

# **Risk Mitigating Strategies**

Risk Mitigating Strategies, or "RMS," is an asset allocation program designed by Meketa Investment Group to provide institutional portfolios with robust diversification benefits and defensive characteristics relative to growth-like asset classes such as equities and credit. RMS programs are designed to have low correlations to equities and traditional assets on average, but especially to have the potential to profit from turbulent markets or equity drawdowns by having low to negative conditional correlations to equities during these times.

RMS programs generally incorporate at least several of the following asset classes: Long Term Treasuries, Trend Following, Global Macro, Long Volatility, and Alternative Risk Premia. Meketa tailors RMS programs to each investor's objectives and constraints. Meketa favors a portfolio approach when constructing an RMS program, as no single strategy can effectively fulfill all return and risk objectives of the program.

### Traditional diversification and its limits

Institutional investors construct portfolios through a strategic asset allocation process that attempts to satisfy specific objectives, while subject to any number of constraints. Though objectives and constraints abound and vary by type of investor, in general, most institutional portfolios attempt to generate sufficient returns to achieve a desired return objective (e.g., an assumed rate of return for a pension plan, or a spending rate for a university endowment), while at the same time attempting to minimize "risk".

To fulfill return objectives, U.S. investors have historically looked to equities (public and private, domestic and international) as the main driver of returns for their portfolios given their exposure to economic growth. Since these assets have historically offered relatively high returns and high risks, investors take advantage of the diversification benefits<sup>2</sup> of adding additional asset classes to reduce the risk of investing exclusively in equities.

This quest for diversification (and returns) has led investors to introduce new asset classes to their portfolios as part of a constant attempt to generate its return objectives, while at the same time managing their risks. Starting from a traditional

#### WHITEPAPER SEPTEMBER 2019

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<sup>1</sup> Risk in this context can have many different definitions, such as permanent loss of capital, but is generally defined as volatility or the standard deviation of returns.

<sup>2</sup> We define "diversification benefits" as having less than perfect correlation (1) to an existing portfolio. U.S.-centric "60-40" allocation, over the years this has included the introduction of asset classes such as international equities, real estate, private markets, credit, commodities, hedge funds,<sup>3</sup> and many others.

While these traditional asset classes can offer diversification benefits "on average," the competitiveness of capital markets has, over time, eroded some of these benefits, and to the detriment of some investors, market dynamics can even cause these benefits to disappear during crises or turbulent market times. This translates to portfolios that are not "protected" from the risk of investing in equities, especially when it is most needed.



<sup>3</sup> MIG does not explicitly consider hedge funds an asset class, but a vehicle to achieve desired exposures.

#### CHART 1 U.S. Equities Returns and Diversification<sup>4</sup> Monthly Returns: January 1990 — June 2019

<sup>4</sup> U.S. Equities Represented by S&P 500 Index. Average correlation is based on 36-month rolling correlations to U.S. Equities of the following assets: MSCI EAFE, MSCI Emerging Markets, Bloomberg Barclays High Yield Index, Bloomberg Barclays Global Aggregate Index, Bloomberg Commodity Index, and S&P Global Natural Resources Index.

We saw an example of this dynamic during the Global Financial Crisis (2008), as most traditional assets became more correlated to U.S. equities during one of the worst periods for the asset class. The result was portfolios experiencing losses at a magnitude that was unexpected given the diversification assumptions presumed for most traditional assets.

# Risk Mitigating Strategies ("RMS")—enhanced diversification and defensive characteristics for institutional portfolios

The demanding return objectives that most institutional investors face means they cannot drastically reduce their exposures to growth-oriented assets, in particular, equities. Combining this with the fact that diversification benefits of traditional asset classes have declined, and sometimes even disappeared, leaves institutional portfolios vulnerable to significant market losses.<sup>5</sup>

With this issue in mind, Meketa has designed RMS, a program that is expected to provide defensive characteristics (e.g., downside protection) relative to equity-

<sup>5</sup> For example, underfunded pension plans may be exposed to solvency issues. dominated portfolios during times of crisis, while at the same time, offering sufficient expected returns during normal times to partially mitigate the opportunity cost of reduced holdings of higher expected return asset classes. It is worth noting that Crisis Risk Offset<sup>™</sup>, or "CRO" is considered a specific implementation type of RMS that focuses on extreme downside protection.

Since no two institutional investor portfolios are the same, and return objectives and risk constraints can vary among investors, RMS does not have a single specification or "one size fits all" formula. Rather, Meketa designs these programs after carefully evaluating the specific objectives and constraints of each investor.

Given that no single asset can satisfy all constraints, RMS programs generally include a combination of the following strategies:<sup>6</sup>

- → Long Term Treasuries<sup>7</sup>
- → Trend Following
- → Global Macro
- → Long Volatility/Tail Risk Hedging
- → Alternative Risk Premia

### **Risk Mitigating Strategies components**

The following section provides a brief overview of each component, in the context of their role in a Risk Mitigating Strategies allocation.<sup>8</sup>

#### **Long Term Treasuries**

Long Term Treasuries are fixed-rate U.S. dollar nominal debt issued by the U.S. Treasury, with maturities greater than 10 years. These bonds are perhaps the most prominent defensive asset used historically by institutional investors. Furthermore, the characteristics of these bonds (i.e., dollar denominated, and government issued), make them one of the deepest and most liquid securities market in the world.

