

Understanding and modelling market dislocation

Recent market shocks have prompted institutional investors to revisit the portfolio risk and performance analysis tools that they have in place to support their investment decision making.

FSR talks to

Roveen Bhansali,

Managing Director at MSCI Barra, about the direction in which product innovation is moving

Sometimes it can take a shock to reinforce the value of skills and services that we have come to take for granted – and stress events that have characterised global financial markets since mid-2007 have underlined the value that multi-factor risk analysis can bring to investors in understanding how their investment bets stood up under stress conditions and why they did so. Given its dominant position in the multi-factor risk modelling space, MSCI Barra has been well placed to meet demand from asset owners and money managers to bring explanatory tools to extreme event analysis and shortfall risk

evaluation, in addition, more broadly, to providing an understanding of where their asset managers were able to generate alpha.

This trend reflects a striking increase in appetite from both asset owners and asset managers for granularity in their risk analysis, providing greater explanatory power around the risk numbers that they generate. In the past, a customer might typically monitor a top-level risk number such as a tracking error ratio or a value at risk (VaR) measure but that is where their analysis would stop. Now risk



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managers are demanding further detail around their risk analytics, providing measure not just of how their maximum risk of loss has changed, but also why it has changed. For asset owners, there is a drive to understand how their external managers are performing and the degree of correlation between their respective investment strategies. Within an asset management company, a Chief Investment Officer may demand detailed analysis of where individual managers are generating return in terms their exposure to specific stocks, sectors and currencies. However, they may also monitor at enterprise level for shifts in total value at risk or for unintended concentration to specific market factors.

Importantly, this is not simply a reporting game, through which asset managers are required to provide monthly or quarterly insights on their

managers may be paid zero basis points for index-type returns, but will be paid 15-16 bps for every one per cent of outperformance that they generate above the benchmark. For this fee structure to be effective, it is crucial that asset owners have tools to identify which fund managers are creating alpha and where this value is coming from. This trend has reinforced demand for MSCI Barra's analytics products which, suggests Bhansali, are all attuned to the separation of alpha and beta.

Understanding market dislocation

As asset owners apply risk budgeting approaches to guide their investment process, the ability to quantify return generated per unit of risk across different sections of the portfolio has become an enduring requirement for asset owners. But in the face of market uncertainties prevailing globally

The importance of tail risk is acknowledged by virtually everyone in the financial services industry, particularly as so called extreme events appear to be taking place more frequently than anticipated. However, until now, a shortage of data has been a show-stopping impediment to the inclusion of tail risk in the investment process. In a recent breakthrough, the MSCI Barra research team has developed a system to generate synthetic data histories that lead to accurate tail risk forecasts for portfolios in a wide range of markets and asset classes.

returns to satisfy regulatory obligations. Rather, asset owners are using MSCI Barra tools to provide detailed insight on what a manager's bets are, the degree to which outperformance can be explained through manager skill, and whether there is evidence of style drift against the investment mandate.

This reflects broader efforts by the asset owner community to separate alpha and beta. The philosophy from the investors' side is that one should pay for alpha and get beta at low cost. As a result, asset managers are constantly looking for new mechanisms through which they can generate alpha – and asset owners are typically only willing to pay well for investment managers that can deliver sustained outperformance.

Some large asset owners have taken this process a step further by proposing to make the remuneration in their external mandates directly related to investment performance. For example, external

since mid-2007, we have also witnessed a drive from asset owners to develop better understanding of the causes of market dislocation and to build this facility more effectively into their risk modelling.

We have seen a series of market shocks during this period, fuelled by substantially different explanatory factors. In July-August 2007, for example, sizeable market dislocation resulted from fears in the US around credit losses linked to US sub-prime mortgage lending, with increased market volatility in the second half of the year. This trigger has prompted credit tightening across a wide range of markets globally. A few months later, in January 2008, we observed sharp movement in European and US stocks as a result of major trading losses sustained at Société Générale in Paris.

