

THE RETURN OF FACTOR INVESTING

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2022 will have been a difficult year on the markets, all asset classes combined. In this chaotic environment, where it was generally impossible to generate positive returns on equities with long-only strategies, long-short strategies – and especially factor strategies – performed well.

Comparative performances – Long-only strategy¹ vs. Factor long-short strategies²

Strategy	2021		2022	
	Return	Volatility	Return	Volatility
<i>Long-only / Global equities</i>	+12.5 %	14.6 %	-16.1 %	18.6 %
Factor 1 - Value	+11.8 %	4.8 %	+8.5 %	4.4 %
Factor 2 - Carry	+1.0 %	3.7 %	+3.6 %	5.0 %
Factor 3 - Quality	+8.7 %	4.6 %	+9.2 %	5.6 %
Factor 4 - Low Vol	+2.5 %	2.7 %	+2.2 %	4.7 %
Factor 5 - Size	-3.9 %	2.7 %	-2.9 %	4.7 %
Factor 6 - Momentum	+5.8 %	4.3 %	+0.9 %	9.3 %
<i>Multifactor</i>	+5.3 %	1.8 %	+4.4 %	3.4 %

Source: StarQube / S&P XpressFeed

Objective

The objective of this article is to expose the flexibility that StarQube offers to quickly build elaborate investment strategies, backtest them and implement them. This is not, strictly speaking, a Research article.

Methodology

To this end, we have built a series of factor equity strategies. On a methodological level, we were strongly inspired by the article “Value versus Glamor Stocks: The Return of Irrational Exuberance?” published by Benoit Bellone and Raul Leote de Carvalho of the Quantitative Research team of BNP Paribas Asset Management – without however seeking to replicate the results identically.

¹ Dynamic portfolio made up of the 2,000 largest market capitalizations in the world, weighted by the market capitalizations of its components and rebalanced each month (performance in USD).

² Factor strategies built on the same investment universe as the long-only portfolio and calibrated for an annualized volatility of 2.50% - refer to methodology in Part I (performance in USD).

The first part of this article presents the methodology used to build different long-short factor strategies (Value, Carry, Quality, Low Vol, Size, Momentum) as well as a multifactor strategy.

Main findings

The second part of the article draws some lessons from the factor strategies developed:

- Factor strategies performed well in 2022, with the exception of the Momentum strategy, penalized by the market downturn, and the Size strategy, which continued its downward trend observed since 2018.
- All factor strategies generated a positive performance over the observation period (2000-2022).
- "Fundamental" strategies based on accounting aggregates or earnings consensus (Value, Quality, Carry) performed better overall than strategies based exclusively on price or market capitalization data (Low Vol, Size, Momentum).
- The 6 factor strategies are very weakly (negatively) correlated with each other and with the market.
- The multifactor strategy benefits from the low correlation between its constituent strategies and generates a very satisfactory Sharpe Ratio of 1.6 over the observation period.
- However, the Sharpe Ratio of the multifactor strategy tends to decline, suggesting that factor investing has been democratized and is increasingly well arbitrated.

Key messages

The third part of the article highlights the flexibility StarQube offers to build and backtest investment strategies:

- *Ease of creating (complex) investment strategies:* less than 15 lines of (simplified) code are required to build the various factor strategies described, despite the relative complexity of the methodology implemented. The multifactor strategy requires only one line of code (average of the 6 factor strategies).
- *Calculation time of the different factor strategies at a date t :* instantaneous.
- *Calculation time for the backtest of a factor strategy:* < 5 minutes (backtest over 23 years with monthly rebalancing, daily calculation of performance, 300,000 stocks in the investment universe).
- *Instant and secure implementation:* StarQube operating in object mode, a backtested strategy can be called as an object (by its name) in the portfolio management interface to be implemented instantly and without any operational risk.

CONSTRUCTION OF FACTOR-BASED LONG-SHORT STRATEGIES

Construction of the Value strategy

The Value strategy is a long-short strategy based on the a priori that a company with a low market value must outperform a company with a high value.

Observation period of the Value factor

In the context of this article, the Value factor has been calculated since January 1, 2000. The same is true for the other factors observed.

Investment universe

For the calculation of the various factors, StarQube relied on a dynamic universe consisting of 2,000 stocks with the largest global market capitalizations, rebalanced monthly.

