Revisiting the
Two Sigma Factor Lens

Written by:

Robert Xie, Venn CSS Team

December 2023

Abstract

In 2018, we published a paper titled "**Introducing the Two Sigma Factor Lens**," in which we presented the framework for a factor approach to investment analytics. We recognized that asset allocators had become increasingly interested in risk factor analytics across their entire portfolios and individual investments as well. However, most industry literature on this topic focused on why they should apply a factor approach, so we decided to focus on how to construct a factor approach instead. In this update, we will revisit our original intentions for creating the Two Sigma Factor Lens, and also explore the expansions we have made in the years since.

Two Sigma Investments | Two Sigma Advisers
www.twosigma.com

NEW YORK   HOUSTON   LONDON   HONG KONG   TOKYO

I. Introduction

In 2018, we published a paper titled "**Introducing the Two Sigma Factor Lens**," in which we presented the framework for a factor approach to investment analytics. We recognized that asset allocators had become increasingly interested in risk factor analytics across their entire portfolios and individual investments as well. However, most industry literature on this topic focused on why they should apply a factor approach, so we decided to focus on how to construct a factor approach instead. In this update, we will revisit our original intentions for creating the Two Sigma Factor Lens, and also explore the expansions we have made in the years since.

The key issue we wanted to address was that for many years, investors had been relying on the assumption that combining different asset classes within a portfolio was an effective way to maximize risk-adjusted returns. We believe, however, that different asset classes may be exposed to the same systematic sources of risk, or factors, which may lead an investor to believe that they are more diversified than they actually are. In contrast, examining a portfolio through a factor lens may identify overlapping sources of risk across asset classes. We believe that this allows for more efficient management of portfolio risk and expected return.

We debuted the Two Sigma Factor Lens with a set of 8 factors, split across Core Macro and Secondary Macro categories. These original factors were specifically designed to analyze multi-asset portfolios and were derived from returns of broad, liquid, asset class proxy indexes (Exhibit 1 below).

Exhibit 1 | Risk Factor Descriptions

Category	RiskFactor	Description
Core Macro	Interest Rates	Exposure to the time value of money (inflation risk and future interest rate changes)
	Equity	Exposure to the long-term economic growth and profitability of companies
	Credit	Exposure to corporate default and relative asset illiquidity risks
	Commodities	Exposure to changes in prices for hard assets, which can be driven by economic shifts
Secondary Macro	Foreign Currency	Exposure to moves in developed-market currency values versus the portfolio's local currency
	Emerging Markets	Exposure to the sovereign and economic risks of emerging markets
	Equity Short Volatility	Negative exposure to the changes in equity market volatility
	Local Inflation	Exposure to inflation-linked rates relative to fixed nominal rates within the currency area

Through the Two Sigma Factor Lens, we wanted to provide a set of actionable factors that could collectively explain much of the cross-sectional and time-series risk in typical portfolios.

Our 2018 paper went into detail on how to construct and assess these factors, as well as how we could extend our lens to include additional factors that might capture new sub-asset class or cross-sectional risks. The factor lens we laid out in this paper, and our ongoing work to expand it, also formed the foundations of our Venn™ platform. Venn was originally designed as a cloud-based investment analysis software, helping institutional investors evaluate and manage their multi-asset class portfolios.

In the years since, we have extended the lens to include an additional 10 factors, which we split between two new groupings: Macro Styles and Equity Styles. We wanted to add new factors that could increase the explanatory power of the Factor Lens by covering less common, but still sizable drivers of portfolio risk. These additions were crafted to be orthogonal to existing factors, while still following a similar research and construction methodology. Together, this expanded set of factors was intended to even better capture and explain the risk attribution of investment portfolios.

As our Factor Lens continued to expand, so too did the Venn platform. Venn was officially launched to the external investment community in 2019, and has seen broad-based growth in clients since. Originally designed for institutional allocators, Venn soon expanded its client base to also include teams at: wealth managers, family offices, asset managers, insurance companies, and investment consultants. For many Venn clients, the platform became their entry point to a more transparent understanding of risk across their investments and portfolios.

The current Two Sigma Factor Lens includes a broader holistic set of factors chosen to identify risk and return drivers in both diversified portfolios and individual investments. A thoughtfully chosen and constructed factor lens can assist with answering questions such as what risks investors may be over- or underexposed to, how their risk exposures differ from their benchmark, or what is driving their overall and benchmark-relative returns.

II. Current Factor Lens

Today, our Factor Lens consists of the following 18 factors:

Macro Factors

Macro factors are commonly found risk exposures in an institutional investor's portfolio due to their high liquidity and capacity

Core Macro

EQUITY

Exposure to the long-term economic growth and profitability of companies.

INTEREST RATES

Exposure to the time value of money (interest rates and inflation risk).

CREDIT

Exposure to corporate default and failure-to-pay risks specific to developed market corporate bonds.

COMMODITIES

Exposure to changes in prices for hard assets.

Secondary Macro

EMERGING MARKETS

Exposure to sovereign and economic risks of emerging markets relative to developed markets.

FOREIGN CURRENCY

Exposure to moves in foreign currency values versus the portfolio's local currency.