Both of these stress events resulted in sharp loss of market confidence that drove equities indices downwards. However, the underlying factors that

explain these two events differ substantially. On the basis of MSCI Barra multi-factor analysis, we note that in July-Aug 2007 Value, which had outperformed Growth in the previous years (Fig 1), showed a sharp reversal in this period (Fig 2). Additionally, several style-type Barra factors, including Value and Growth, but also Momentum, Earnings Yield, and Volatility, showed three to five standard deviation events over several weeks during this period. If investors were on the wrong side of a particular style bet, they were destined to experience dramatic underperformance as is evidenced in looking at the various factors in the Barra US Equity Model USE3 (Fig 3).

If we contrast this with market developments in January 2008 in European and Asian equity markets, we note in the latter case that the dislocation was not as closely tied to style factors, and instead, was tied to certain industry factors (See Fig 4 for European Equity Model factors).

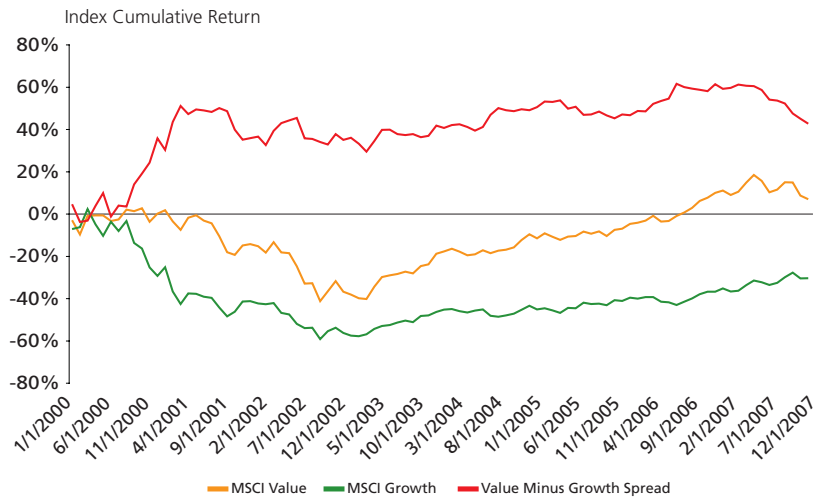
These examples underline the value that MSCI Barra's multi-factor modelling expertise can offer in providing a causal understanding of extreme events. Asset owners and investment managers employ VaR analysis and stress testing widely to model their risk exposure under different market conditions – but without the intuition provide by multi-factor analysis, they have limited powers to analyse underlying characteristics that have driven these recent shock events. Investors wish to drill deeper via factor analysis to understand causation – and specifically to understand how their bets will react to movements in key explanatory variables. Asset owners have been proactive in demanding this granularity in order to gauge how they should respond to these dislocations and how they should afford themselves better protection in the future.

MSCI Barra has reacted to this trend in several ways. In response to requests from clients, it is now publishing monthly research that explains recent market events in the context of Barra factor models. On the product side, it has also built a wider range of risk measures (including VaR, simulations, and stress testing) into its products, thereby providing greater breadth of analysis to the customer but without compromising the depth of analysis that it has long extended via a multi-factor approach.

More broadly, asset owners and investment managers are looking at the market shocks that we have witnessed over the past 9-10 months and