Long Term Treasuries are considered a defensive asset class for several reasons: first, given the perceived risk-free characteristics of all U.S. government-issued debt, Treasuries have historically behaved as a "safe haven" asset during times of crisis. Additionally, given that equity market declines and periods of economic slowdowns have generally coincided with declines in interest rates, their long durations relative to other U.S. government bonds magnifies their defensive impact. Finally, while having lower expected returns than growth assets such as equities, Long Term Treasuries have historically had a low or negative correlation with equities, while at the same time, offering periodic income in the form of coupons.

- <sup>6</sup> While not explicitly considered part of the RMS framework, it is worth mentioning that cash, viewed in an "asset only" framework, is perhaps the ultimate defensive asset (assuming cash is defined as 1-month or 3-month Treasury Bills). While its low return results in high long-term opportunity costs to holding it (relative to higher returning assets), cash is the safest and most liquid asset any investor can hold in a time of crisis.
- <sup>7</sup> Treasury bonds with maturities of ten or more years.
- <sup>8</sup> This section is intended to provide a brief introduction to the component strategies considered in RMS. For a more detailed analysis, please refer to Meketa's white papers on each.

Nonetheless, Long Term Treasuries cannot fulfill all the defensive objectives of an RMS allocation. If a rising rate environment triggers an equity drawdown or period of crisis, then Long Term Treasuries could face significant losses, or at the very least, would not be an effective "hedge" to equities. Additionally, the current environment of low interest rates means that the potential to "run," or provide positive returns from rate declines, is more muted relative to other periods in history when starting interest rates were higher.



#### **Trend Following**

Trend following strategies use systematic processes to invest based on the direction (or trend) of equities, interest rates, government bonds, currencies, and commodities, through futures contracts.

As the name suggests, trend following strategies capture directional trends or momentum in markets, understood as the tendency of assets that have performed well (or poorly) recently to continue to perform well (or poorly) in the near future. Since models are based on recent market price history, signals vary in terms of horizon or holding period: short-term (daily to a couple of weeks), medium-term (one month to six months), and long-term (over six months).

Investors should expect trend following strategies to capture trending behavior in markets, but struggle during market inflection periods, as well as during trendless but volatile environments (i.e., "sideways markets").<sup>9</sup>

The average time horizon of trend following models provides a tradeoff between reactiveness to inflection points and excessive trading. While medium- to long-term trend following strategies can be slow to capture market inflections, they will on the other hand remain invested longer in trends, reducing the risk of being continuously "chopped off" during sideways markets. Short-term models, by contrast, will be

<sup>9</sup> See Appendix III for additional information.

quicker to react to market inflections, but with a higher risk of entering and exiting trends too soon, creating excessive trading costs, and hurting performance in the process.

There are three main reasons why trend following strategies are theoretically expected to provide defensive characteristics relative to an equity-dominated portfolio:

- → Ability to profit from downward price trends: Trend following strategies have no bias for long or short positions; they are designed to equally capture both upward and downward price trends. This means they can generate positive returns during downward trending markets by "shorting" these assets, as opposed to traditional strategies that only have long positions.
- → Implied (not guaranteed) long volatility profile: most trend breakout (or trend initiation) periods are characterized by increasing volatility. By profiting during times of high and/or increasing volatility, trend following can further protect equity-oriented portfolios, which have historically suffered during periods of increasing volatility.
- → Low correlations to traditional assets over the long term: With no bias to be long or short, and a broad investable universe, trend following strategies have historically exhibited low correlations, on average, relative to equities and other traditional asset classes. However, low correlations are not expected at all times. For example, if equity markets are trending upward, trend followers will likely be increasingly correlated to the asset class, as both profit from this positive trend.

#### **Global Macro**

Global Macro managers focus on macroeconomic conditions, developing "top-down" views and economic analysis to form expectations on the direction of equities, interest rates, currencies, credit, and commodities, or virtually any available asset class that meets minimum liquidity requirements. Managers tend to implement their views, both long and short, using a variety of liquid securities and often utilizing various degrees of leverage (predominantly through derivatives).

Global Macro managers generally make several key assumptions in their investment process. First, there is a disequilibrium in a market that can be expressed as an undervaluation or overvaluation. Second, there will be a reversion towards a neutral valuation, or a change from where a security is currently priced, to where the manager believes the instrument will be priced. Ideas can be as broad as the subprime mortgage market stress, or as simple as an expected price reversion of one currency relative to another, based on balance of payments dynamics. The most favorable environment for global macro strategies occurs when many themes are present, recognized, and actionable. In contrast, they may struggle when markets hover on "equilibrium", as there are few profitable themes present. Consequently, turbulent or volatile times can be good environments for Global Macro, as these are, by definition, times of disequilibrium, which should lead to market and price disruptions that can be capitalized by these strategies.

