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Portfolio of Risk Premia: a new approach to diversification | January 2009

Remy Briand

Frank Nielsen

Dan Stefek

Abstract

Traditional approaches of structuring policy portfolios for strategic asset allocation have not provided the full potential of diversification. Portfolios based upon a 60/40 allocation between equities and bonds remain volatile and dominated by equity risk. In this paper, we introduce a different approach to portfolio diversification. This approach looks at structuring portfolios using available risk premia within the traditional asset classes or from systematic trading strategies rather than focusing on classic betas such as equities and bonds. We start by reviewing the various ways of dissecting asset classes into their underlying systematic drivers or risk premia and analyze the historical risk and return patterns for a number of risk premia across asset classes. In a second stage, we illustrate empirically that correlations between risk premia have been low, offering significant diversification potential. We then confirm the benefits of diversification with a simple asset allocation case study by comparing a typical 60/40 equity/fixed income allocation with an equal weighted allocation across eleven style and strategy risk premia. From 1995 to 2008, this simple combination had returns similar to the traditional allocation but with 65% less volatility.

Introduction

Classic asset allocation combining equities and bonds is not diversified enough and is characterized by high volatility. The previous down market in 2001-2003 amply demonstrated this phenomenon, which was subsequently analyzed by Leibowitz (2004) and Qian (2005). The consequence has been a gradual shift of strategic allocations towards alternative asset classes, such as private equity, hedge funds or commodities. However, these new allocations only partially addressed the problem as the 2008 crisis glaringly revealed. Some alternative segments did not provide the needed diversification. For example, private equity may provide diversification if portfolios are composed of uncorrelated high alpha funds but in reality, the beta component of private equity is structurally dependent on equity market returns and interest rates. In addition, the majority of hedge funds are long / short equity funds whose returns incorporate a big element of classic equity beta. Furthermore, many fixed income hedge fund strategies are variants of a simple credit exposure trade. More granular allocations within the equity or bond asset classes are no solutions, either, since the resulting portfolios are still exposed to the common equity market return or the general level of interest rates.

Investors also tried constructing portable alpha portfolios, in the hopes that alpha produced by many managers would provide uncorrelated returns. However, capturing alpha is notoriously difficult. As a result, what tends to matter most are asset allocation decisions and beta returns.

In an ideal world, a portfolio would be composed of a wide range of return-producing units, each of which is risky but independent of the others. Such a portfolio would result in high returns with low volatility. The return-producing units would also have capacity large enough for allocations by large funds. So, how can we identify these independent, return-producing units?

The answer is deceivingly simple. These return-producing elements or risk premia exist in the traditional asset classes and are identified by fundamental factors. They just need to be separated from assets dominated by the equity market or interest-rate return.

We illustrate our concept of risk premia using the example of small cap equities. An investor investing in a small cap portfolio gets the equity market return plus the small cap risk premium. Exposure to the more risky small cap assets justifies this additional return. Since investment management advances allow for easy and cost effective ways to hedge market beta, accessing the pure small cap premium can be accomplished with a portfolio that is long small caps and short large caps. That portfolio captures the small cap risk premium.

Similarly, in the bond world, a high yield portfolio provides the government bond return for similar maturities plus the risk premium associated with the riskier high yield bonds. A portfolio long in high yield bonds and short in government bonds captures the high yield risk premium.

Finally, some strategies that aim to capture a specific risk premium through the execution of systematic trading rules also qualify for the risk premium approach. Arbitrage strategies such as merger arbitrage or convertible arbitrage qualify under that scheme. Being rules-based, these strategies can be replicated in a cost effective way and avoid risk associated with the selection of active managers.

The main objective of this paper is to better understand the risk and return characteristics of risk premia, first as standalone entities and second in the context of a portfolio of risk premia.

We first define a set of requirements that a risk premium has to satisfy and identify a number of risk premia across asset classes. We then discuss how one might create investable indices that capture risk premia. Next, we highlight the possible benefits of a well-defined and investable set of risk premia with an asset allocation case study. We conclude with an outlook on future research focusing on the development of a broad range of risk premia indices.

I. Definition of and Examples for Risk Premia

A risk premium is typically defined as the expected investment return in excess of the risk-free rate.[1] The risk premium compensates investors for the additional risk relative to a risk-free investment. We categorize risk premia into those arising from asset-class, style, and strategy, and use the concept of betas, which in combination capture a portfolio's systematic return.