Fig 1: Longer-term Value-Growth Trend

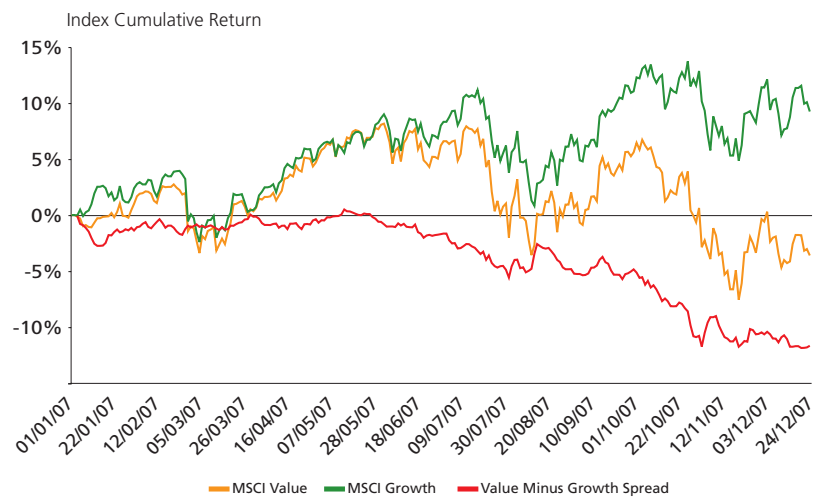
Value-Growth Premium Strong Since 2000



Source: MSCI Barra

Fig 2: Value-Growth Reversal in July-Aug 2007

Value-Growth's Sharp Reversal in 2007



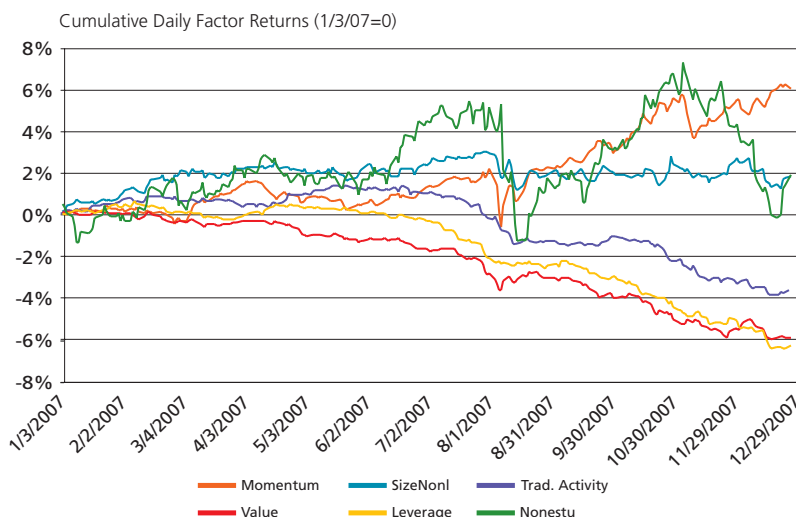
Source: MSCI Barra

are wishing to situate how severe these events are in historical context. To provide this insight, MSCI Barra has run historical factor modelling across more than 50 factors over a 20 year time series for US equities markets and has monitored the movement of these variables through key stress events such as the 1997 Asian equities crisis, the 1998 Russian ruble crisis and the SARS epidemic of 2003. The goal of this analysis is to identify which groups of factors were impacted during these market shocks and with what level of severity.

Though developments during June-July 2007 and

Fig 3: Relative performance of different factors in the Barra USE3 model for 2007

Top and Bottom Three USE3 Factors in 2007



Source: MSCI Barra

Fig 4: Contrast between Jan 2008 and July/Aug 2007 market dislocations

Date	Event	Number of Negative STYLE factor returns beyond 3 stdev	Number of Negative STYLE factor returns beyond 5 stdev	Number of Negative INDUSTRY factor returns beyond 3 stdev	Number of Negative INDUSTRY factor returns beyond 5 stdev
9-Aug-2007	Quant Meltdown	4	2	8	0
16-Aug-2007	Subprime II	3	0	52	8
21-Jan-2008	End of Bull Market?	0	0	55	12

Source: MSCI Barra

January 2008 have caused severe dent to market confidence, Barra factor models indicate that during the 1998 Russian ruble crisis and in the wake of the collapse of Long Term Capital Management underlying factors were impacted with greater severity and over a longer timeframe.