Perhaps a function of its broad investable universe, Global Macro encompasses a wide array of sub-strategies or styles. This creates a challenge for asset allocation, as the strategy exhibits very high dispersion of returns among its practitioners, making it more reliant on manager selection skill relative to other strategies in order to be effective.



In general, Global Macro managers can be classified as either Discretionary Fundamental or Quantitative. Discretionary macro is the classic expression of Global Macro; these strategies are characterized by having one or more portfolio managers making investment decisions based on fundamental macro-economic analysis. Quantitative macro utilizes a systematic implementation of fundamental macro. These strategies automate, through quantitative models, several of the most recognized fundamental macro investment styles, such as relative value, momentum, and directional.

#### Long Volatility/Tail Risk Hedging

Long Volatility is a strategy that purchases options (derivative instruments) on asset classes such as equities, fixed income, credit, currencies, and commodities, to benefit from the increasing volatility in their underlying assets, hence being "long volatility."

Options are flexible and customizable derivative contracts, so trades can be structured to create any imaginable payoff, benefiting not just from volatility increases, but also from price increases and/or decreases of the underlying assets. Long Volatility

strategies will generally only buy options on assets, not sell them. However, while some strategies or specific trades will include short options positions, the net exposure for this category should always be long options or long volatility.

As the name suggests, Long Volatility strategies generally profit from rising volatility in the underlying asset classes, while calm markets generate losses.

The main benefit from purchasing an option on an asset is that the buyer has a positive asymmetry; the upside is virtually unlimited while the downside is capped. However, purchasing options requires an initial payment (option premium) to set up the position. This initial outlay can result in a "negative carry," when options expire worthless, resulting in a loss. Negative carry thus refers to the periodic cash outflow required to establish long options/long volatility positions.

Long Volatility strategies have flexibility regarding the tenor, or time to maturity, of the options they purchase. While some managers prefer investing in liquid, exchange-traded short maturity options (e.g., one month to one year), others prefer over-the-counter instruments that are longer dated (e.g., two years or longer).

As the name suggests, Long Volatility strategies generally profit from rising volatility in the underlying asset classes, while calm markets generate losses. This is why Long Volatility strategies are similar to purchasing insurance on the performance of an asset. The strategy will generate flat returns or losses during calm times (like an insurance premium) but will produce large positive returns during market drawdowns (like an insurance payout).

There are two main reasons why Long Volatility strategies provide defensive characteristics relative to an equity-dominated portfolio:

- → Negative correlation between equity returns and volatility: Equity market corrections or drawdowns tend to be accompanied by sharp increases in volatility, so strategies that are long equity volatility will directly profit from such scenarios.
- → Convexity: Long options positions provide their holder a favorable return asymmetry, where volatility increases can result in non-linear (hence, convex) positive returns during equity drawdowns.

It is worth noting that in order to directly profit from a declining equity scenario, Long Volatility strategies need to explicitly purchase equity volatility. Long Volatility strategies can suffer from basis risk<sup>11</sup> in their expected defensive performance to equities drawdowns if they have small or no allocations to equities (i.e., if they invest primarily in fixed income, commodities, or FX volatility).

#### **Alternative Risk Premia**

Alternative Risk Premia (ARP) strategies seek to systematically harvest sources of returns which are differentiated relative to traditional risk premia (e.g., equity risk and interest rate risk). The most common ARP are value, carry, momentum, low volatility and quality. ARP, or factor returns, come from the evolution of the investment management industry. Advances in technology and in the robustness of markets (especially in the U.S.) have allowed for the proliferation of strategies that can provide systematic exposures to these factors without the exposure to the underlying asset class (e.g., equities).

ARP can be harvested at both the macro-level and micro-level. In general, macro-level ARP are implemented across asset classes (e.g., equities, fixed income, currencies, and commodities) while micro-level ARP are implemented in single securities. By utilizing both macro- and micro-level approaches, managers can further increase the breadth of their strategies.

Below we briefly introduce the most common ARP.

- → Value is one of the most widely recognized alternative risk premia, specifically in the equity space. In general, it references the historical tendency for cheap assets to outperform (relatively) expensive assets over the long-term. For example, with stocks, value is often identified as those with low ratios of price to book value, price to earnings, or price to cash flows. Many studies have found value stocks to outperform their counterparts (called growth stocks), and at times even the market, over long periods of time and across different geographies.
- → Momentum is another well-known ARP. It involves buying prior winners and, if permitted, selling prior losers, based on the assumption that the winners will continue to do well and the losers will continue to do poorly. Positive returns from momentum have been attributed to a combination of drivers including behavioral factors (e.g., under reaction, feedback loops, herding) and economic factors (e.g., structural hedging requirement or activities of companies).<sup>12</sup>
- → Carry refers to the tendency of higher-yielding assets to outperform lower-yielding assets and is typically implemented at the macro-level. This strategy seeks to profit from the spread between the two by buying higher-yielding assets and selling lower yielding assets. For example, this could involve buying currencies of

Basis risk in this context originates from the fact that volatility increases in asset classes different from equities may not correctly match the volatility increases in equities, hence reducing the defensive capabilities of the overall strategy relative to an equity drawdown.