In our terminology, asset-class beta for a portfolio captures the expected return coming from a particular asset class. For a particular portfolio, it is defined more precisely as the product of the risk premium for a particular group of assets, such as equities, and the relationship of the asset group's return to its benchmark return (the latter being the more traditional definition of beta). For example, the long term equity risk premium historically has been around 6% and many long only equity mandates have a traditional beta of roughly one, leading to the asset-class beta for equities, according to our definition, to be 6%. In a similar vein, style betas describe the systematic return coming from individual security characteristics like book-to-price ratio of equities or the credit spread of fixed income securities. The style beta of a portfolio captures the expected return coming from the risk premium of the style multiplied by the exposure of the portfolio to the respective style. Next, strategy betas capture the systematic return derived from replicating investment strategies. An example is the merger arbitrage strategy where the manager invests in the target and shorts the acquirer. Such arbitrage strategies often results in a traditional beta close to zero and small style exposures. The risk premium compensates for the uncertain

[1] For example, US investors often use the 1-month Treasury-Bill as the risk-free rate.

outcome of the merger, i.e., only if the merger succeeds earns the strategy a profit. Finally, the non-systematic source of portfolio return is alpha. These four components can explain the total return of an investment:

Return	=	Asset - Class Beta	+	Style Beta	+	Strategy Beta	+	Alpha

The systematic component of, for example, an equity portfolio return can be broken down into the sum of its risk premia: The traditional beta with respect to a market index times that index's return, and its exposures to certain styles like Value, Size, and Momentum times the respective styles' returns. In contrast, a merger arbitrage strategy exhibits little exposure to the equity market or styles but its systematic portfolio return may be explained largely by its strategy Beta. A more granular categorization of traditional and alternative Beta sources is described in Anson (2008).

Well-known risk premia within the equity class include the equity risk premium, as well as Value, Small Cap, and Momentum. Other asset classes, including fixed income, real estate, and commodities, also demand risk premia above the risk-free rate. Similar to equities, there are distinct risk premia within those asset classes. Examples include term structure, credit, and high yield spread factors. Liquidity and volatility are harder to identify and replicate but are important sources of risk and return for most alternative asset classes and many hedge funds strategies.[2] Exhibit 1 classifies a number of risk premia across asset classes.

Exhibit 1: Risk Premia across Asset Classes

Asset Class	Asset - Class Beta	Style Beta	Strategy Beta
Equity	Broad Equity Markets	Size Value Momentum	Merger Arbitrage
Fixed Income	Broad Fixed Income Markets	Credit Spreads High Yield Spread Term Structure Spread	Convertible Arbitrage
Currency	Broad Currency Markets		Carry Trade Momentum Value

Exhibit 1 is just provided for illustrative purposes; the framework can capture other asset classes such as commodities or real estate as well as a number of additional style and strategy risk premia within asset classes.

[2] We do not treat hedge funds as a separate asset class but look at certain hedge funds strategies within the existing asset classes, e.g., a merger arbitrage is viewed as a strategy risk premium within equities.

Historically, style and asset class betas have been bundled together. For example, the MSCI Value index offers exposures to both the equity market and to the value risk premium. Isolating exposure to a style beta can be achieved by going long on one dimension of a style and short the opposite dimension. For example, exposure to the value premium may be achieved by going long the MSCI Value index and short the MSCI Growth index. Such a long/short combination would eliminate most of the market exposure and effectively capture the value risk premium.

Exhibit 2 demonstrates ways to capture different well-researched style and strategy risk premia. However, the list is not meant to be comprehensive and different methods to capture risk premia are possible.

Exhibit 2: Ways of capturing different Risk Premia – An Illustration

Risk premium	Long Position	Short Position
Value	MSCI World Value	MSCI World Growth
Size	MSCI AC World Small Cap	MSCI AC World Large Cap
Momentum	World Momentum (simulated)	MSCI World
Credit Spread	Merrill Lynch US Corporate (AAA)	Merrill Lynch US Treasury
High Yield Spread	Merrill Lynch High Yield US Corporate	Merrill Lynch High Quality US Corporate
Term Spread	Merrill Lynch US Treasury 10+ years	Merrill Lynch US Treasury 1-3 years
Merger Arbitrage	Target	Acquirer
Conv Arbitrage	Convertible Bond	Underlying Stock
Currency Carry Trade	3 Highest Interest Rate G10	3 Lowest Interest Rate G10
Currency Value	3 Most Undervalued G10	3 Most Overvalued G10
Currency Momentum	3 Best Performing G10	3 Worst Performing G10

Many style betas can be created simply through long/short combinations of existing indices, whereas there are only few strategy risk premia available as investable indices, yet. MSCI has simulated the Strategy Beta indices as well as the Equity Momentum Style index. The different methodologies for the simulated indices are explained in Appendix A.

