Equitorial

What price risk?

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Federated Hermes Limited

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Not all risk models are built alike. Here, the Global Equities team provide an overview of their proprietary MultiFRAME risk model. During periods of market stress, they argue, it can cut through the noise to provide a true picture of underlying exposures.

The collapse in global equity markets that resulted from the Global Financial Crisis (GFC) prompted a major shift in how we approach risk at Federated Hermes. During this period of extreme market turbulence, the Global Equities team identified the need to measure their portfolio's exposure to rising credit spreads, something that was not possible using the commercial risk models of the time. In response to this need, we introduced the first iteration of the proprietary MultiFRAME (Multi Factor Risk and Attribution Model for Equities) investigation tool. The model was able to provide the team with the flexibility to measure the fund's exposure to any quantifiable risk factor, which gave us a clear advantage in what was an extremely challenging time for global markets. At the time of writing, there are approximately 400 risk factors at our disposal that have, at some point, been incorporated into MultiFRAME.

While commercial models have improved in the ensuing years, many standalone tools remain static in nature and still only enable users to determine exposure to a limited list of risk factors. However, MultiFRAME was designed so that it works effectively in harness with commercial models, enabling an extra layer of risk analysis and providing us with the flexibility to assess risk factors not included in off-the-shelf models. This is particularly pertinent in times of severe market stress, as we are experiencing today with soaring inflation, rising bond yields and the war in Ukraine. During periods such as this, using multiple systems provides reassurance that we are capturing the dynamic nature of the markets in our risk analysis.

MultiFRAME 3.0 – enhanced capabilities

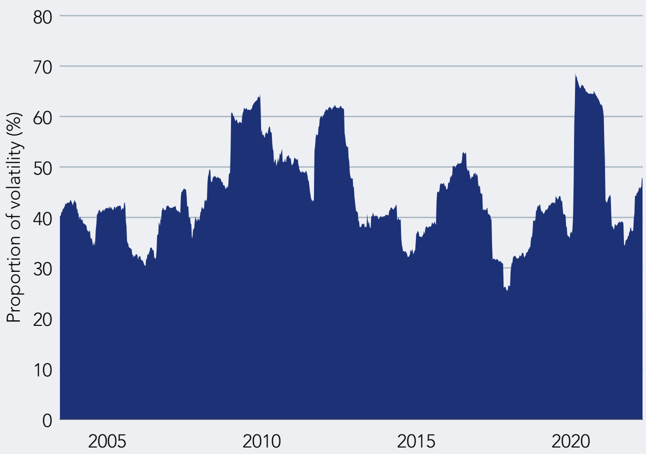
We recently launched an upgraded version of MultiFRAME. In addition to being able to produce data faster, the model has several other advantages over its predecessor. Risk management is, of course, integral to our investment process. That is a constant. However, in periods of heightened market volatility – such as at present – more questions are raised regarding the risk factors at play and the impact they are having on the portfolio. Therefore, we feel that now is a good time to showcase the enhanced capabilities of the model and how we can use them to address the concerns, as well as market hypotheses, we might have at any given time. In the rest of this article, we look at some of the key questions we have right now and how we can use MultiFRAME 3.0 to tackle them.[1]

What is factor risk?

In simple terms, a stock's risk can be decomposed into factor risk and stock-specific (idiosyncratic) risk. Stock-specific risk is driven by characteristics that are unique to that stock. Factor risk is driven by an exposure to a non-stock-specific variable. This might be a macroeconomic sensitivity, for instance bond yields or the oil price, or a broader market factor such as growth, value or sentiment.

In times of pronounced market stress, such as the GFC, the sovereign debt crisis of 2011, the outbreak of Covid-19 and the recent Russian invasion of Ukraine, the amount of risk in the equity markets that can be attributed to factors rises significantly. The elevated levels of factor risk during times of market stress can be clearly seen in Figure 1. The chart shows what proportion of the variance in returns in the MSCI World Index can be explained by five 'statistical' risk factors – theoretically, the factors that best explain volatility at any given moment.

Figure 1: Variance explained by first five principle components (MSCI World, 52 week rolling window)



Source: FactSet, Bloomberg, Federated Hermes as at 20 June 2022.
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Additionally, it is clear from our analysis that volatility is often fuelled by 'non-traditional' factors, as was the case with rising credit spreads during the GFC. Off-the-shelf models commonly used by portfolio managers typically use a fixed set of factors that have been calibrated to explain the historical drivers of risk in equity markets. However, MultiFRAME gives us the advantage of being able to assess the emerging risks that the commercial models miss in times of market turmoil.

[1] The following commentary illustrates the MultiFRAME risk model and how it relates to a representative portfolio from one of our diversified global equity strategies.

1. What is the impact of the surging oil price on our risk budget?

MultiFRAME is highly effective in helping us to understand the inherited characteristics of recommended trades and their impact on the wider portfolio. If MultiFRAME unearths a material risk in our portfolios, one not identified by the commercial risk models we utilise, we can export the stock-level exposures from MultiFRAME and instruct our optimisation engine – the system that combines all our data and recommends trading activity – to limit exposure to that risk.

As long-term investors, the traditional risk models we use tend to have a longer-term perspective over which to measure and forecast risk, in line with our investment horizon. However, this does not mean the short term is irrelevant, and over-reliance on long-term models can leave an investor blind to emerging drivers of volatility. Our starting point for any risk analysis is to compare a medium-term monthly model (covering a five-year window) to a shorter-term weekly model (covering the prior year), with our focus being on understanding the difference between these two perspectives.