<sup>12</sup> Investors should be careful in the construction of any Risk Mitigating Strategies program of not duplicating momentum risk exposure already present inside a Systematic Trend Following component. As such, the momentum in ARP references cross-sectional momentum. Crosssectional momentum involves buying recent winners and selling recent losers relative to other assets as opposed to systematic trend following (eg time-series momentum) which involves buying recent winners and selling recent losers relative to an asset's own history. For example, cross-sectional momentum would seek to capitalize on the relative mispricing between stock A and stock B who compete in the same industry. Another implementation distinction is that time series momentum (trend following) strategies are directional (i.e., they can be 100% long or short) while cross-sectional momentum strategies are constructed to be market neutral (i.e., roughly equally long and short).

countries with high interest rates and selling currencies of those with low interest rates. Profiting from these differentials assumes that prices and relationships between the assets is stable.

- → Low volatility premia derives from an anomaly that has been found empirically. Finance theory is based on the relationship between return and risk; to achieve higher returns one needs to take more risk. The low volatility anomaly found that, over long periods of time, portfolios of low volatility or low beta stocks have outperformed portfolios of higher volatility or higher beta stocks; that is, with lower risk, they obtained higher returns.
- → Quality<sup>13</sup> is perhaps the most controversial. Targeting stocks based on a perceived quality or profitability measure is a well-established investment process but there is no universal agreement on the definition. From a fundamental standpoint, quality businesses are expected to be consistent performers in the long run with the ability to protect value better in economic downturns. Additionally, empirical studies have found that quality has explained variability in the returns of equities not previously explained by other factors like Value or Momentum.

Alternative Risk Premia is by structure the least "defensive" category among the RMS strategies considered. ARP expects to earn a positive return for accepting the specific risks related to each premium. It seeks to capture these premia from a "market neutral" perspective, and in doing so, generally uses leverage to amplify returns. As such, it is susceptible to drawdowns, negative returns, and delevering events, even if over the long term it is expected to earn a positive return, on average, and have low correlations to traditional asset classes. Note that this is still a relatively new asset strategy, so there is limited available history of returns, as well as implementation options, relative to other RMS components.

That said, because the risks targeted by ARP are different from traditional equity and credit risk, ARP is expected to provide diversification benefits relative to a traditional portfolio<sup>14</sup> and serve as a return generator for an RMS program.

#### Summary table

As we have seen, each of the asset components considered in the Risk Mitigating Strategies program have different characteristics and expected defensive behaviors relative to traditional asset classes or portfolios, which supports a portfolio approach. However, they do share some common characteristics (with varying degrees of effectiveness), such as:

- → Low correlations to equities and traditional assets on average, and low to negative conditional correlation to equities during equity declines,
- → Potential to profit from turbulent market times and/or equity drawdowns, and
- $\rightarrow$  Provide alternative sources of returns relative to traditional asset classes.

<sup>13</sup> It is worth noting that some ARP implementations combine Quality and Low Volatility signals into a "Defensive" category.

<sup>14</sup> As an example, ARP is expected to drawdown at different times than equities since they target different sources of returns. The table below provides a summary of the benefits and challenges of each component discussed in the context of an RMS program.

Strategy	Benefits	Challenges		
Long Term Treasuries	<ul> <li>→ Traditional defensive asset/safe haven</li> <li>→ Has historically provided positive returns during large equity drawdowns</li> <li>→ Highly liquid</li> <li>→ Low cost implementation</li> </ul>	<ul> <li>→ Highly volatile returns</li> <li>→ Likely ineffective in <i>drastic</i> rising rate environments</li> </ul>	TABLE 1 Risk Mitigating Strategies Component Comparison	
Trend Following	<ul> <li>→ Ability to profit from negative equity trends (and concurring positive bond trends)</li> <li>→ Diversified exposure to a broad range of asset classes</li> <li>→ Highly liquid</li> </ul>	<ul> <li>→ Can have positive equity beta at times</li> <li>→ Suffers during trend reversals and sideways markets</li> <li>→ Path dependency: different types of drawdowns will be captured differently depending on models and speed of signals</li> </ul>		
Global Macro	<ul> <li>→ Have historically benefited from large market disruptions</li> <li>→ Expected to benefit from higher rate environments (due to high cash allocations)</li> </ul>	<ul> <li>→ Highest manager selection risk</li> <li>→ May be highly concentrated at times</li> <li>→ May struggle during times of muted volatility</li> </ul>		
Long Volatility	<ul> <li>→ Explicit hedge to equity drawdowns through long options positioning</li> <li>→ High positive convexity (i.e., non-linear returns) relative to equity drawdowns</li> <li>→ Most reliable strategy across all types of drawdowns (i.e., negative equity beta)</li> </ul>	<ul> <li>→ Negative carry during calm times</li> <li>→ Path dependency: the timing and duration of a drawdown will affect the profit and positioning of the strategy depending on option maturities</li> </ul>		
Alternative Risk Premia	<ul> <li>→ Low correlation to traditional assets over the long term</li> <li>→ Positive expected returns reduce opportunity costs of divesting from traditional assets</li> </ul>	<ul> <li>→ Relatively new asset class/limited empirical experience during equity drawdowns</li> <li>→ Susceptible to delevering events during turbulent times</li> </ul>		

# RMS: Empirical performance of underlying strategies<sup>15</sup>

This section reviews the historical performance of RMS assets relative to traditional asset classes (e.g., global equities<sup>16</sup>), with emphasis on their ability to protect returns during equity drawdowns. The first chart shows the performance of different RMS components during the worst quarters of equity performance over the last thirty years.

