Black Box + Glass Box
Using Creative Systematic Risk Modelling to Navigate an Uncertain Macro Environment

May 2023
Time to read: 7 minutes

Macro volatility has finally returned. This new era represents both risks and opportunities for systematic bottom-up security selection managers. We outline how a black box (i.e., statistical learning from market data realised in the past) and glass box (i.e., human engagement to define risk factors on a forward-looking basis) approach to risk modeling can help address the challenges posed by today's complex macro environment.

Authors

Valerie Xiang
Associate Portfolio Manager, Man Numeric

Ziang Fang, CFA
Portfolio Manager, Man Numeric

Chao Xia, PhD, CFA, FRM
Senior Quantitative Researcher, Man Numeric

Introduction

After a decade of central bank interference, macro volatility has finally returned.

Specifically, top-down macro factors are increasingly driving equity returns (Figure 1), constraining the opportunity for systematic stock selection strategies that focus on bottom-up modeling to generate alpha.

In this article, we outline how a black box (i.e., statistical learning from market data realised in the past) and glass box (i.e., human engagement to define risk factors on a forward-looking basis) approach to risk modeling could help address the challenges posed by today's complex macro environment, as well as potentially add significant value.

Figure 1. Share of Equity Returns Attributable to Macro Factors

Source: Citigroup, December 2004 – March 2023.

Using a Statistical Factor Risk Model to Identify Risks

> **Markets are dynamic, adaptive and constantly evolving – and therefore, so are the risks.**

For systematic investors, risk models embedded within the portfolio construction process are the primary tools for risk management. Traditional quantitative processes often incorporate fundamental risk models, which use a pre-determined set of risk factors (such as industry and style factors) to identify and capture the risks in the market. At Man Numeric, we believe markets are dynamic, adaptive and constantly evolving – and therefore, so are the risks. Rather than relying on humans to pre-define the risk factors in the market, we have been proponents of using a statistical factor risk model ('SFRM'). This is a supervised learning model that identifies blind factors through an iterative process. These blind factors are essentially a series of portfolios consisting of companies in the universe that can explain the most prevalent risks in the current market environment. Such approaches do not pre-specify risk factors; rather, they allow the market to tell the story, and are therefore much more responsive to macro risks, which often vary over time.

Let's look at one such blind factor in our global developed markets universe which emerged during 2022 as an example.

Figure 2 represents this factor's composition, with each shape representing an individual company. The colour indicates each company's portfolio weight in the blind factor portfolio, with yellow denoting long exposure and blue indicating short exposure. In addition, the size of the shape represents the company's market cap. Companies are clustered together by sector.

This blind factor takes a long position in energy-related stocks (illustrated by the yellow cluster) and shorts almost everything else – a proxy for energy prices. Given the elevated inflation levels not seen in decades, and the Russian invasion of Ukraine, it's not surprising that energy prices drove equity returns last year – a risk that the SFRM was able to pick up promptly.
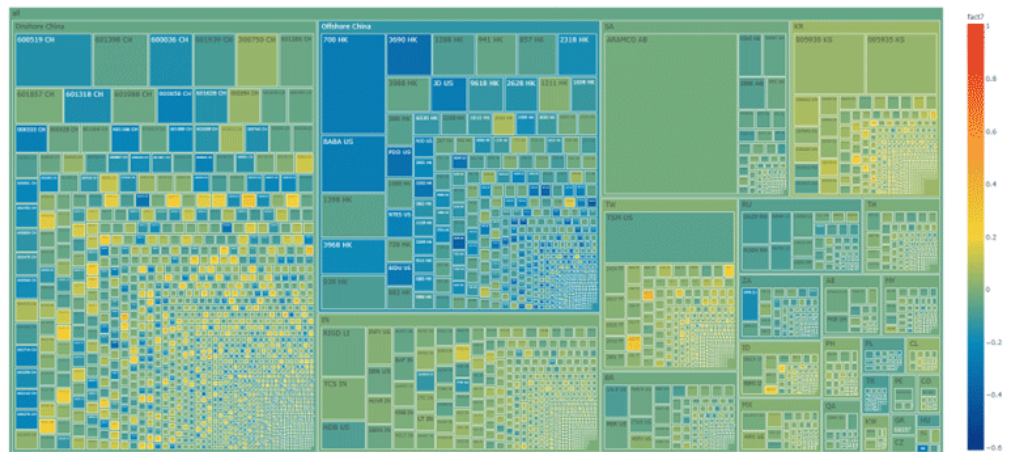
Figure 2. Energy Price Risk
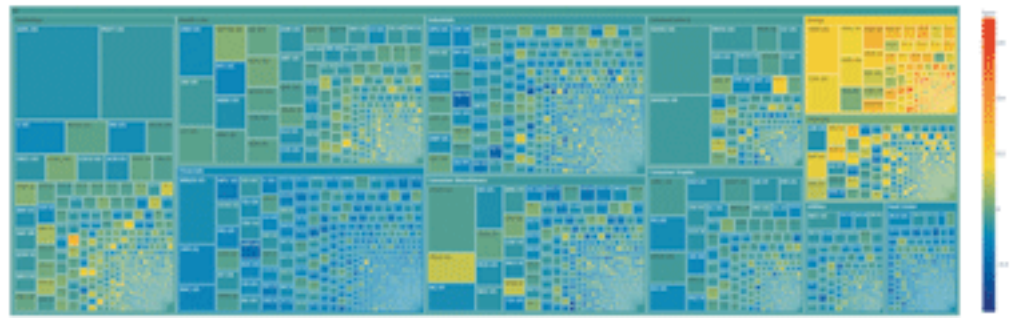
Source: Man Numeric; as of June 2022.
The organisations and/or financial instruments mentioned are for reference purposes only. The content of this material should not be construed as a recommendation for their purchase or sale.