Reducing cost of ownership

Ten years ago, asset owners were often reluctant to pay for specialist performance and risk analytics because they were comfortable to rely on the monthly or quarterly reporting that they received from asset managers they employed to run their external mandates. This has now changed substantially. To guide their investment decision making, and to ensure fiduciary responsibilities to scheme members are discharged effectively, asset owners are increasingly willing to pay for MSCI Barra's analytics products, enabling them to support

detailed and independent monitoring of performance and risk exposures across their full range of allocated assets.

Significantly, this is extending beyond the large asset owners with high-value portfolios to embrace more mid-tier asset owners that are subject to similar regulatory pressures and reporting obligations, but that have a more modest budget to commit internally to investment risk and performance monitoring. By offering its products through an ASP platform to external customers, MSCI Barra has been able to reduce the cost of ownership substantially and this has opened the door to a diverse group of asset owners and small and mid-tier fund managers that previously had limited access to Barra functionality.

At one end of the customer spectrum, MSCI Barra has asset owner and asset management customers that wish to purchase a packaged integrated risk solution such as BarraOne, delivered in the ASP platform, or Barra TotalRisk, deployed in a client-server architecture. But alongside this, it has customers, particularly in the hedge fund and boutique asset management communities, that may wish to employ specialised elements of the Barra product range such as a Barra optimiser module or its Barra Aegis and Barra Cosmos modules to support equities and fixed income portfolio construction. For the high-end asset manager that has its own investment risk model, the firm can employ the plug and play Barra optimiser via an API toolkit and can tailor this to its own specific needs in order to build optimal portfolios as part of the investment process. Should it wish to, the customer also has freedom to manage MSCI Barra's analytics products on a third-party quantitative analytics platform such as FactSet or MarketQA, allowing it to access Barra risk models but doing so via a range of delivery models.

Importantly, for investors employing 130:30 type short-extension strategies, the Barra Aegis equity portfolio analytics package is an important tool to help create, backtest and analyse strategies, and identify where the manager is, or is not, generating alpha. This is key to the success or failure of the strategy. When an investment manager is adding alpha, leveraged strategies may work well; but when you don't have alpha, leverage is dangerous. As asset owners venture further into the active-extension space, the need to separate alpha and beta, and to appreciate the causal mechanisms, is vitally important.

Modelling alternatives

More broadly, asset owners have dramatically increased allocations to alternative investments during the past five years, including hedge funds and fund of hedge funds, property, private equity and commodities. To support this trend, MSCI Barra has refined its product suite in order to extend multi-factor modelling into the alternative investments space. This includes the release of the Barra Hedge Fund Model in 2007, which incorporates a set of hedge fund style factors in conjunction with the equity, fixed income and currency factors in the Barra Integrated Model (BIM). This allows for a consistent and meaningful aggregation of exposures as well as decomposition of risks from investing in hedge funds, alongside the risk of investing in traditional asset classes such as equities and fixed income. This allows for an asset owner to facilitate total plan analysis, risk budgeting and manager monitoring using a consistent framework across all the asset classes that they invest in.

It has been possible to extend a measure of this innovation to performance attribution for fixed income and alternative investment portfolios. "By using factor-based analysis to distil any market into sources of risk, and then modelling the risks generated through movements in each of these factors, you have a framework that can be applied to a wide range of asset classes," says Bhansali. This works well for equities, fixed income, for currencies and for a range of other exposures. For fixed income attribution, one can analyse key rate duration as a source of risk and then apply techniques such as shift-twist-butterfly to model how interest rates move from month-to-month or day-to-day. Alongside this, MSCI Barra includes credit factors, swap spreads, rating factors and other variables that will shape the bets made by the fixed income portfolio manager.