As illustrated by Figure 2, shorter-term risk models, such as this weekly model, highlight that factor risks have been more prominent recently given the backdrop of heightened macroeconomic and geopolitical uncertainty. As would be expected following the recent disruption in energy markets, oil prices (WTI Futures) have become a more prominent factor risk. Therefore, having an underweight to energy stocks carries more risk than during more 'normal' market conditions should current levels of volatility persist.

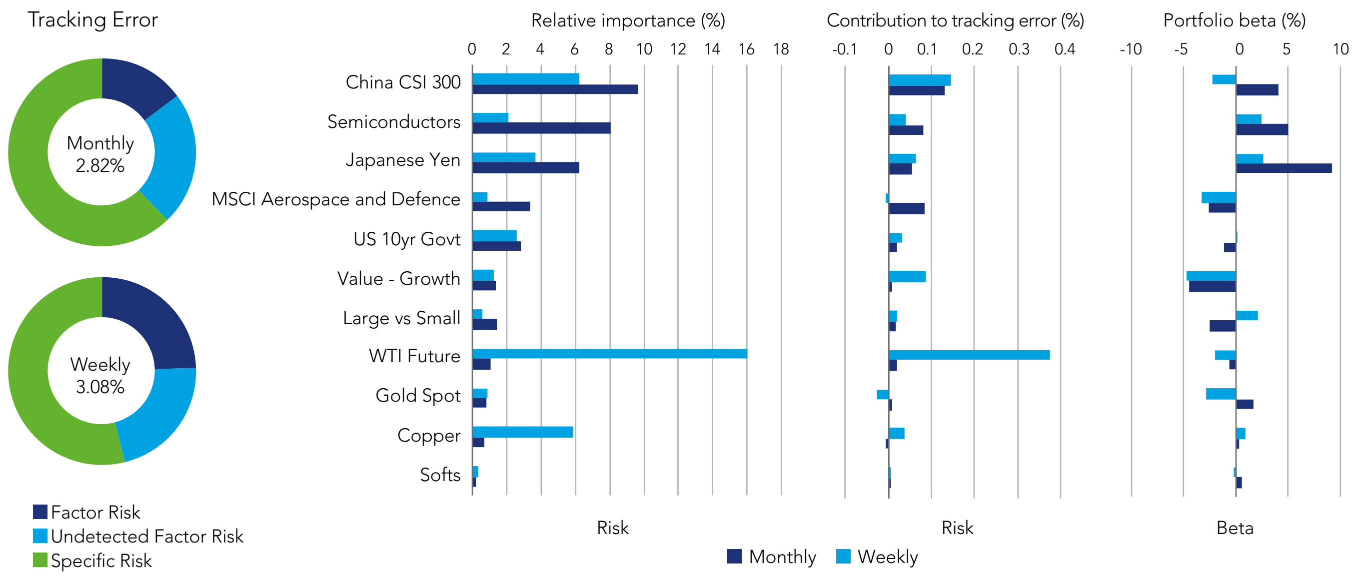
With MultiFRAME highlighting that the portfolio's underweight to oil is a large driver of the current day-to-day and week-to-week active volatility, we are then able to constrain this underweight exposure via the optimisation engine.

Our process is designed to build a diversified portfolio of investments that have an attractive combination of fundamental characteristics – there is no explicit macroeconomic tilting in the construction of the portfolio. That is, we seek to avoid concentrated factor risk where possible, favouring stock-specific risk.

In this particular example, a negative relationship to the oil price is anticipated. One of the team's beliefs is that companies that are better at managing their environmental footprint are likely to outperform over the long term, and this will tend to steer our portfolios away from energy-intensive industries. Nevertheless, we seek to deliver consistency of excess returns by ensuring that the overall risk budget is not dominated by any one belief or factor. Therefore, given the large contribution to the risk budget from the oil factor, action is warranted. By constraining the short-term oil exposures within the optimiser, we can identify the energy stocks, or companies with oil sensitivity, to which we can increase our exposure in order to limit the dominance of this factor.

Assessing risk over multiple time horizons provides very different perspectives, as shown in Figure 2. Above, we discussed the emergence of oil as a key risk factor following the recent surge in energy prices and MultiFRAME's effectiveness in measuring the impact of such sudden changes in volatility profiles. However, it is also the case that the fundamental relationships between share prices and macroeconomic variables often change when viewed through different time horizons. The portfolio betas shown in Figure 2 illustrate how the strategy's active return is expected to move relative to each risk factor, and the differences between these betas in each of the risk models is striking. For instance, the portfolio is negatively correlated with Chinese equities (China CSI 300) over the near term but, over a longer period, this same set of stocks has had a positive relationship. These different perspectives are crucial when building a portfolio.

Figure 2: Comparison of current portfolio risk according to two alternative risk models



Source: FactSet, Bloomberg, Federated Hermes as at 20 June 2022. For illustrative purposes only.