Indicators used in the measurement of the Value factor

In order to capture the valuation of the companies in the investment universe, several indicators were used and then combined together:

- Book-value to Price (BV/P).
- Earnings yield, i.e. Earnings to Price (E/P, the profit taken into account being the estimated consensus for the current year).
- Operating cash-flows to Enterprise value (OpCF/EV).
- Free cash-flow yield, i.e. Free cash-flow to Price (FCF/P).

These indicators make it possible to capture the valuation of companies in the investment universe through different lenses:

- Combination of a balance sheet approach (BV/P) and an income statement approach (E/P).
- Consideration of debt (OpCF/EV) in addition to equity (BV/P) in the valuation of companies.
- Taking into account in the valuation of companies their earnings capacity (E/P) but also their capacity to self-finance their growth (FCF/P).

Data cleaning

For each of the valuation indicators and on each observation date, a 2% winsorization is performed in order to cap the extreme values of the sample.

Cross-sectional normalization

Each valuation indicator is transformed into a cross-sectional z-score for each stock in the investment universe.

Calculation of the composite z-score

The Value factor being captured from 4 valuation indicators, a composite z-score is calculated from the equally weighted average of the 4 z-scores for each stock in the investment universe.

Sectoral centering of the composite z-score

For each stock in the investment universe, an adjusted z-score is calculated by subtracting from the composite z-score its sector average (GICS 2 sector classification).

Weighting of stocks in the long-short portfolio

The long-short portfolio is constructed by weighting each stock in proportion to its adjusted z-score.

By construction, the adjusted z-scores being centered on their sector average, the portfolio is **sector-neutral** and consequently has no residual exposure (long or short) to the market.

Long-short portfolio risk calibration

On each monthly rebalancing date, the leverage is adjusted so that the volatility of the strategy (ex-ante and calibrated over 52 rolling weeks) is 2.50%.

Construction of other factor strategies

The methodology described to construct the Value factor was replicated identically to construct the Carry, Quality, Low Vol, Size and Momentum factors.

The same investment universe and the same observation period were used.

The measurement of the Carry factor

The Carry factor is based on the a priori that the dividend is an essential component of a stock market performance and a tangible proof of the financial health of companies; companies that distribute a dividend must outperform their peers. It is captured by the Dividend Yield (ratio of the last dividend paid to the share price) of the companies in the investment universe.

The measurement of the Quality factor

The Quality factor is based on the a priori that a structurally profitable and self-financing company must outperform a weakly profitable, loss-making or cash-burn company. It is captured by the combination of the following two indicators: (1) Return on Capital and (2) Free cash-flows to Assets.

The measurement of the Low Vol factor

The Low Vol factor is based on the a priori that low stock market volatility reflects better predictability of results, which should lead to outperformance. The volatility of each security is calculated in local currency and over 3 rolling years.

The measurement of the Size factor

The Size factor is based on the a priori that small companies offer better growth prospects than more mature companies and must therefore outperform. It is captured by the respective market capitalization of the 2,000 stocks in the investment universe.

The measurement of the Momentum factor

The Momentum factor is based on the a priori that past performance (good or bad) tends to continue. It is calculated as the equally weighted average of the price momentum of each stock over 3, 6, 9 and 12 rolling months.

Multifactor strategy

All the factor strategies being calibrated on an ex-ante volatility of 2.50%, the multifactor strategy is constructed as the equally weighted portfolio of the 6 factor strategies.

Alternatively, we could have taken into account the (ex-ante) correlation between the 6 strategies to build an equal-risk weighted multifactor portfolio.

MAIN FINDINGS

Observations on the 2021-2022 period

Strategy	2021		2022	
	Return	Volatility	Return	Volatility
<i>Long-only / Global equities³</i>	+12.5 %	14.6 %	-16.1 %	18.6 %
Value	+11.8 %	4.8 %	+8.5 %	4.4 %
Carry	+1.0 %	3.7 %	+3.6 %	5.0 %
Quality	+8.7 %	4.6 %	+9.2 %	5.6 %
Low Vol	+2.5 %	2.7 %	+2.2 %	4.7 %
Size	-3.9 %	2.7 %	-2.9 %	4.7 %
Momentum	+5.8 %	4.3 %	+0.9 %	9.3 %
<i>Multifactor</i>	+5.3 %	1.8 %	+4.4 %	3.4 %

Source: StarQube / S&P XpressFeed

In an extremely chaotic market environment for equities, factor strategies have generally performed well over the past two years – especially “fundamental” strategies favoring companies with low valuations (Value and Carry factors), profitable (Quality) and offering visibility on their earnings prospects (Low Vol).