LOCAL INFLATION

Exposure to inflation-linked rates relative to fixed nominal rates within the local currency area (only available in USD or GBP).

LOCAL EQUITY

Exposure to home bias (the tendency to invest in domestic over foreign equity).

Style Factor

Style factors correspond to sizable common risk drivers within asset classes, such as individual stocks or bonds.

Macro Styles

EQUITY SHORT VOLATILITY

Negative exposure to the moves in equity market volatility.

FIXED INCOME CARRY

Exposure to high-yielding 10-year bond futures funded by low-yielding bond futures.

FOREIGN EXCHANGE CARRY

Exposure to high-yielding G10 currencies funded by low-yielding G10 currencies.

TREND FOLLOWING

Long-short exposures to multi-asset-class futures based on 6-to 12-month trailing returns.

Equity Styles

LOW RISK

Long exposure to stocks with low market betas and residual volatility and short exposure to higher-risk stocks.

MOMENTUM

Long exposure to stocks that have outperformed recently and short exposure to recently underperforming stocks.

QUALITY

Long exposure to stocks with low leverage and high profitability and short exposure to lower-quality stocks.

VALUE

Long exposure to stocks with low prices relative to accounting fundamentals and short exposure to higher-priced stocks relative to fundamentals.

SMALL CAP

Long exposure to stocks with smaller market caps and short exposure to larger-cap stocks.

CROWDING

Short exposure to U.S. stocks that are widely shorted by the investment community and long exposure to those stocks that are not as widely held short.

Even as we expanded the number of factors, the core principles we followed in constructing this lens remain unchanged. Just as when we first published our 2018 piece, we still believe today that the following four attributes should characterize any factor lens that is ideally suited for portfolio and manager analysis:

- <u>Holistic</u>, by capturing the large majority of cross-sectional and time–series risks for typical institutional portfolios

- <u>Parsimonious</u>, by using as few factors as possible

- <u>Orthogonal</u>, with each risk factor capturing a statistically uncorrelated risk across assets

- <u>Actionable</u>, such that desired changes to factor exposure can be readily translated into asset allocation changes

We classify our current set of factors across four categories that we mentioned previously, starting from the more liquid and high capacity factors that often form the foundation of most institutional investors' portfolios. The four categories are:

- **Core Macro**: The Core Macro factors are the most prevalent factors, and are designed to consist of high-capacity, highly liquid factors that are considered the principal drivers of asset class returns.

- **Secondary Macro**: The Secondary Macro factors seek to identify key risks that can cut across multiple asset classes in diversified portfolios, and are considered to have lower capacity and liquidity than the Core Macro factors.

- **Equity Styles**: Each Equity Style factor represents returns of a portfolio of global stocks that is designed to be market-neutral and region-neutral, except the Crowding factor, which is U.S.-focused. These factor portfolios also target discrete, systematic characteristics shown by academic finance research[1] to generate positive returns over time.

- **Macro Styles**: Each of our Macro Style factors targets discrete, systematic characteristics shown by academic research to generate positive returns over time. Shortly after we added a few of these Macro Styles factors to our lens, we published a **piece** in which we provided background on what these factors were meant to capture, with a special focus on how Trend Following compares to one of our Equity Styles factors, Momentum.

Although these newly added Style factors require more skill to capture and manage, and are more costly to access than the Macro factors, they are still less expensive and higher-capacity than "alpha". Alpha can consist of idiosyncratic sources of return (i.e., uncorrelated to other known factors) that are often limited in capacity and have historically commanded higher fees. When using returns-based statistical factor analysis, these idiosyncratic sources of return generally appear as "residual" given their low correlation with known factors. However, not all residual return represents true "alpha". It can often just be uncompensated risk, and investors should be careful when interpreting the residual from any statistical analysis of historical performance.

A factor lens, such as the one we have been discussing here, can help determine if an investment is indeed providing residual risk and return as opposed to simple exposure to a combination of macro and style factors.

Finally, we believe that any outputs from the factor analysis we discuss here should be translatable into asset allocation insights. For this reason, we constructed each of these individual factors to be "investible," meaning there should be a relatively stable relationship between individual factors and a readily investible set of liquid assets. To find more statistical and economic evidence for the factor lens we originally constructed, including both quantitative and qualitative tests of our factor lens, please refer to our **original paper from 2018**, as well as our **follow-up from 2019** that estimated long-term expected returns to each of the factors in our lens.

III. Conclusion

In the years that have followed our 2018 publication, **"Introducing the Two Sigma Factor Lens"**, we have continued to build upon our original framework of systematically identifying, and then constructing, a practical set of risk factors. Today, the Two Sigma Factor Lens contains 18 factors, with the latest addition coming in 2020 . Through our work on the Venn platform, we've also seen this lens find broad applications among a multitude of client types. As we continue to research and expand upon this lens, we maintain our founding principles: that risk factors should be holistic, parsimonious, orthogonal, and actionable. Together, these criteria continue to guide us through construction and expansion of a flexible risk factor lens that we believe can be used broadly across the investment community. We will address further applications of our factor lens in future publications, and encourage those interested in seeing these applications in action to please contact the Venn team through our **website**.