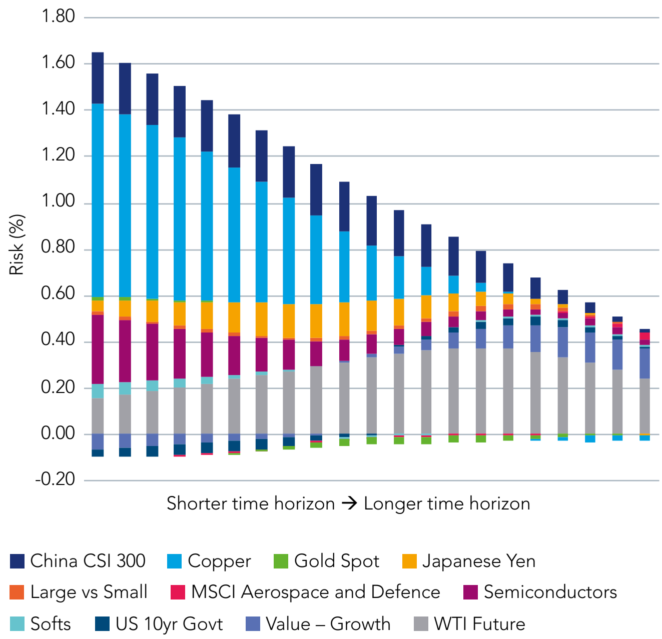
2. What about other commodities?

MultiFRAME 3.0 also incorporates an innovative new view of the 'term structure of risk' in that it systematically examines the effect of giving greater weighting to more recent observations over older, and potentially stale, data points. This expands on the multi-horizon analysis and provides greater detail on how risk contributions vary, depending on which period of recent history is deemed most important.

Figure 3 relates to a weekly one-year risk model, with each vertical slice representing the risk decomposition for a different weighting scheme. On the left, each vertical slice corresponds to a short-term model, which emphasises recent observations. Those on the right relate to models that equally weight all observations during the prior year and provide a relatively longer term perspective. The chart demonstrates how copper has become an increasingly important risk driver in the more recent observations. However, based on a longer-term view, it barely registers. Oil, highlighted as a key risk in the weekly model in Figure 3, has, in fact, become a smaller risk contributor more recently while semiconductors are becoming an increasingly important one.

The enhanced version of MultiFRAME enables us to examine the drivers behind the term structure of risk and helps answer an important question: is it that the factors are becoming more volatile, or is our exposure to these factors, measured by beta, changing? By modifying the model's time horizon, we can re-estimate both the volatility and correlation structures of the factors as well as how each stock interacts with the factors.

Figure 3: Term structure of risk – contribution to weekly Tracking Error



Source: FactSet, Bloomberg, Federated Hermes as at 20 June 2022.
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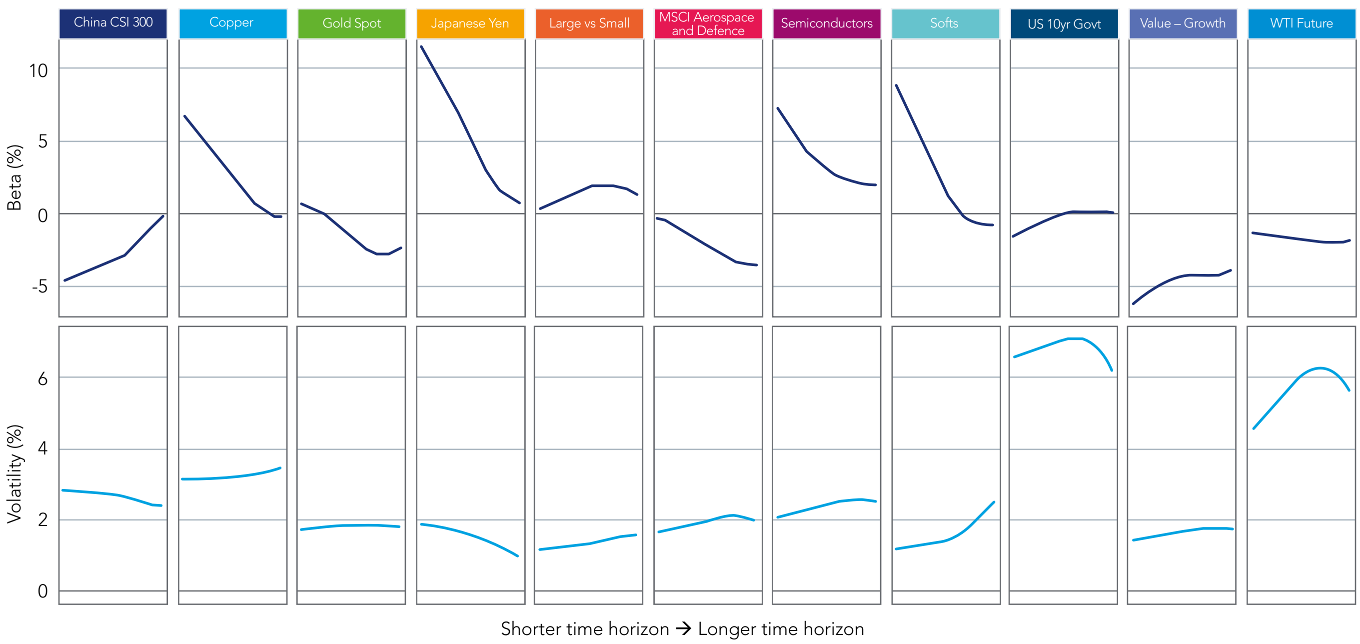
The case illustrated in Figure 4 gives rise to several interesting observations. For example, there has been little change in the volatility of the copper factor. However, the portfolio's exposure to this factor, as measured by beta, has increased significantly. In recent periods, the fund's holdings have traded more in line with copper prices than was previously the case. This warrants further investigation as to which of our holdings are showing increasing sensitivity to copper prices and, by the same token, semiconductors and soft-commodity prices.