For alternative asset classes such as private equity, property or commodities, historical data sets are still relatively short and performance attribution models are still being adapted to capture specialised features of the underlying asset class. "We do not claim at this time to provide the same level of granularity and intuition for alternatives as we do for equities, where MSCI Barra has been providing attribution for roughly 25 years," says Bhansali. "However, this science is developing quickly and MSCI Barra can now provide the investor with robust insight regarding where its alternative investment managers are generating additional

Fig 5: **Extreme Events in Historical Context: Systematic Extreme Events (1990 - 2007)**

Systematic Extreme Events (1990 - 2007)			
	# of Negative Factor Returns > 3 Stdevs	# of Negative Factor Returns > 5 Stdevs	
8/6/1990	48	3	Broad and Semi-Strong
8/23/1990	29	-	<i>Broad But Not Strong</i>
11/15/1991	24	-	<i>Broad But Not Strong</i>
2/16/1993	10	1	<i>Broad But Not Strong</i>
3/8/1996	35	1	<i>Broad But Not Strong</i>
7/15/1996	39	2	Broad and Semi-Strong
4/11/1997	21	-	<i>Broad But Not Strong</i>
10/27/1997	56	50	Broad and Very Strong
1/9/1998	21	-	<i>Broad But Not Strong</i>
8/4/1998	37	-	<i>Broad But Not Strong</i>
8/27/1998	43	2	Broad and Semi-Strong
8/31/1998	57	43	Broad and Very Strong
10/1/1998	24	-	<i>Broad But Not Strong</i>
3/7/2000	21	-	<i>Broad But Not Strong</i>
3/15/2000	1	1	<i>* Focused *</i>
4/14/2000	53	17	Broad and Strong
3/12/2001	22	-	<i>Broad But Not Strong</i>
9/17/2001	36	12	Broad and Strong
7/19/2002	14	1	<i>Broad But Not Strong</i>
7/23/2002	6	1	<i>Broad But Not Strong</i>
2/27/2007	42	-	<i>Broad But Not Strong</i>
8/3/2007	26	-	<i>Broad But Not Strong</i>
8/8/2007	4	2	<i>* Focused *</i>
8/9/2007	32	4	Broad and Semi-Strong
8/10/2007	2	1	<i>* Focused *</i>
10/19/2007	21	-	<i>Broad But Not Strong</i>
11/1/2007	16	1	<i>* Focused *</i>

Source: MSCI Barra

Fig 6: **Scope, Breadth and Severity of Market Dislocations**

	Asian Flu	LTCM - Ruble Devaluation 1998	Tech Bubble Burst 2000	Quant-Liquidity Crisis 2007
Styles	Narrow	Broad	Narrow	Broad
Industries ("Market")	Broad	Broad	Broad	Narrow
Severity	High	High	High	Low
Duration	Short	Long	Medium	Medium
Speed of Onset	Short	Medium	Long	Short

Source: MSCI Barra

return and, importantly, how strongly these returns are correlated to its equities and fixed income allocations." Moreover, within BarraOne, this intuition is available within a single aggregated framework, enabling the customer to analyse risk and performance attribution without worrying about the inconsistencies resulting from pulling in analysis from multiple platforms and vendor packages.