Another example is the regulatory developments in China and the US-China geopolitical tensions, which brought into focus risks around offshore Chinese listings. Figure 3 shows one of the blind factors that effectively captures this risk. It heavily shorts offshore Chinese internet platform companies (blue), while taking a more neutral stance on onshore listings and the rest of stocks in the universe (yellow).

Figure 3. Chinese Offshore Listing Risk

Source: Man Numeric; as of June 2022.
The organisations and/or financial instruments mentioned are for reference purposes only. The content of this material should not be construed as a recommendation for their purchase or sale.

Both scenarios described above are point in time examples of how the SFRM can identify relevant risks. It's encouraging to note that the risk model is also responsive over time, as illustrated by the percentage of energy or Chinese offshore listing risks identified by SFRM (Figures 4-5).

Figure 4. Energy Price Risks Identified
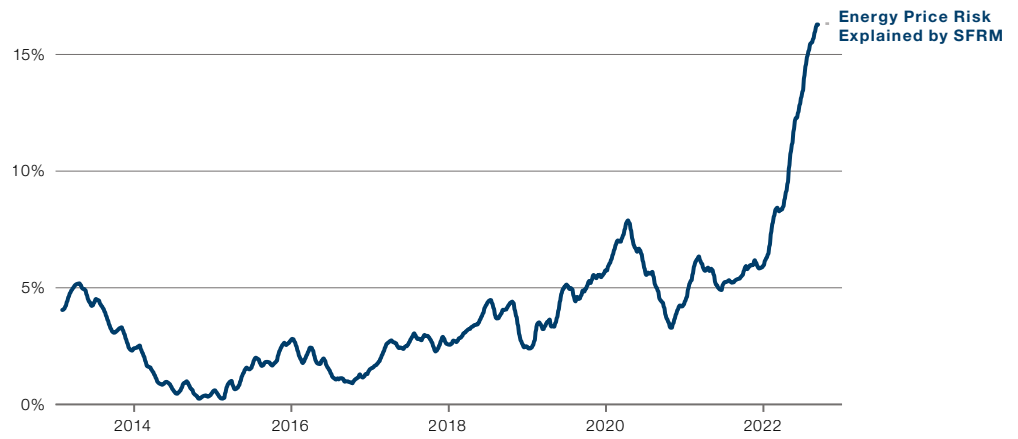
Source: Man Numeric; between January 2013 and July 2022.

Figure 5. Chinese Offshore Listing Risks Identified
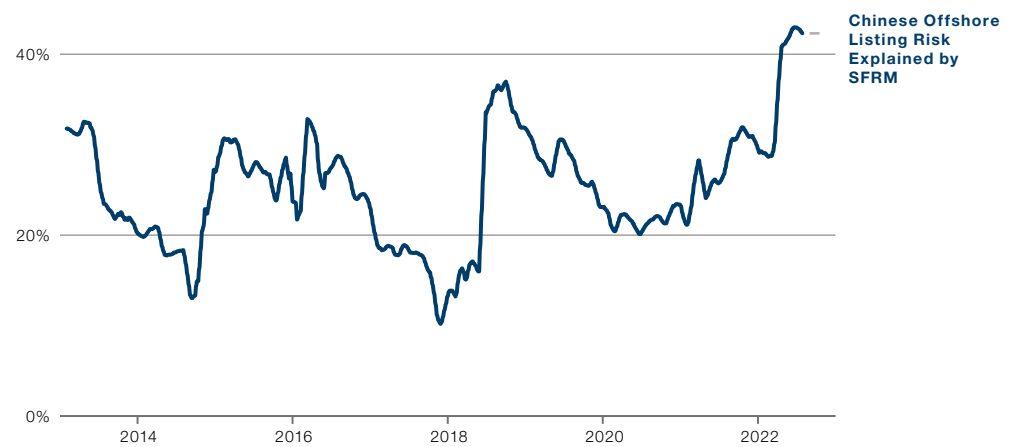
Source: Man Numeric; between January 2013 and September 2022.

Complementing a Black Box Approach With a Glass Box Approach

Despite the responsiveness of the risk model, Figures 4-5 also show that not 100% of the risks are captured by SFRM. Moreover, any type of risk model, regardless of how good it is, has the limitation of being backward-looking, and therefore potentially failing to capture risks that are important, but have not emerged in the past.