- <sup>15</sup> Refer to the appendix for description and characteristics of the indices utilized for each strategy.
- <sup>16</sup> Global equities are used as a proxy for a traditional portfolio as equity risk is the main risk for most institutional portfolios. See Appendix for more details.



The ability of RMS assets to "protect" returns and provide defensive capabilities relative to equities is clear. Each strategy has, more often than not, provided positive returns. The magnitude of protection has varied as well. For example, in two of the most extreme cases, Long Term Treasuries outperformed equities by over 40%.



Correlations, which have all been below 0.45 on average during the period examined, also demonstrate the diversification benefits of RMS assets. Perhaps most importantly, during times of equity stress and contrary to most traditional assets, correlations have declined, sometimes even turning strongly negative.



Finally, RMS assets have not just offset equity returns during negative quarters, they have provided outstanding protection during its most accentuated drawdowns. Furthermore, RMS drawdowns have tended to occur at different times than equities, confirming again their diversification potential.

## Implementation considerations

#### **Defense against what?**

While each of the strategies considered in RMS programs is expected to fill a defensive role relative to equity-dominated portfolios, the characteristics of a drawdown (i.e., initiation, magnitude, and duration) will influence the effectiveness of each of these components. It is important for investors to understand both their risk tolerance and risk preferences to design the most beneficial RMS program to fit their needs.

For example, a trend following strategy that was initially "long equities" will struggle during a quick market correction (i.e., trend reversal), but will capitalize on the downward trend after some time has passed and the models turn to short exposures.

The table below shows a stylized example of the performance expectations of the RMS components through different equity drawdown paths. While we expect that all strategies will "kick-in" during large duration and magnitude drawdowns, each one will take a different path to get there, supporting a portfolio approach for the program.

Strategy Expected Performance	Equities Trending Up	Drawdown: 0% to 10% Time Period: 0 to 15 Days	Drawdown: 10% to 25% Time Period: 15 to 45 Days	Drawdown: >25% Time Period: >45 Days	TABLE 2 RMS Expected Performance by Type of
Positive	<ul> <li>→ Long Term Treasuries (assuming stable rates environment)</li> <li>→ Alternative Risk Premia (positive carry)</li> </ul>	→ Long Volatility	<ul> <li>→ Long Volatility (high convexity)</li> <li>→ Global Macro</li> </ul>	<ul> <li>→ Long Volatility (high convexity)</li> <li>→ Global Macro</li> <li>→ Long Term Treasuries (safe haven)</li> <li>→ Trend Following (short equities)</li> </ul>	Equity Environment
Flat or Uncertain	→ Global Macro → Trend Following	<ul> <li>→ Long Term Treasuries (depends on interest rate environment)</li> <li>→ Global Macro (depends on prior positioning)</li> </ul>	<ul> <li>→ Long Term Treasuries (depends on interest rate environment)</li> <li>→ Trend Following</li> <li>→ Risk Premia (low correlation to equities)</li> </ul>	→ Alternative Risk Premia (low correlation to equities)	
Negative	→ Long Volatility (negative carry)	<ul> <li>→ Trend Following (reversals)</li> <li>→ Alternative Risk Premia (delevering)</li> </ul>			

In general, the different characteristics of each strategy within RMS provide flexibility regarding the structuring of programs. The program design takes advantage of these differences to construct the most robust solution to comply with different objectives and constraints.

#### Active versus passive implementations

Aside from Long Term Treasuries, which are generally (but not necessarily) implemented through a passive approach designed to track a desired benchmark, all RMS strategies have an active or quasi-active implementation,<sup>17</sup> as their exposures will depend on the approach of each manager chosen.

The more active the manager,<sup>18</sup> the greater the possibility for that manager's performance to deviate from expectations for that strategy in both returns and defensive characteristics. This is why a robust manager research process is required to construct RMS programs, aiming to select the best added-value manager exposures per unit of management fee paid.

<sup>17</sup> Quasi-active includes rules-based or replication strategies.

<sup>18</sup> More accurately, the greater the amount of active risk, or tracking error.

#### **Portfolio structuring**

Risk Mitigating Strategies can choose from five different components. However, not all programs will *always* contain *every* component. As we have seen, return and risk objectives for both the overall portfolio and the RMS program can vary, so different objectives can lead to different RMS structures. For example, as seen on the previous table (Table 8), an RMS program designed to defend against extreme drawdowns (over 25%) will have a different structure and strategy selection than a program designed to defend against quicker and smaller drawdowns (10% or less).