In contrast, the market downturn penalized momentum strategies in 2022. The Size factor continued its downward trend observed since 2018.

We also note an increase in the realized volatility of the various strategies in 2022 compared to 2021.

Performance of factor strategies over a long period (2000-2022)

Strategy	Annualized Return	Volatility	Sharpe Ratio
Value	+4.0 %	3.5 %	1.15
Carry	+2.1 %	3.9 %	0.52
Quality	+3.5 %	3.4 %	1.04
Low Vol	+0.5 %	3.2 %	0.17
Size	+1.5 %	4.2 %	0.36
Momentum	+1.5 %	5.2 %	0.29
<i>Multifactor</i>	+2.7 %	1.7 %	1.64

Source: StarQube / S&P XpressFeed

³ Dynamic portfolio made up of the 2,000 largest market capitalizations in the world, weighted by the market capitalizations of its components and rebalanced each month (performance in USD).

- The 6 factor strategies all generated positive performance over the long term.
- “Fundamental” strategies based on accounting aggregates or earnings consensus (Value, Quality, Carry) performed better overall than strategies based exclusively on price or market capitalization data (Low Vol, Size, Momentum).
- The realized volatilities significantly exceed the target volatility of 2.50% ex-ante for all strategies.
- The multifactor strategy, on the other hand, offers a risk profile consistent with the objective of a target volatility of 2.50% and generates a very satisfactory Sharpe Ratio of 1.6.

Correlations between factor strategies

Correlations	Value	Carry	Quality	Low Vol	Size	Momentum
Value	-	0.59	0.03	0.01	-0.13	-0.46
Carry	0.59	-	-0.08	0.04	-0.09	-0.50
Quality	0.03	-0.08	-	0.04	-0.31	0.18
Low Vol	0.01	0.04	0.04	-	-0.21	0.05
Size	-0.13	-0.09	-0.31	-0.21	-	0.03
Momentum	-0.46	-0.50	0.18	0.05	0.03	-
Average	0.01	-0.01	-0.03	-0.02	-0.14	-0.14

Source: StarQube / S&P XpressFeed

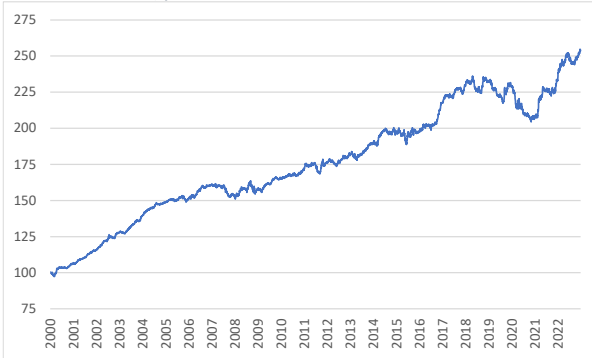
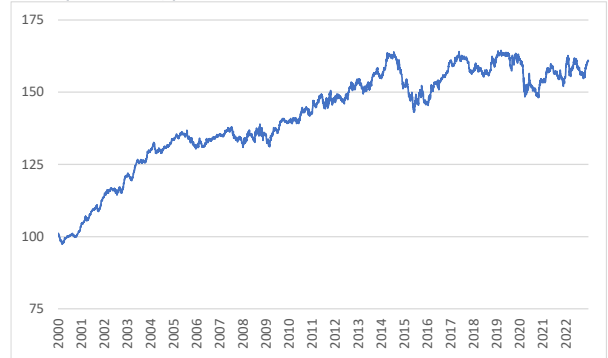
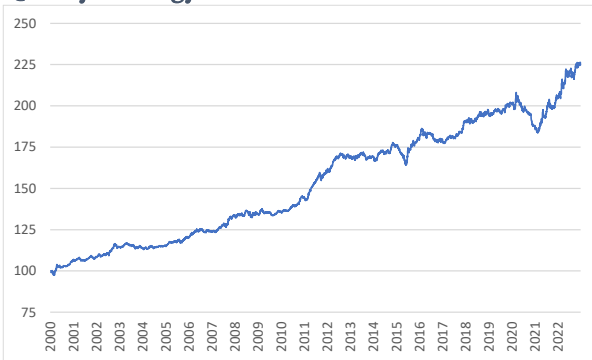
- The 6 factor strategies are very weakly (negatively) correlated with each other (overall average correlation of -5%).
- The 6 factor strategies have a low average correlation with their “benchmark” (long strategy made up of the 2,000 largest market capitalizations in the world).
- The two most correlated factor strategies are, quite logically, the Value and Carry strategies, the dividend yield used for the Carry strategy being itself a measure of company valuation.