Figure 4: The effect of time-horizon on estimates of factor volatility and portfolio exposure (beta)



Source: FactSet, Bloomberg, Federated Hermes as at 20 June 2022. For illustrative purposes only.

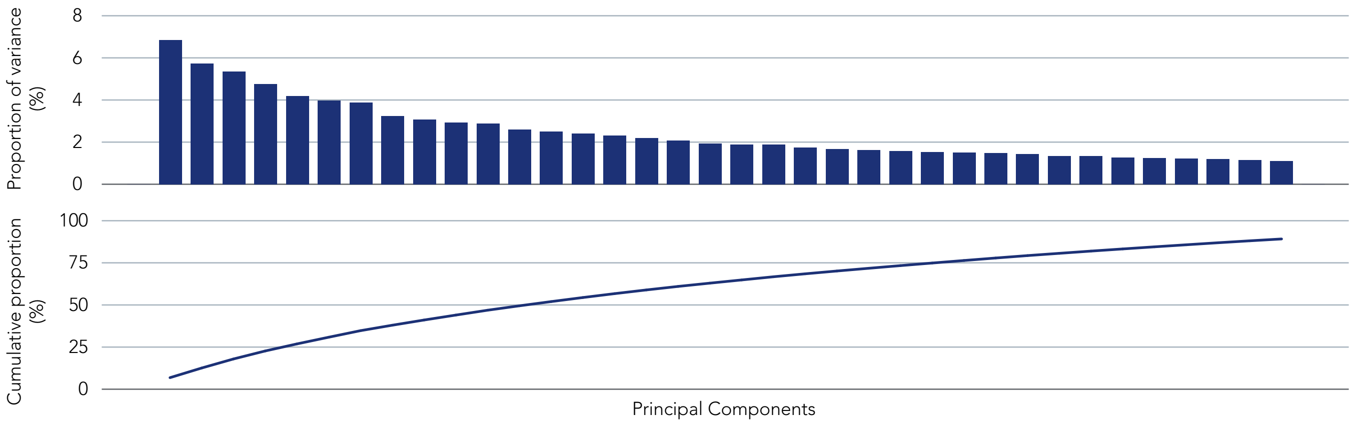
3. Are there other emerging risks?

The model calculates how much of the portfolio's risk can be attributed to the specified risk factors (factor risk). The residual volatility, therefore, is assumed to be stock-specific risk. However, it is possible that a large portion of risk in the market stems from a factor that has not been included in our model. We use principal component analysis (PCA) to find the 'hidden factors' within the residual specific risk. If PCA detects any meaningful signs of correlation within specific risk, we assume that there are indeed hidden factors present.

These factors do not necessarily correspond to any real-world variable, but MultiFRAME has the capability to deduce which real-world factors, or groups of factors, they most resemble.

We can observe from the breakdown of hidden risk in Figure 5 that, in this particular example, there is no single dominant hidden risk. This is a good sign as it indicates that the model has not missed a major driver of portfolio excess returns. We can also see that the hidden risks correlate to Indian consumer price inflation, and, to a lesser extent, vehicle sales and interest rates in Japan. These factors had not previously been considered and could be added to the model for a more accurate picture of risk.

Figure 5: Hidden factor risk



PC1		PC2		PC3	
Name	**Correlation**	**Name**	**Correlation**	**Name**	**Correlation**
India – CPI	74%	Vehicle Sales	64%	JPY Rates	60%
JPY Rates	60%	India – CPI	44%	TED Spread	42%
Economic Surprise – US	42%	UK House Prices	40%	Chinese IndProduction	42%

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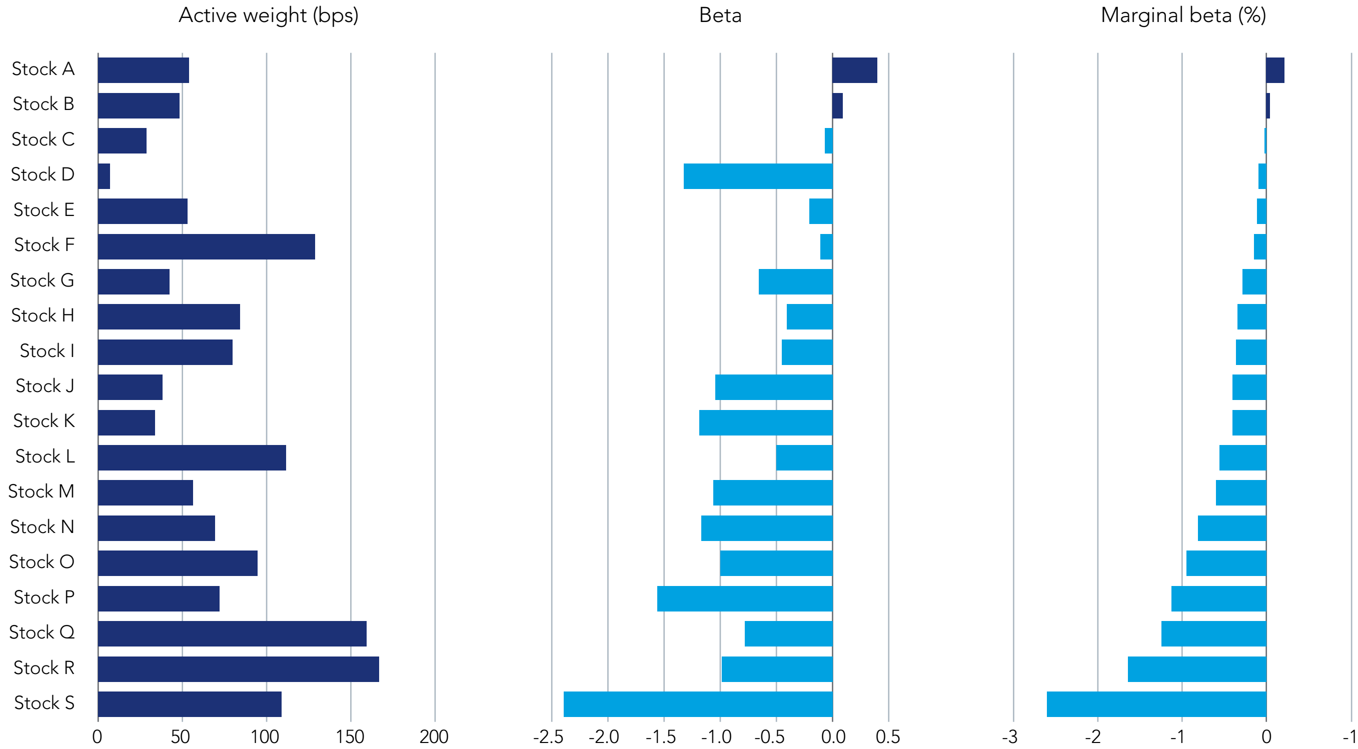
4. Given the rotation from growth to value, which of our technology holdings are most vulnerable?