II. Risk and Return Characteristics of Risk Premia

We next examine the risk and return characteristics of the different asset-class, style, and strategy risk premia over the period May 1995 to October 2008. Exhibit 3 shows annualized returns and realized annualized volatilities, as well as the Sharpe ratio and maximum drawdown. The Sharpe Ratio is defined as the annualized excess return over the annualized volatility. Maximum drawdown is the maximum cumulative loss during an uninterrupted down market, i.e., the worst difference between market peaks and troughs over different market cycles.

Over this period, the strategy risk premia, particularly merger arbitrage, currency carry trade, and currency value strategies, performed well on a risk-adjusted basis; all have realized Sharpe ratios above 0.75. Recently, asset-class based and style premia indices have been negatively impacted by the financial crisis, particularly in October 2008 as we will discuss later.

Exhibit 3: Risk and Return Profiles of selected Risk Premia – 5/1995 to 10/2008

Style / Strategy Beta	Risk Premium	Annualized Premium	Annualized Volatility	Sharpe Ratio	Maximum Drawdown
Style	Value	1.6%	8.3%	0.20	-30.0%
	Size	0.6%	7.7%	0.08	-38.4%
	Momentum	0.9%	10.3%	0.09	-40.1%
	Credit Spread	0.3%	1.4%	0.18	-5.2%
	High Yield Spread	-0.6%	7.3%	(0.08)	-33.2%
	Term Spread	2.8%	7.3%	0.39	-12.8%
Strategy	Merger Arbitrage*	3.2%	3.5%	0.92	-12.0%
	Convertible Arbitrage**	2.0%	6.4%	0.31	-31.2%
	Carry Trade	7.1%	8.7%	0.82	-26.6%
	Currency Value	5.7%	7.6%	0.76	-9.2%
	Currency Momentum	3.0%	9.4%	0.32	-21.9%
Asset-Class Beta	**Risk Premium**	**Annualized Premium**	**Annualized Volatility**	**Sharpe Ratio**	**Maximum Drawdown**
Equity	MSCI EAFE	0.3%	15.9%	0.02	-54.0%
	MSCI Japan	-5.4%	19.4%	(0.28)	-69.0%
	MSCI USA	3.4%	15.5%	0.22	-51.7%
	MSCI Emerging Markets	3.2%	24.6%	0.13	-61.2%
Bonds	Merrill Lynch Domestic Master***	1.7%	3.7%	0.46	-7.6%

* MSCI HFI Merger Arbitrage before 2003, afterwards a simulated Merger Arbitrage Index
** MSCI HFI Convertible Arbitrage before 2003, afterwards a simulated Convertible Arbitrage Index
*** Merrill Lynch Domestic Master follows the US dollar denominated investment grade Public Corporate and Government debt.

The return/risk profile is an important consideration but understanding the diversification benefit of investing in risk premia is equally important. Exhibit 4 displays the correlations between the style and strategy risk premia. The upper left box shows the correlations between different style indices whereas the lower box to the right displays the correlations between the different strategy indices for the period from May 1995 to the end of October 2008.

Exhibit 4: Correlations of Style and Strategy Risk Premia – 5/1995 to 10/2008

	Value	Size	Mom	Credit Spread	HY Spread	Term Spread	Merger Arb.	Conv. Arb.	Carry Trade	Curr. Value	Curr. Mom.
Value	1										
Size	0.11	1						< 0.25			
Momentum	-0.47	0.15	1					> 0.50			
Credit Spread	0.07	0.06	0.15	1							
High Yield Spread	0.06	0.26	0.20	0.56	1						
Term Spread	-0.05	-0.02	0.18	0.04	-0.09	1					
Merger Arbitrage	-0.02	0.18	0.33	0.29	0.49	-0.12	1				
Convertible Arbitrage	-0.02	0.18	0.52	0.25	0.39	0.17	0.44	1			
Carry Trade	0.00	0.10	0.35	0.41	0.45	0.08	0.37	0.58	1		
Currency Value	0.10	-0.04	-0.19	0.20	0.20	-0.03	0.00	-0.20	0.32	1	
Currency Momentum	-0.10	-0.20	-0.14	-0.13	-0.26	0.01	-0.20	-0.20	-0.01	-0.05	1

Most of the correlations in Exhibit 4 are below 0.25 and confirm that the risk premia captured unique return characteristics and offered diversification over this period. Note the highly negative correlation of -0.47 between Momentum and Value - two factors that are often deployed in quantitative equity investing. Not surprisingly, the correlation between high yield and credit spread is high at 0.56, suggesting that these two factors are at least partially redundant.