Performance of the multifactor strategy over a long period

Periods	Annualized Return	Volatility	Sharpe Ratio
<i>2000-2022 – Full period</i>	<i>+2.7 %</i>	<i>1.7 %</i>	<i>1.64</i>
2000-2006	+4.4 %	1.4 %	3.26
2007-2013	+2.7 %	1.6 %	1.70
2014-2020	+0.4 %	1.6 %	0.26
2021-2022	+4.8 %	2.7 %	1.80

Source: StarQube / S&P XpressFeed

- The multifactor strategy takes full advantage of the low correlation between the strategies that constitute it and thus offers a risk profile in line with (lower than) the volatility objective of 2.50% over the entire observation period as well as over each subperiod.
- The multifactor strategy generates a very satisfying Sharpe Ratio of 1.6 over the entire observation period.
- The Sharpe Ratio is however in decline over the various sub-periods of 7 years, suggesting that factor investing has been democratized and is increasingly well arbitrated.
- However, the performance of the past two years is very good after a year 2020 in which the Covid shock had severely affected most factor strategies.

Performance charts of factor strategies (2000-2022)⁴
Value Strategy

Carry Strategy

Quality Strategy

Low Vol Strategy

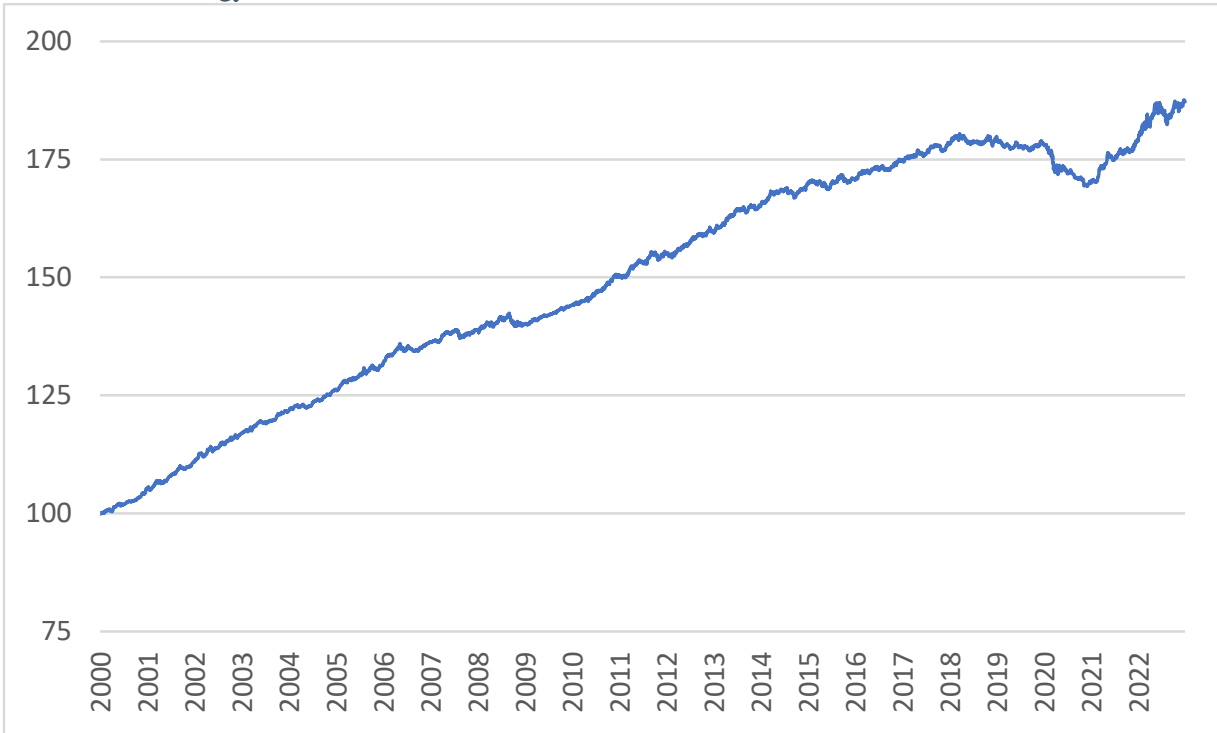
Size Strategy

Momentum Strategy


Source: StarQube / S&P XpressFeed

⁴ The scales of the charts may be different.

Multifactor Strategy



Source: StarQube / S&P XpressFeed

FACTOR INVESTING ON STARQUBE

The main objective of this article is to demonstrate:

1. The ease with which elaborate investment strategies – such as the factor and multifactor strategies described above – can be set up in StarQube.
2. The speed of the calculations allowed by the power of the StarQube NoSQL database and the RAM cache.
3. The ability offered to the StarQube-user to switch an investment strategy from backtest to production instantly and securely.

Construction of factor strategies

- *Main module used:* the PORTFOLIO module – designed to configure investment strategies.
- *Number of “code” lines:* 13 lines of useful code for each of the single-indicator strategies (Momentum, Low Vol, Carry, Size); about thirty lines of useful code for the Value strategy which combines 4 valuation measures. The “code” uses a library of StarQube functions that allow to easily build formulas (~equivalent to using Excel functions). **Less than 15 lines of code are required to configure the entire methodology described for each factor, i.e. definition of an investment universe, calculation of the indicator to be used for all the stocks in this universe, cross-sectional winsorization then normalization of data, sector centering of z-scores, weighting of stocks in the long-short portfolio, calibration of the strategy’s risk.**