In terms of allocation weights, Meketa Investment Group favors a balanced approach (i.e., equal weighting or even balanced risk contribution) as a starting point when allocating capital to each component. The main reason for this approach is that these asset classes have achieved comparable risk-adjusted returns over long-term periods, even if they tend to experience periods of under or outperformance. Additionally, as there is no reliable way to predict the characteristics of a future drawdown, a balanced allocation represents a sensible approach for such uncertainty. However, additional considerations such as expected carry, fees or complexity,<sup>19</sup> can lead investors to reasonably overweight certain strategies in some cases.

#### RMS weight within the overall portfolio

RMS programs should have a meaningful allocation in institutional portfolios, ranging between 5% and 20%. The program's positive expected return and relatively low correlation to traditional asset classes justifies its sizeable inclusion in portfolios. The size of the allocation depends on several factors.

The first two factors are expected return of the RMS portfolio and its conditional performance during drawdowns. As with most investments, these two factors tradeoff on each other, meaning allocations with higher expected returns may tend to have lower guarantee of positive performance during turbulent times.

Furthermore, the characteristics of an RMS portfolio influence the structure of the rest of the portfolio, as RMS programs with high expected conditional performance during drawdowns allow investors to increase their equity or growth risk exposure, thereby implementing a "barbell" approach to risk allocations. Conversely, RMS programs with higher expected returns but lower defensive capabilities may warrant a larger size in the portfolio, but may not allow for taking much additional growth asset risk in the rest of the portfolio.

<sup>19</sup> Fee sensitive investors may overweight Long Term Treasuries given its potential for passive implementation, and lower perceived complexity relative to "hedge fund like" strategies such as Global Macro, Trend Following, and in some cases, Long Volatility. In addition, investors wanting to achieve a higher expected return during normal times may underweight Long Volatility, given this strategy may offer neutral to negative returns during these times (low and/or decreasing volatility). For example, programs with high allocations to Long Volatility strategies will have lower expected return (negative carry) but higher conditional performance during drawdowns (high convexity). This structure supports a lower RMS allocation at the overall portfolio level, because with higher convexity, the program can afford to be smaller in order to mitigate the opportunity costs of having lower expected returns during normal times, without materially losing defensive capabilities. On the other hand, programs with allocations to Alternative Risk Premia will have higher expected returns (positive carry) but lower conditional expected performance during market crises.

Lower	RMS Weight in Portfolio Higher		TABLE 3 RMS Overall Portfolio	
Allocation	Lower (5–10%)	Balanced (10—15%)	Higher (15—20%)	Allocation Guidelines <sup>20</sup> <sup>20</sup> Portfolio figures based on Meketa
Composition (high-level guidelines)	<ul> <li>→ Include Long Volatility</li> <li>→ Alternative Risk</li> <li>Premia optional</li> </ul>	<ul> <li>→ Balanced allocation to core strategies, subject to additional constraints</li> <li>→ Alternative Risk Premia optional</li> </ul>	<ul> <li>→ Underweight (or remove) Long Volatility</li> <li>→ Include Alternative Risk Premia</li> </ul>	Investment Group 2019 Asset Study. These guidelines are for illustration purposes only. Meketa Investment Group works directly with investors to customize their RMS or CRO programs in order to achieve their specific objectives.
Expected Return for RMS Allocation	→ Lower (1—3%)	→ Moderate (3—5%)	→ Higher (>5%)	
Conditional performance during equity drawdowns	<ul> <li>→ Highest</li> <li>→ Low dependence         <ul> <li>on drawdown             characteristics             (initiation, size, and             duration)</li> </ul> </li> </ul>	<ul> <li>→ High</li> <li>→ Moderate</li> <li>dependence</li> <li>on drawdown</li> <li>characteristics</li> </ul>	<ul> <li>→ Moderate</li> <li>→ Higher dependence on drawdown characteristics</li> </ul>	

In addition, related to the concept of convexity,<sup>21</sup> the expected returns of an RMS allocation tend to increase the more significant the equity-related stress scenario (e.g., equity declines of 25% or more), yet their effectiveness can be less certain during smaller equity "corrections" (e.g., equity declines of 10% or less).

Finally, given that most institutional portfolios do not traditionally use RMS programs and their underlying components, the larger the size of an RMS program, the higher the expected tracking error will be relative to peers. <sup>21</sup> See Appendix IV for additional details.

### Summary and conclusions

Institutional investors have a very daunting task in that they need to achieve – for the most part – high expected returns to support their objectives (e.g., assumed rate of returns, spending rates, etc.) while at the same time controlling for different metrics of risk. While diversification through traditional asset classes had been sufficient to fulfill these objectives historically, events such as the Global Financial Crisis demonstrated that during times of stress, most assets tend to move in unison. This reduces, and sometimes even eliminates, some of the diversification benefits and risk reducing characteristics that investors counted on from traditional assets, leaving portfolios exposed to very large losses.

Risk Mitigating Strategies is an asset allocation program designed to provide institutional portfolios with robust diversification benefits and defensive characteristics, especially during times of crisis. These programs are constructed to complement growth-oriented asset classes such as equities, which should continue to be the main driver of expected returns in many institutional portfolios.