In Exhibit 5, we analyze the historical correlations between the style, strategy, and asset-class indices. Again, many of the correlations are low but a couple of larger correlations (above 0.50) indicate that some of the risk premia capture similar sources of return.

For example, the term spread has a correlation of 91% with the Merrill Lynch Domestic Master Index, indicating little benefit when including both in the investment universe. Other high correlations are observed between the high yield spread and the equity indices. This result is not surprising since high yielding fixed income instruments are expected to perform like equities. The default risk is higher and the return depends more on the performance of the underlying company than the interest rate environment.

Exhibit 5: Correlations with traditional Asset Class Risk Premia

	MSCI EAFE	MSCI Japan	MSCI USA	MSCI EM	ML Domestic Master
Value	-0.14	-0.15	-0.17	-0.12	-0.05
Size	0.05	0.13	-0.17	0.21	-0.04
Momentum	0.35	0.06	0.07	0.12	0.06
Credit Spread	0.46	0.28	0.52	0.44	0.15
High Yield Spread	0.59	0.34	0.59	0.60	-0.23
Term Spread	-0.18	-0.09	-0.14	-0.23	0.91
Merger Arbitrage	0.52	0.34	0.54	0.51	-0.10
Convertible Arbitrage	0.41	0.23	0.32	0.37	0.30
Carry Trade	0.37	0.12	0.38	0.44	0.12
Currency Value	0.00	-0.08	0.17	0.14	-0.07
Currency Momentum	-0.21	-0.22	-0.13	-0.14	-0.03

Our results confirm that the risk premia capture systematic and independent sources of return beyond the traditional asset classes. Thus far, we have reviewed individual risk premia and their risk and return characteristics. We will now consider potential applications for style and strategy indices, combine the risk premia into portfolios, and compare a portfolio of risk premia to a traditional asset allocation.

III. Applications for Risk Premia Indices

In recent years, academics and practitioners have focused on the replication of certain hedge funds strategies through mechanical trading rules. Mitchell and Pulvino (2001) discuss the characteristics of merger arbitrage strategies and describe methods to create merger arbitrage portfolios that can function as benchmarks for active merger arbitrage hedge funds strategies. In a number of published papers, Fung and Hsieh describe 'asset-based style' factors that allow the replication of the systematic component of several hedge funds strategies, including convertible arbitrage. Clarke, De Silva, and Murdock (2005) discuss the potential benefits of a factor based asset allocation and report promising results for the replication of global macro hedge funds strategies.

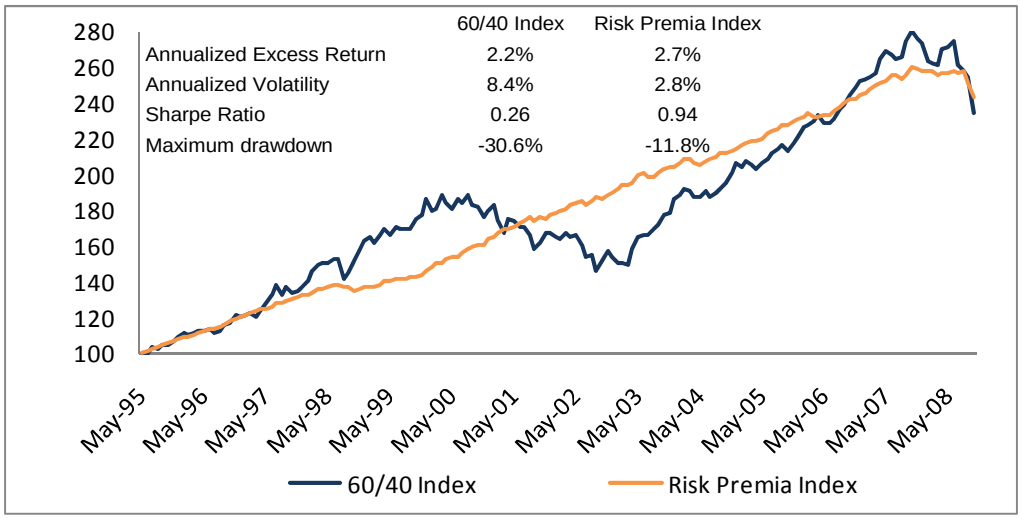
A more refined set of strategy and style betas has several applications beyond the obvious one of cost effective access to desired risk premia. A set of risk premia that explains different sources of investment returns may be used for:

- Asset allocation
- Portfolio construction
- Risk management and stress testing
- Manager selection and performance attribution

We will focus on asset allocation as one important class of decisions where diversification benefits are vital. In our case study, we compare a portfolio characterized by a traditional 60/40 equity/bond mix with a simple equal-weighted mix of the strategy and style indices described in Exhibit 2. The 60/40 portfolio is composed of 60% MSCI World and 40% Merrill Lynch Domestic Master. We rebalanced both allocations on a monthly basis over the period, May 1995 to end of October 2008. Exhibit 6 shows the cumulative returns of the two allocations and a number of summary statistics.

The annualized excess return above the risk-free rate is comparable: 2.2% for the 60/40 mix versus 2.7% for the equal weighted combination. The much lower realized volatility of only 2.8% (annualized) over this period for the risk premia mix, compared to 8.4% for the 60/40, led to a Sharpe ratio more than 3 times higher for the risk premia index, 0.94 vs. 0.26 respectively.

Exhibit 6: Cumulative Return of traditional and factor based asset allocation



The maximum drawdown highlights the volatility introduced by the 60% equity allocation. During the bear market after the burst of the technology bubble, the 60/40 allocation lost 30.6%, leading to a significant shortfall in many pension plans relative to their liabilities. In contrast, the risk premia combination experienced a 12% maximum drawdown. Similarly, during the recent crisis the 60/40 allocation lost 19.2% between May 2007 and end of October 2008 vs. 11.2% percent for the risk premia combination.

Another important consideration for asset allocation decision making is the performance of the portfolio during extreme events. Exhibit 7 confirms, that the 60/40 allocation experienced greater losses during the months of the Asian crisis in 1997, the LTCM debacle of August 1998, the 9/11 attacks in 2001, and during October 2008. Only during the August 2007 turmoil was the performance of the 60/40 allocation superior.

Exhibit 7: Performance during Extreme Months

Event	Asian Crisis	LTCM	9/11	Quant meltdown	Financial Crisis
Monthly Return in	Oct-97	Aug-98	Sep-01	Aug-07	Oct-08
60/40 Index	-3.0%	-7.8%	-5.0%	0.1%	-8.4%
Risk Premia Index	0.1%	-1.8%	-1.9%	-1.3%	-4.5%
Value	2.3%	-3.4%	-1.0%	-0.6%	0.9%
Size	1.4%	-2.0%	-4.0%	-1.8%	-4.2%
Momentum	0.2%	-2.3%	1.2%	-3.2%	-18.9%
Credit Spread	-0.1%	-1.2%	-0.5%	-0.4%	-1.9%
High Yield Spread	-0.6%	-5.6%	-8.0%	0.1%	-10.4%
Term Spread	2.6%	3.3%	-0.7%	0.9%	-4.1%
Convertible Arbitrage	0.6%	-1.9%	0.5%	-1.4%	-14.4%
Merger Arbitrage	0.3%	-5.0%	-2.2%	0.3%	-3.7%
Carry Trade	-1.5%	-1.9%	-5.1%	-4.6%	-14.6%
Currency Value	-2.2%	-1.7%	-5.2%	2.0%	7.3%
Currency Momentum	-1.8%	2.2%	4.1%	-5.3%	14.1%

Analyzing the performance of the individual style and strategy indices explains the relatively small losses during extreme events; while some risk premia experienced heavily losses, others performed well. October 2008 stands out for the risk premia index with a loss of 4.5% driven by a number of extreme negative returns of more than 10%. These losses were partially offset by the Currency Value and Currency Momentum Indices.

Conclusion and Future Research

The asset allocation case study only scratches the surface of the possibilities for investable risk premia. Being able to invest in independent sources of return across asset classes can have application beyond asset allocation, including portfolio construction, risk management, performance attribution, and manager selection.

