/A values, perform outlier management, and calculate group-relative factor scores instead of universe relative ones.

After factor values have been adjusted by preprocessing, the Universe is split into the number of quantiles (buckets) chosen, ***Q***, thus dividing the list of N companies in the universe at time ***t*** into **Q** buckets that will be approximately equally distributed if the factor scores are continuous and with few ties.

Each company's **forward return** (from ***t*** *to* ***t+1*** as determined by the rebalancing frequency) is then calculated using adjusted prices and dividends or cash distributions to create total returns, which are then aggregated for each bucket into a **quantile return** for the rebalancing. By iterating the above process, the factor's performance over multiple forward return periods is evaluated and summary statistics on an absolute and benchmark-relative basis are calculated and reported. It is important to note that **regardless of the rebalancing frequency**, company-level returns are calculated based on **daily returns**.

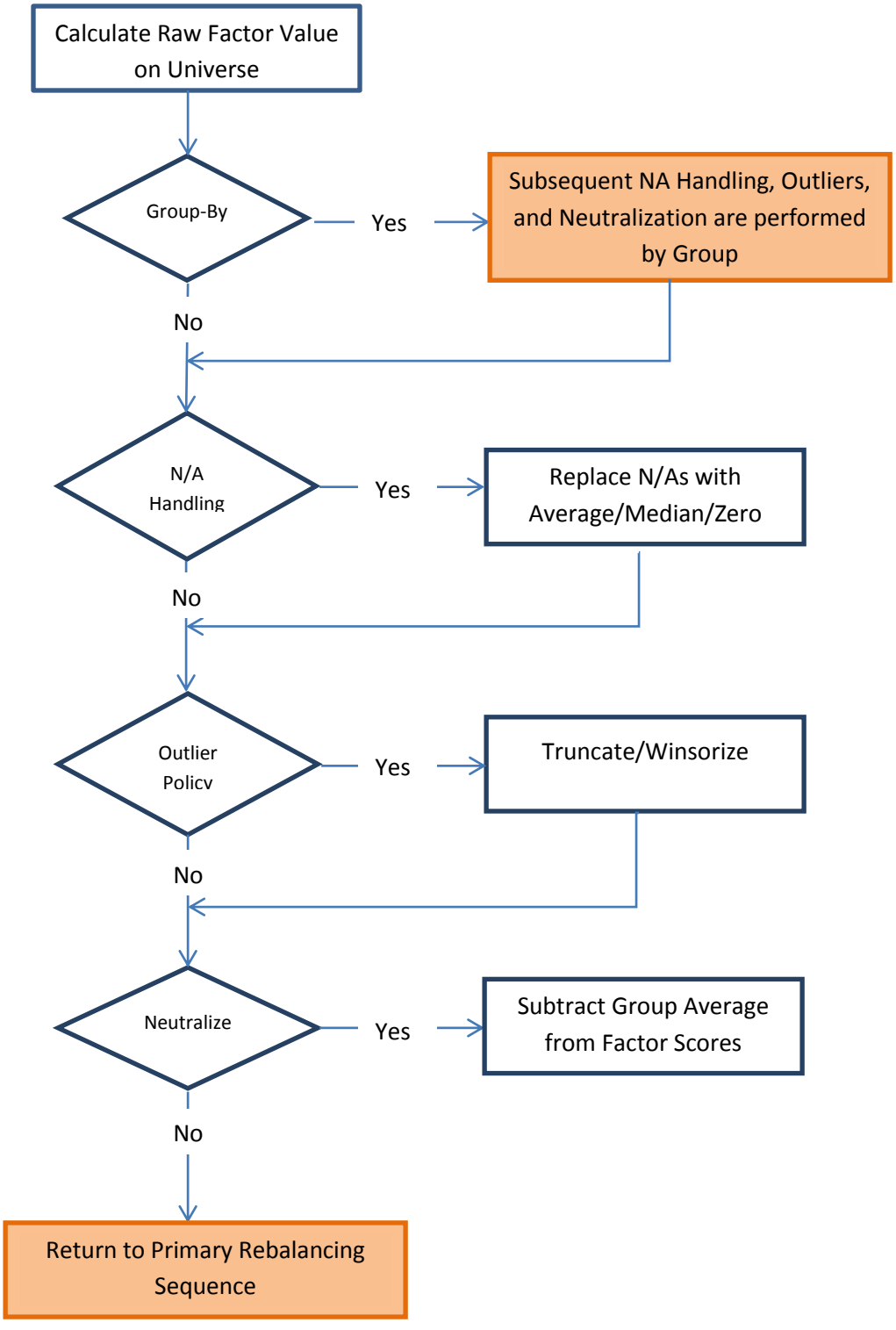
METHODOLOGY DETAIL

The following diagrams illustrate the steps performed by the primary rebalancing sequence. This sequence is repeated in FTST at each rebalancing period ***t*** over the history of the test.



Factor Preprocessing

The steps within the factor preprocessing cycle are detailed below:



PARAMETERS AND SETUP

The following parameters and options determine the behavior of FTST analytics and are presented to the user during the setup stages of the function.