To tackle this problem, we propose using a framework (that we will refer to as SFRM+) that allows us to complement SFRM blind factors with any risk that can be proxied by a return time-series. We believe this black box (i.e., statistical learning from market data realised in the past) and glass box (i.e., human supervision to define risk factors on a forward-looking basis) approach of risk modeling can help build a more customisable, comprehensive and robust risk management system. Furthermore, the '+' factors are fully integrated within the SFRM framework, thus preserving all properties of a statistical risk model and making it seamless for portfolio risk measurement or control.

To see how this framework works, we return to the offshore Chinese listing risk. Such a risk can be proxied by the return spread between Nasdaq Golden Dragon Index and CSI 300 Index. The Golden Dragon Index consists of Chinese companies listed in the US, while the CSI 300 represents the large-cap companies listed onshore in mainland China. This spread hedges out the overall China risk – such as economic or earnings growth – and isolates the unique risk around offshore Chinese listings. After adding this

additional risk factor into the SFRM model and estimating each security's exposure to it, this factor cleanly isolates offshore Chinese listings from the rest of emerging-market securities (Figure 6).

**Figure 6. Additional Offshore Chinese Listing Risk**

Source: Man Numeric; as of June 2022.
The organisations and/or financial instruments mentioned are for reference purposes only. The content of this material should not be construed as a recommendation for their purchase or sale.

If we zoom into the offshore Chinese listings, it's clear that this factor can differentiate various types of offshore listings, loading positively on internet platform companies while negatively on state-owned enterprises listed offshore such as banks and insurance companies (Figure 7).

Figure 7. Differentiating Between Offshore Listings

Source: Man Numeric; as of June 2022.
The organisations and/or financial instruments mentioned are for reference purposes only. The content of this material should not be construed as a recommendation for their purchase or sale.

So, what does this all mean?

In a nutshell, SFRM+ can pick up the additional offshore listing risk not initially captured by SFRM (Figure 8). We believe that by better identifying and capturing additional macro risks with the SFRM+ construct, more informed risk/return trade-offs can be executed within portfolios.

Figure 8. Annualised Factor Risk Measured by SFRM Versus SFRM+ in a Representative EM Portfolio

SFRM	0.31%
SFRM+	0.69%
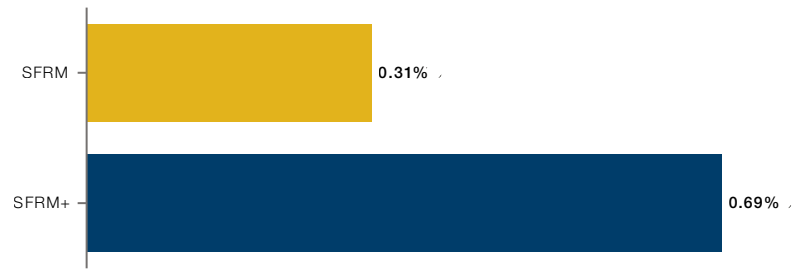
Source: Man Numeric; as of June 2022.

Conclusion

The world of investing is never short of risks. Whenever we experience a sea change in the macroenvironment, both macroeconomic forces and geopolitical tensions play an increasingly important role in equity pricing, compared to purely company-specific fundamentals.

This represents both risks and opportunities for systematic bottom-up security selection managers. We believe creative risk modeling via a systematic approach (the black box) with human engagement (the glass box) is essential to navigate such a complex and ever-changing macro environment.

Authors

Valerie Xiang
Associate Portfolio Manager, Man Numeric

Valerie Xiang is an associate portfolio manager at Man Numeric. Prior to joining Man Numeric in 2019, Valerie worked at Panagora and Citigroup Global Markets. Valerie received a bachelor's degree in economics from Fudan University and Masters' degree in finance from Massachusetts Institute of Technology.

Ziang Fang, CFA
Portfolio Manager, Man Numeric

Ziang Fang is a portfolio manager at Man Numeric. He is responsible for the China-A share strategies and assists in the day-to-day portfolio management of the emerging markets strategies. Ziang is also actively engaged in the research efforts within the firm. Prior to joining Man Numeric in 2017, Ziang had investment banking and private equity experience in Asia. Ziang received a bachelor's degree in economics from Renmin University of China and a master's degree in finance from MIT Sloan School of Management. He is also a CFA charterholder.

Chao Xia, PhD, CFA, FRM
Senior Quantitative Researcher, Man Numeric

Chao Xia is a senior quantitative researcher at Man Numeric. Her research efforts focus on machine learning, factor combination, event strategies, alternative data and macro timing. Chao is also a co-portfolio manager and manages a team of researchers. Prior to joining Man Numeric in 2017, Chao interned at JP Morgan as a research associate. Chao received a bachelor's degree in statistics from University of Science and Technology of China and a doctorate degree in applied mathematics from Brown University. Her thesis focused on applying Kaman Filters in traffic flow forecasts. Chao is a CFA and FRM charterholder.