Our initial foray into the world of risk premia was not, per se, trying to select the best performing combination for risk premia but more to validate the fact that a combination of such risk premia could provide enough return and diversification benefits as an attractive alternative to traditional asset allocations. Indeed, this approach leads to promising results.

Our future research will focus on three main areas: (1) identifying a comprehensive and independent list of risk premia and finding ways to combine them into efficient portfolios, (2) creating style indices with special attention paid to 'purity' of style and investability, and (3) developing strategy indices that capture the distinct performance patterns of investments with a significant systematic component.

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Appendix A: Simulated Style and Strategy Risk Premia

1. Momentum Style Index:

The simulated momentum equity index consists of the top 1/3rd of the MSCI World market capitalization ranked by twelve months performance. The Momentum Style Index reflects the performance of a long position in the simulated momentum index and a short position in the MSCI World Index. The style index is rebalanced semi-annually.

2. Merger Arbitrage Strategy Index:

The simulated Merger Arbitrage Index includes cash-only and cash/stock merger deals. For cash-only deals the index will enter a long position in the target. For deals based on stocks, the index will enter a long position in the target and short the same amount in the acquirer. Borrowing costs and short interest are considered in the performance calculation of the index. The index is rebalanced when mergers are announced and enter the index or when the intended merger either closes, fails, or is stale for at least 6 months.

3. Convertible Arbitrage Strategy Index:

The simulated Convertible Arbitrage Index enters into long positions in convertible bonds and shorts the delta adjusted equivalent amount of the underlying stock. Borrowing costs and short interest are considered in the performance calculation of the index. The index is rebalanced monthly.

4. Carry Trade Strategy Index:

The simulated Currency Carry Trade Strategy Index uses the G10 currencies as the universe (AUD, CAD, CHF, EUR, GBP, JPY, NOK, NZD, SEK, USD). It enters into a long position in the 3 currencies with the highest interest rates combined with a short position in the 3 currencies with the lowest interest rates. The index is rebalanced monthly and shows the performance for a 2:1 leveraged investment of USD 100.

5. Currency Value Strategy Index:

The simulated Currency Value Strategy Index uses the G10 currencies as the universe. It enters into a short position in the 3 currencies that are most overvalued relative to their Purchasing Power Parity (PPP) implied exchange rate combined with a long position in the 3 currencies that are undervalued relative to their PPP implied exchange rate. The index is rebalanced monthly. We used OECD annually-published PPP values to construct the index.

6. Currency Momentum Strategy Index:

The simulated Currency Momentum Strategy Index uses the G10 Currencies as the universe. It enters into a long position in the 3 currencies with the largest spot price increase combined with a short position in the 3 weakest currencies over the previous twelve months. The index is rebalanced monthly and shows the performance for a 2:1 leveraged investment of USD 100.

Contact Information

clientservice@mscibarra.com

Americas

Americas	1.888.588.4567 (toll free)
Atlanta	+ 1.404.949.4529
Boston	+ 1.617.856.8716
Chicago	+ 1.312.706.4999
Montreal	+ 1.514.847.7506
New York	+ 1.212.762.5790
San Francisco	+ 1.415.576.2323
Sao Paulo	+ 55.11.3048.6080
Toronto	+ 1.416.943.8390

Europe, Middle East & Africa

Amsterdam	+ 31.20.462.1382
Cape Town	+ 27.21.683.3245
Frankfurt	+ 49.69.2166.5325
Geneva	+ 41.22.817.9800
London	+ 44.20.7618.2222
Madrid	+ 34.91.700.7275
Milan	+ 39.027.633.5429
Paris	0800.91.59.17 (toll free)
Zurich	+ 41.44.220.9300

Asia Pacific

China Netcom	10800.852.1032 (toll free)
China Telecom	10800.152.1032 (toll free)
Hong Kong	+ 852.2848.7333
Singapore	+ 65.6834.6777
Sydney	+ 61.2.9033.9333
Tokyo	+ 813.5424.5470

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The company's flagship products are the MSCI International Equity Indices, which are estimated to have over USD 3 trillion benchmarked to them, and the Barra risk models and portfolio risk and performance analytics, which cover 56 equity and 46 fixed income markets. MSCI Barra is headquartered in New York, with research and commercial offices around the world. Morgan Stanley, a global financial services firm, is the majority shareholder of MSCI Barra.