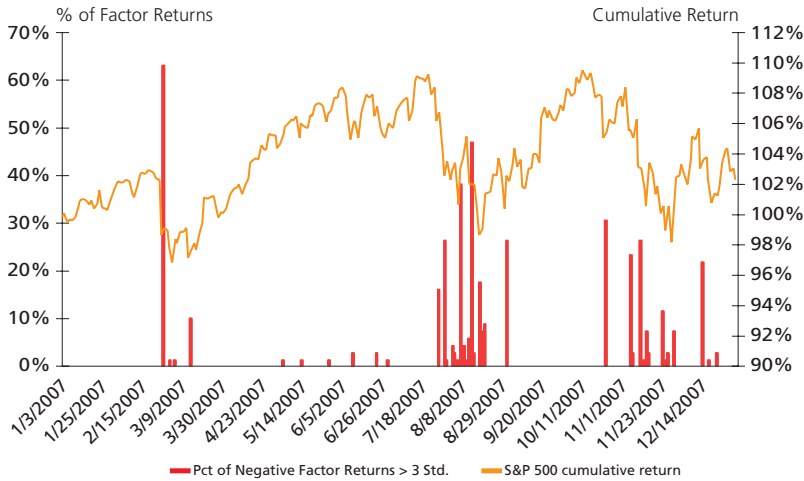
Modelling the future

In summary, we witness an investment environment in which asset owners are not simply attempting to reduce risk, but instead to optimise the returns that they generate for each unit of risk across their asset portfolio – and this focus has

Fig 7: 2007 in Review: Extreme High-Frequency Events

Extreme Factor Moves in 2007

* Daily factor returns are standardized by the USE3L forecast as of the beginning of the month.



Source: MSCI Barra

been crucial over 2-3 years in order to address any funding shortfall between scheme assets and liabilities.

One practical implication of this trend is that some large US asset owners are gradually moderating the domestic bias that has long existed in their equities allocations. With 55 per cent of global equities market capitalisation listed on exchanges outside of the US, the California Public Employees Retirement System (Calpers), for example, has opted to reduce the relative percentage of US to international holdings in its US\$150 billion equities portfolio from 66/33 per cent to 45/55 per cent. For this asset owner alone, this will result in a US\$30 billion rebalancing from US to international equities.

In keeping with this trend, MSCI Barra is revising its global equities model, which previously drew on an estimation universe of approximately 2000 securities, to create a new model that will source historical data from approximately 8000 securities worldwide. The powerful blend of MSCI historical index data and Barra investment risk analytics have provided a strong platform from which to model trends in international equities investment since the two companies merged in 2004.

MSCI Barra is also working on applying extreme value theory to analyse non-linear investment returns, and extending the multi-factor analysis to model skewness or tails. The importance of tail risk is acknowledged by virtually everyone

in the financial services industry, particularly, as the so called extreme events appear to be taking place more frequently than anticipated (see Fig 7). However, until now, a shortage of data has been a show-stopping impediment to the inclusion of tail risk in the investment process. In a recent breakthrough, the MSCI Barra research team has developed a system to generate synthetic data histories that lead to accurate tail risk forecasts for portfolios in a wide range of markets and asset classes. The construction relies on proprietary Barra factor return data and specific risk forecasts. It supports factor decompositions of tail risk that enable investors to attribute tail risk and analyse performance. By applying this methodology in a multi-factor framework, MSCI Barra has been able to model risk of loss in extreme events, while retaining the intuition of a factor-based model.

Reflecting on product evolution at MSCI Barra, Roveen Bhansali observes that, two to three years ago, there was a sentiment internally that in many ways the company was ahead of the curve in anticipating where the industry was moving and in developing solutions to pre-empt customer requirements. "With hindsight, many of the themes that we identified have proven to be closely aligned with the needs of our asset owner and asset management client communities," he says. With over a 25 year track record in delivering multi-factor risk modelling, this is an experience that MSCI Barra has encountered on a number of occasions previously. "When we established our equities risk modelling and attribution service in the early 1980s, it felt akin to building a high performance lightweight sailing yacht, but with little wind to drive our progress," he explains. Subsequently, the market has become much more interested in understanding risk-adjusted return and demand for multi-asset class risk attribution, delivered from a versatile risk platform such as BarraOne, has grown dramatically. So too, investor demand for preserving the investment intuition provided by factor models across asset classes, yet at the same time the need for accounting for extreme event analysis and shortfall risk modelling, has pushed innovation in a multi-factor modeling framework back to centre stage. This framework allows for consistent and rigorous analysis across various functions within an investment organisation spanning across portfolio construction, portfolio analysis, and risk management, and also allows for a common language across the asset owner and asset managers. ■