The MultiFRAME 3.0 engine can extract the tracking error or beta contributions from any factor, security or group of securities and rank them according to their level of influence in the portfolio. In Figure 6, the algorithm has identified that the portfolio has a significant skew within the technology sector to growth and, therefore, a sizeable negative beta to the value-minus-growth factor. Stocks A and B have a marginally positive exposure to value; in other words, they are more value oriented in nature. But the majority of our holdings are in the growth bracket, and they are mostly larger active weights than our more defensive companies. Albeit stock S accounts for much of this exposure as one of the most growth-biased stocks and one of the largest active weights.

Figure 6: Top contributors to beta: Value – growth within information technology



Source: FactSet, Bloomberg, Federated Hermes as at 20 June 2022. For illustrative purposes only. The above does not represent all of the securities held in the portfolio and it should not be assumed that the above securities were or will be profitable. This information does not constitute a solicitation or offer to any person to buy or sell any related securities or financial instruments.

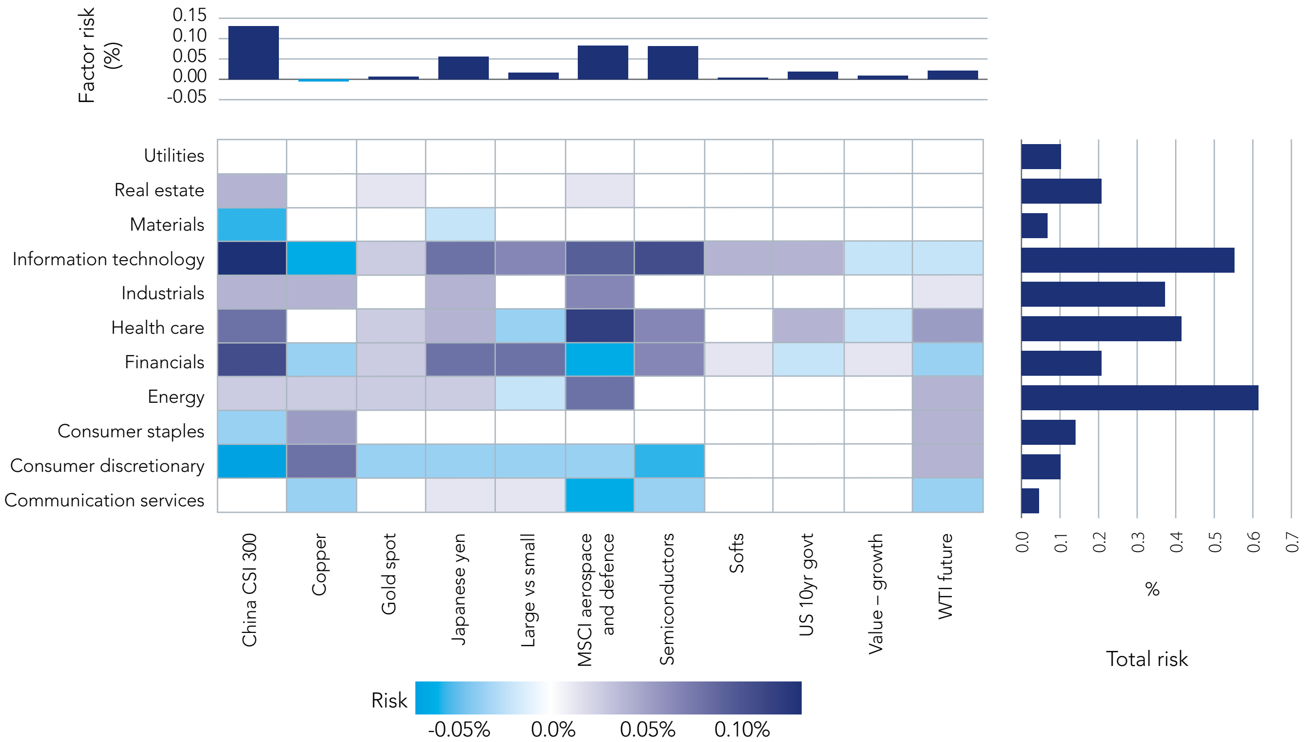
5. How is the portfolio exposed to the more volatile Chinese internet stocks in an environment of increasing regulatory scrutiny?