An RMS program will include at least several of the following components: Long Term Treasuries, Trend Following, Global Macro, Long Volatility, and Alternative Risk Premia. Each component has its merits and limitations, so Meketa favors a portfolio approach (instead of selecting one of these assets), when constructing these programs. RMS programs are tailored to each investor's objectives and constraints, but in general, they are expected to have low correlations to equities, positive expected returns, and most importantly, positive expected performance during times of market crisis or equity drawdowns.<sup>22</sup> <sup>22</sup> Exact definition of drawdown or crisis used influences the composition of each RMS program.

# Appendix I. Risk contributions of "diversified" portfolios

While most institutional portfolios appear well diversified from a capital allocation perspective, the risk characteristics (e.g., volatility) of growth-like assets, such as equities, translates to very uneven weights, from the perspective of each asset's contribution to the total risk of the portfolio.

In practice, growth-like assets, such as equities, drive the vast majority of the risk in traditional institutional portfolios. Based on this fact, this paper used equities as proxy for measuring the defensive capabilities of the RMS concept.



## Appendix II. Indices used for RMS components

- → Long Term Treasuries Bloomberg Barclays US Long Treasury Total Return Index (Bloomberg Ticker: LUTLTRUU Index): Index includes all publicly issues U.S. Treasury securities that have a remaining maturity of ten or more years, and have \$250 million or more of outstanding face value.
- → Trend Following Barclay CTA Index (BARCCTA Index): industry benchmark of representative performance of commodity trading advisors. There are currently 510 programs included in the calculation of the Barclay CTA Index for 2019. The index is equally weighted and rebalanced at the beginning of each year.
  - → The SG Trend Index is more commonly used as a benchmark for trend following mandates, but Barclay CTA Index was selected for its longer track record (1979 Inception).
- → Global Macro HFRI Macro (Total) Index (HFRIMI Index): Equal-weighted benchmark updated monthly of "Investment Managers which trade a broad range of strategies in which the investment process is predicated on movements in underlying economic variables and the impact these have on equity, fixed income, hard currency and commodity markets."
- → Long Volatility Eurekahedge CBOE Long Volatility Index (EHFI451 Index): "equally weighted index of 10 constituent funds. The index is designed to provide a broad measure of the performance of underlying hedge fund managers who take a net long view on implied volatility with a goal of positive absolute return. The CBOE Eurekahedge Long Volatility Index is a collaborative index between Eurekahedge and the Chicago Board Options Exchange."
- → Alternative Risk Premia Eurekahedge Multi-Factor Risk Premia Index (EHFI900 Index): "Index is based on a weighted sum of bank-provided risk premia strategy swaps. The index is composed of multiple risk premia strategies managed by large global banks, and is designed to provide a broad measure of the performance of a diversified portfolio of systematic drivers of risk and return across various asset classes."
  - → The SG Multi Alternative Risk Premia Index is commonly used as a benchmark for Alternative Risk Premia strategies, but Eurekahedge Multi-Factor Risk Premia Index was selected for its longer track record.

<sup>24</sup> Taken from Meketa Investment Group's Global Macro White Paper.

# Appendix III. Trend following and trending/sideways markets<sup>24</sup> based on SG Trend indicator

To illustrate the behavior of trend following strategies, below are two examples of the behavior of a simple trend following signal applied to real world asset returns. The trend following signal is the following: go long (short) the asset whenever the fast moving average (14 days) is above (below) the slow moving average (6 months).

The examples below are shown for illustration purposes only. They do not reflect how a real world strategy would have fared in the same environment, as the illustrations do not incorporate any risk management metrics or market frictions, such as cost of trading and market impact.

1. Trending market—Japanese yen during 2016 calendar year As we see in the chart below, the Japanese yen had a relatively smooth trend, consistently appreciating in value over the first 10 to 11 months of the year, which was successfully captured by the signal being short USD during that period. Around mid-November (right after the U.S. presidential election) the trend changed, which the strategy eventually captured, by shifting to a long position, but not without suffering a dip in performance from it. As expected, the trend following signal successfully captured a trending market but suffered during the only inflection point (i.e., a sharp trend reversal).



2. Sideways market—Brent Oil during 2016 calendar year Brent Oil exhibited the most damaging behavior for trend following strategies during the second half of 2016; a volatile, yet trendless (i.e., sideways) market.

As illustrated, the strategy experienced multiple inflection points during the year, with eight different signals to change positions. Even without considering the costs generated from repeatedly having to trade in and out of positions, the strategy suffered severe losses in this market.



# Appendix IV. The concept of convexity and defensive portfolio strategies<sup>25</sup>

<sup>25</sup> Based on Meketa Investment Group's Global Macro White Paper.

#### **QQ** plots and scatter plots

It is possible to summarize most of the defensive characteristics of an investment strategy by looking at the shape of its return distribution and comparing it to a how a normal distribution with the same characteristics (mean and variance) would look.



The above MSCI ACWI chart shows a negatively convex (or concave) distribution that translates to some familiar equity return characteristics: a negative skew, which is confirmed by a larger than normal propensity for extreme negative (left tail) events and lower than normal probability of extreme positive returns. Furthermore, the slope of the normal line denotes a volatile strategy, as we will see when comparing it against others below.