Rebalancing Frequency
Backtests can be run on one of the following frequencies:
• Weekly • Monthly • Quarterly • Semi-Annually • Annually.

Outlier Management
Factor data can be treated to manage outliers at each rebalancing. As described in the FTST methodology section, outliers are calculated either on a universe-relative basis or group-relative basis depending on whether the user has specified a Group-By option. Winsorization and Truncation are applied as follows:

Value := the input factor value at the rebalancing time ***t***
c := the threshold value set by the user for Winsorization

Winsorization

*If (value) > UniverseAverage + (c * UniverseStdDev) then OUTPUT =*

*UniverseAverage + (c *UniverseStdDev)*

*Else If (value) < UniverseAverage - (c * UniverseAverage) then OUTPUT =*

*UniverseAverage - (c * UniverseAverage)*

Else
OUTPUT = value

Truncation

*If (value) > UniverseAverage + (c * UniverseStdDev) then OUTPUT = NULL*

Else
OUTPUT = value

NA Handling

If a security has missing values for a given factor at a rebalancing period ***t***, several replacement options may be selected to replace the NA values: the default behavior will exclude the security from that rebalancing (if the security is held in an existing quantile going into the rebalancing it would be sold). Alternatively, NA values can be replaced with 0 or with a value equal to the average or median of that security's peer group as defined by the Group-By policy.

Neutralization

Neutralization removes group-level effects from the factor distribution such that factor data is comparable across sectors, countries, or other grouping systems that may create systematic biases in a factor's values. A typical example of systematic bias that requires sector neutralization is the P/E factor: Companies in the Technology sector typically have uniformly higher P/E ratios than similarly sized companies in Industrials. As such, using raw P/E in a factor test is likely to lead to a high concentration of Technology companies in the top quantile. Factor neutralization will remove this effect. For each company in the Universe, neutralization simply subtracts the average of the company's peer group from each individual company's raw factor value:

*NeutralizedFactor(**t**) =RawFactorValue(**t**) – Avg (all security values in given group at time **t**)*

Bucketing

The Universe can be bucketed into deciles, quintiles and quartiles – collectively referred to as **quantiles**. The algorithm for bucketing is as follows:

1) Factor values are ranked according to user defined sort order (Higher is Better/Lower is Better)

2) Ranking begins at 1 and increments in the case that the previously ranked company's value is not equal to the current value to be ranked. After all elements are ranked the quantile is calculated as

*Quantile = Ceil(q * (1 - (rank - 1) /number of elements))*

Where *q* is the desired number of buckets

Return Weighting

Periodic quantile returns are calculated by default as the equally weighted average of the individual company forward returns within each quantile at each rebalancing. As an alternative, quantile returns can be calculated using a market –cap weighted average.

Composite Factors

Composite factor building is provided as way for users to simplify the creation of factors that are calculated as the weighted sum of two or more individual factors as follows:

$value_{composite} = Zfactor\_value_1 * weight_1 + Zfactor\_value_2 * weight_2 + \ldots + Zfactor\_value_n * weight_n$

$Zfactor\_value_i$ is the **cross-sectionally z-scored** value of the raw factor at time ***t***. If Group-By policy has been selected, the z-score is performed relative to the company's peer group (sector, country, etc).

Composite factors behave identically to individual factors within the FTST rebalancing procedure.

RESULTS AND METRICS

FTST <GO> reports provide information that allows for factor-to-factor comparison and as well as single factor drilldown. Some of the key measures and their definitions are provided below:

Correlation
The factor-to-factor correlation is calculated as the average of the single period cross correlations between each of the factor values. Options are provided to choose between Spearman Ranked correlation or traditional Pearson correlation.

IC (Information Coefficient)
The IC is the rank correlation between the cross section of factor values at each rebalancing and the realized forward returns. The value ranges from -1 to 1 although in practice factors with an average IC of 0.05 – 0.07 are considered to have excellent predictive capacity.

Turnover
The turnover for each quantile ***Q*** at time ***t*** is defined **names turnover** and is:

$$T = dQ(t - 1) / N(t - 1)$$

where *dQ(t - 1) is* the number of constituents in quantile Q at time ***t*** that are not also in quantile Q at time ***t***-1, and *N(t)* is the total number of scored securities in the Universe at time ***t***. The turnover is reported on a quantile-by-quantile basis for each period. Given the above formulation, the maximum turnover per quantile is 100%.

Hit Ratio
The % of companies in a given quantile that outperform the benchmark as defined by for a given period.

QSpread
All measures marked QSpread are calculated from the return series of the long short portfolio of Quantile 1 minus Quantile N (bottom bucket). This is the theoretical long short strategy which captures the factor effect, also known as the "factor portfolio".

Count
The number of companies that are scored (do not have NA factor value) at a given rebalancing. This measure is used for diagnostics to make sure there is sufficient data coverage or to check whether the distribution of companies is uniform across buckets. If NA replacement options are applied, the Count will always equal the number of companies in the Universe.