Some of the enhancements focus more on how the data is presented rather than on providing more information. Figure 7 illustrates how the risk is allocated across the portfolio and Figure 8 shows the sensitivity of the fund to the various factors. In this case, it is broken down by sector, but this can be done by region, stock or any other grouping we require. In the monthly model shown in Figure 2, we saw that exposure to China was one of the key risks in the monthly (medium-term) model. Here we can see that this exposure is derived from holdings within the financials and IT sectors that have a skew towards Chinese equities. Although some of the risk is neutralised by our consumer-discretionary holdings' contrary exposure to China, the data indicates that some diversification within the IT sector may be required to reduce the concentration of risk.

However, as shown in Figure 9, the shorter-term models suggest that this risk is not as pronounced, and our IT holdings, which are predominantly US based, no longer exhibit such a strong relationship with the Chinese markets. These different, and often conflicting, views of risk are all valuable pieces of information for investors and are often missed when risk is viewed through a single lens.

Figure 7: Contribution to tracking error by sector

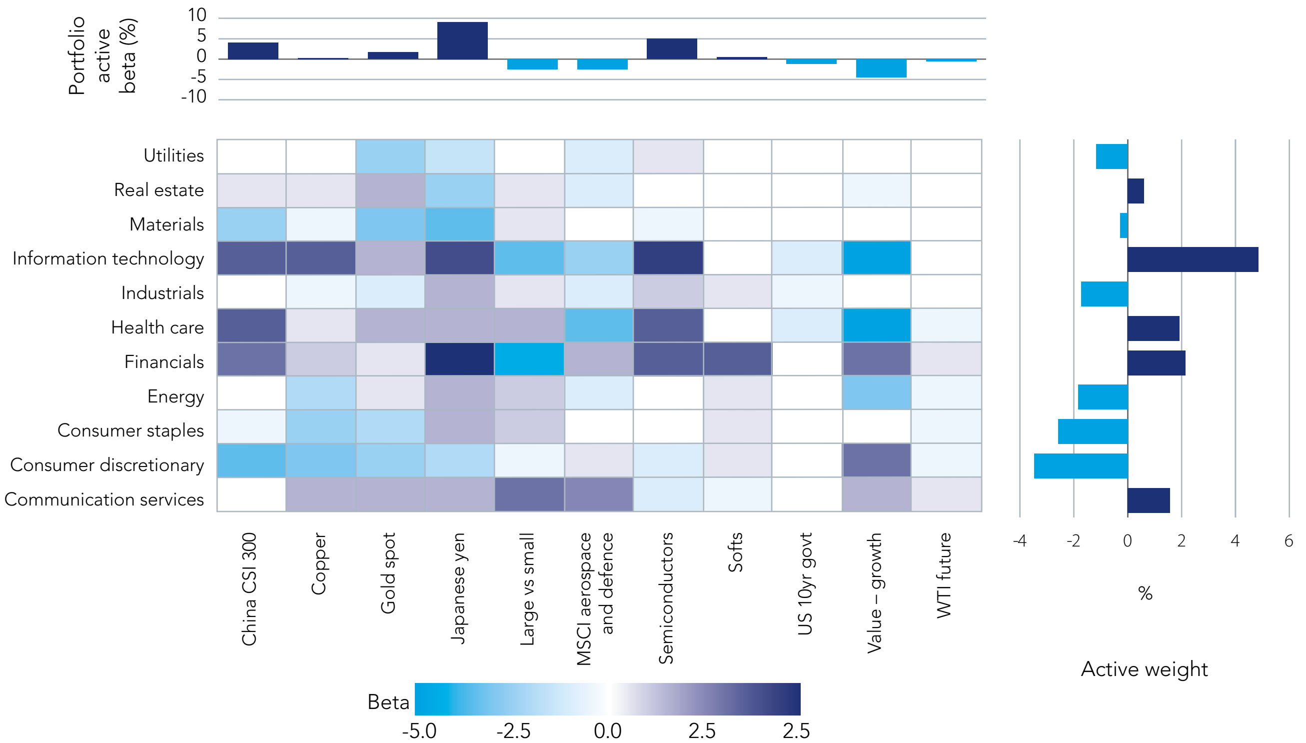
Using a monthly risk model



Source: FactSet, Bloomberg, Federated Hermes as at 20 June 2022. For illustrative purposes only.