- *Calculation time of the 2,000 largest global stock market capitalizations among an investment universe of more than 300,000 stocks in the StarQube database:* instantaneous at a date t.
- *Calculation time of the weightings of a long-short factor strategy at a date t:* instantaneous.

Construction of the multifactor strategy

- *Number of “code” lines:* one line (one formula), the multifactor strategy being the simple equally weighted average of the 6 factor strategies that make it up.
- *Calculation time of the stock weightings of the multifactor strategy at a date t:* instantaneous.

Backtesting of factor strategies

- *Main module used:* the BACKTEST module – designed to backtest investment strategies and offering a wide range of diagnostics.
- *Number of lines of “code”:* no line of code is necessary, the backtest module allows to backtest the different factor strategies by simple configuration (of the backtest period, of the rebalancing frequency, of the names of the strategies to be backtested and metrics/charts to display graphically).
- *Calculation time for the backtest of a factor strategy:* < 5 minutes. For memory:
 - More than 300,000 stocks in the investment universe, 2,000 stocks selected and weighted at each rebalancing date.
 - Monthly rebalancing of the factor strategy over 23 years, i.e. 275 rebalancings. The performance of the strategy is of course calculated each business day and not only on each rebalancing date.
 - All calculations are performed on the fly, a dynamic cache in RAM to optimize the speed of calculations.

Implementation of the multifactor strategy

- On StarQube, backtested / validated strategies can be put into production instantly and without any operational risk.
- StarQube indeed works in object mode, i.e. Indicators, Portfolios, Risk Models, Optimization parameters are stored as objects that can be called indifferently in the different modules (Backtest or Portfolio Management); switching the multifactor strategy into production thus involves calling the “Portfolio” object that corresponds to it in the Portfolio Management graphical interface to view its constituents, the relevant metrics (ex-ante risk, breakdown by country, sector, currency ...) and trigger, if necessary, the rebalancing of the strategy.
- All objects have audit trails (of different versions) and permissions (read-write or read-only).
- No line of code, no file transfer is necessary to switch a backtest to production; if the author of a strategy is absent, any authorized employee can trigger its update with a single click, which considerably reduces operational risks.
- Finally, the updating of the factor and the multifactor strategies is instantaneous (calculation time < 1 second).

REFERENCES

Benoit Bellone et Raul Leote de Carvalho. 2021. “Value versus Glamour Stocks: The Return of Irrational Exuberance?”