Figure 8: Active beta by sector

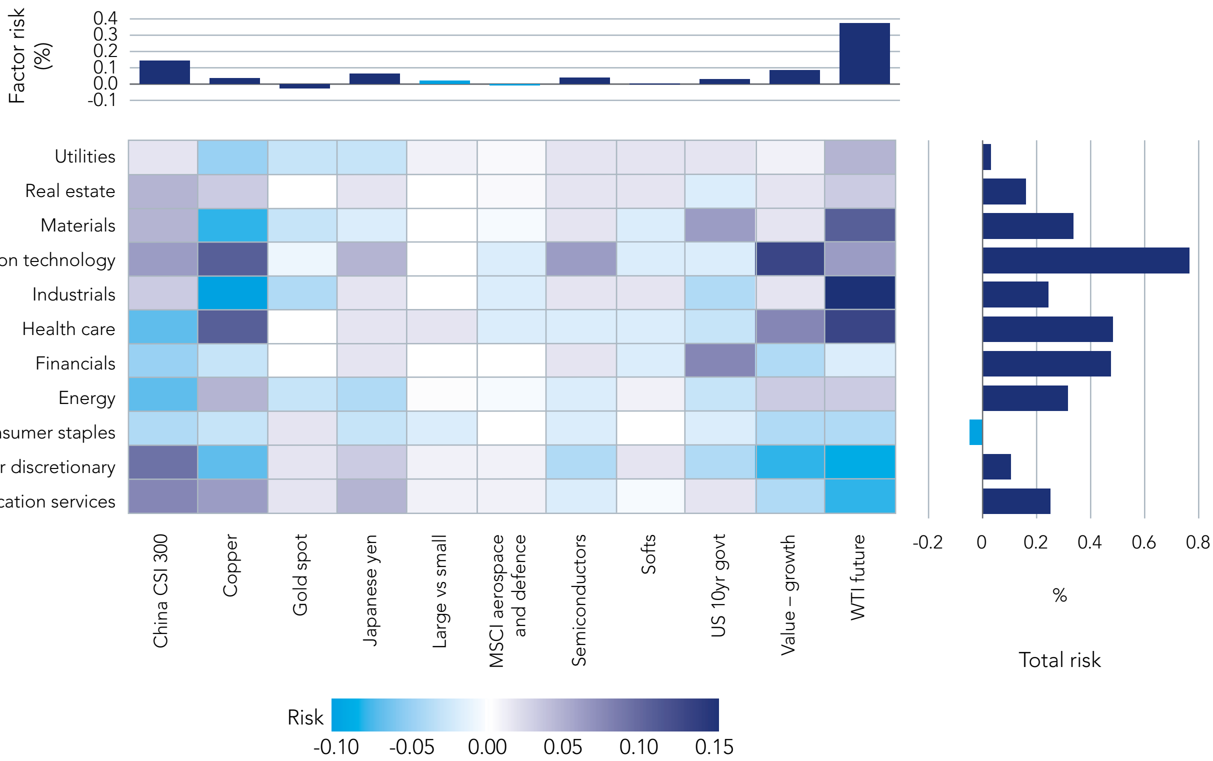
Using a monthly risk model



Source: FactSet, Bloomberg, Federated Hermes as at 20 June 2022. For illustrative purposes only.

Figure 9a: Contribution to tracking error by sector

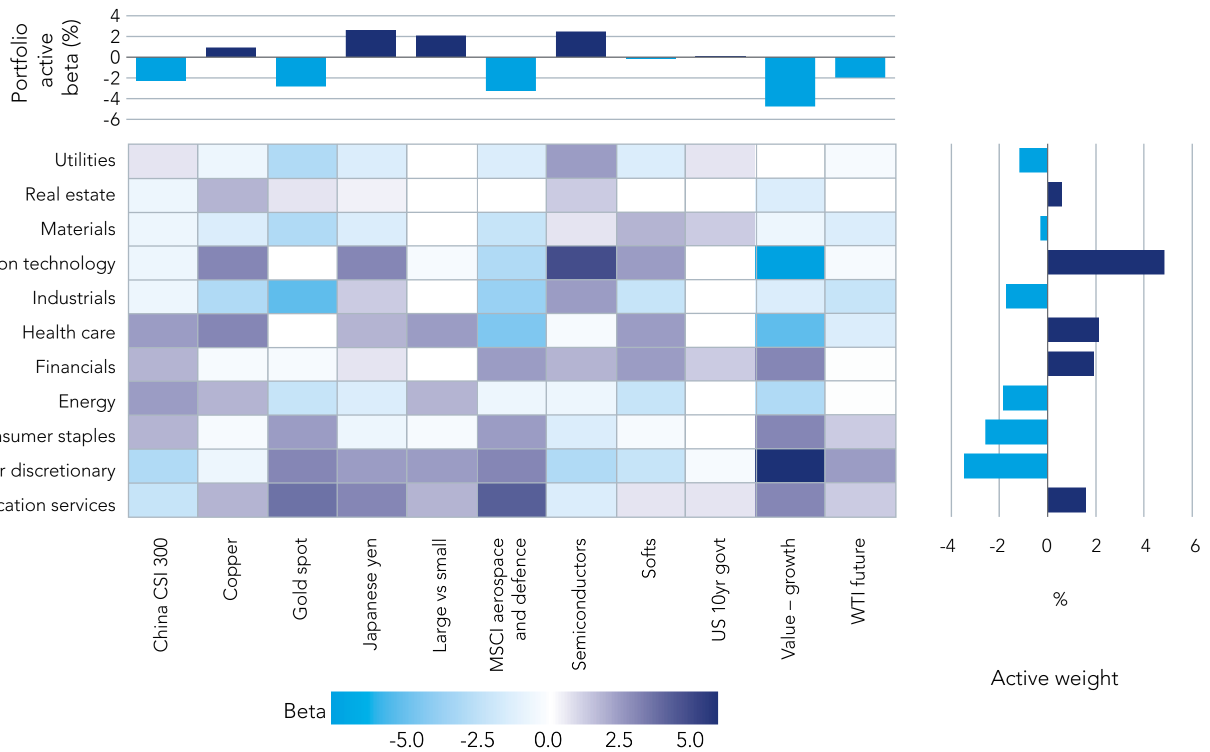
Using a weekly risk model



Source: FactSet, Bloomberg, Federated Hermes as at 20 June 2022. For illustrative purposes only.

Figure 9b: Active beta by sector

Using a weekly risk model



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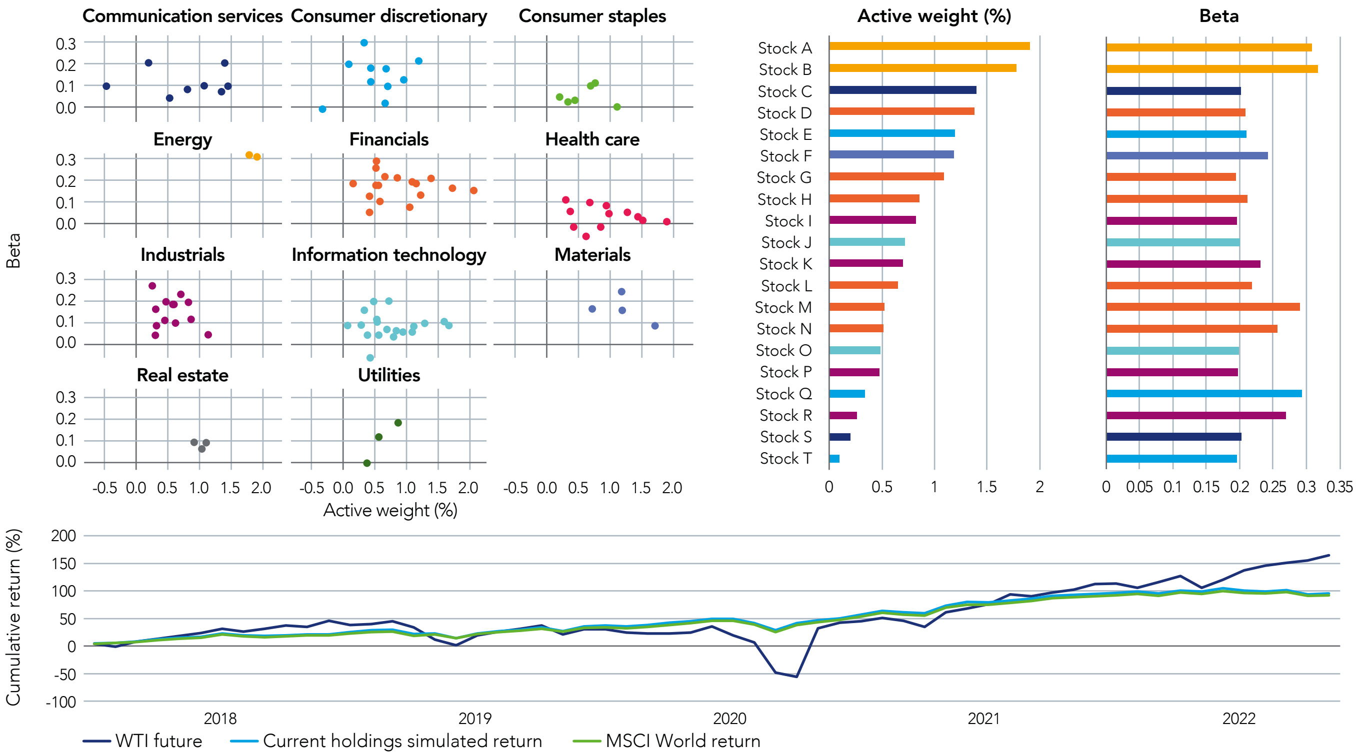
The factor-focused summaries that are now available are another example of the data-presentation enhancements. A one-page summary of the portfolio's positioning versus each holding's exposure is produced for each factor specified in the model, as illustrated in Figure 10 below.

In this example, it is clear that we have comparatively few holdings in the energy sector, and those we do hold have a high active weight and are very sensitive to moves in the oil price.

Conversely, our positions in the real estate sector tend to be low oil beta with a mid-level active weight. The summary also lists the investments with highest exposure to the factor, in this case oil. Unsurprisingly, the top contributors (stocks A & B) are energy companies. However, there are meaningful sensitivities to the oil price in other stocks, which may provide a way to hedge this risk without adding to the carbon footprint of the portfolio.

Figure 10: Beta to WTI future vs active weight



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What can we do about these risks?

MultiFRAME is an extremely powerful tool that enables us to decompose factor risk, and our portfolio's exposure to it, in a highly detailed fashion. We can also conduct scenario analysis to help us understand the potential impact of periods of major market stress, either historical or hypothetical, on our holdings – essentially all the above information can be produced relative to any historical market environment. This enables us to make highly informed decisions. The next stage of the process, which is deciding how to use this information, can be considered more art than science. We draw upon the team's expertise and many years of experience to make decisions as to the materiality of the risks identified, allowing for each investment's fundamental characteristics.

For instance, referring to a previous example, we are confident we have an in-depth understanding of the risk exposure of our positioning in the IT sector. We do not need a sophisticated risk system to determine that IT names tend to be growth stocks, or that large US technology names have tended to be correlated with Chinese equities. However, MultiFRAME allows us to quantify these risks and to understand how they are evolving. In the case of China, we can see that these historical relationships appear to be less important than previously thought. The portfolio's growth bias within the technology sector remains meaningful. Saying that, we can see that it is balanced by value bias elsewhere in the portfolio and that it is not driven by just one or two outsized positions.

Further, we have been provided with a clear picture as to how we could reduce this exposure in a timely and efficient manner if growth stocks faced further shocks. In this regard, the amount of information at our fingertips and the high level of flexibility in the model give us a clear advantage over much of the fund management industry given their reliance on static off-the-shelf risk models.

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