When plotting the historical return distribution of Long Volatility, we can observe an inverse shape to that of equities. First, the lower slope of its curve denotes a much less volatile distribution of returns, and its convexity is a direct representation of a strategy that offers positively skewed returns: that is, lower than normal probability of extreme negative events, and higher than normal probability of extreme positive events. Below are similar charts for Long Term Treasuries, Trend Following, Global Macro, and Alternative Risk Premia.





#### CHART 15 Quantile-Quantile Plot— Alternative Risk Premia Relative to MSCI ACWI Monthly Returns: August 2010 — June 2019

#### QQ plots

- → The convexity charts shown above are Quantile-Quantile (QQ) plots: scatter plots designed to compare data to a theoretical distribution (a normal distribution in this case) to visually determine if returns are likely to have come from the known distribution. Empirical quantiles are plotted on the y-axis and the quantiles of the theoretical distribution are plotted on the x-axis. A reference line is also plotted. If the empirical data comes from the population of the chosen theoretical distribution, the points should fall approximately along the reference line. The larger the departure from the reference line, the greater the evidence that the data comes from a population with a different distribution.
- → The QQ-plots shown in the paper attempt to understand the concept of convexity in the shape of the distribution of returns of an investment strategy. The goal is to gain perspective on how close the actual distribution of returns of a strategy matches a normal distribution and how did the strategy behave during tail events, again relative to a normal distribution. This is accomplished by comparing the realized return distribution of a given manager to a theoretical normal distribution with the same mean and standard deviation of returns.
  - → A concave shape can be associated with a negative skew, with fatter left tails (more frequent extreme negative events) and thinner right tails (less frequent extreme positive events) than a normal distribution.
  - $\rightarrow$  An "S" shape implies a manager who has greater than normal outcomes on the tails of its realized distribution.
  - → A convex shape can be associated with a positive skew, with fatter right tails (more frequent extreme positive events) and thinner left tails (less frequent extreme negative events) than a normal distribution. If repeatable, this can be a valuable characteristic to leverage because it represents both an attractive stand-alone stream of returns and one that can complement well other strategies such as equities, which tend to have concave shapes of returns relative to a normal distribution.

#### **Relative convexity**

Another way of looking at empirical "convexity" in a strategy is in relative terms, by comparing the returns of a strategy relative to a benchmark through a scatter plot. In this case, the benchmark selected is the MSCI ACWI as a proxy for Global Equities. The charts below show how all strategies, with the exception of Long Term Treasuries, have achieved a convex profile relative to equities, a testament of their defensive capabilities.



# Appendix V. RMS overall portfolio allocation guidelines illustrative example

The table below shows how different RMS structures can complement an overall portfolio, especially when considering different types of equity related stress scenarios. An RMS program with lower allocation at the portfolio level needs to offer a high expected conditional performance during equity drawdowns, allowing the rest of the portfolio to take on higher equity risk. As we increase the size of the RMS allocation, we can afford to reduce its "defensive" capabilities by trading it off for higher expected returns.

It is worth noting that these examples are for illustrative purposes only, they do not represent allocation recommendations, as each RMS portfolio is targeted to each investor's needs.

	Simple Portfolio (70-30)	Low RMS Allocation (10%)	Moderate RMS Allocation (15%)	High RMS Allocation (20%)
Traditional Assets	100%	90%	85%	80%
Global Equity	70%	63%	60%	56%
Core Bonds	30%	27%	26%	24%
RMS Assets	0%	10%	15%	20%
Long Term Treasuries		4%	4.5%	5%
Trend Following		2%	4.5%	5%
Global Macro		0%	4.5%	5%
Long Volatility		4%	1.5%	0%
Alternative Risk Premia		0%	0%	5%
Expected Return (20 years)	7.6%	7.1%	7.2%	7.2%
Standard Deviation	12.0%	10.6%	10.2%	10.0%
Sharpe Ratio	0.39	0.40	0.42	0.43
Tracking Error to 70-30		1.5%	2.0%	2.3%
Stress	s Scenarios Pe	erformance (RMS	5 Only)	
Baa Spreads Widen by 50 bps, High Yield by 200 bps		3%	4%	3%
Baa Spreads Widen by 300 bps, High Yield by 1000 bps		12%	7%	1%
U.S. Equities Decline 10%		4%	3%	1%
U.S. Equities Decline 25%		9%	4%	0%
U.S. Equities Decline 40%		14%	9%	2%
Stress	Scenario Perf	ormance (Full P	ortfolio)	
Baa Spreads Widen by 50 bps, High Yield by 1000 bps	-1%	-1%	0%	0%
Baa Spreads Widen by 300 bps, High Yield by 1000 bps	-23%	-20%	-19%	-18%
U.S. Equities Decline 10%	-6%	-5%	-5%	-5%
U.S. Equities Decline 25%	-17%	-15%	-14%	-14%
U.S. Equities Decline 40%	-30%	-25%	-24%	-23%

TABLE 4 RMS Overall Portfolio Allocation Guidelines<sup>27</sup>

<sup>27</sup> Portfolio figures based on Meketa Investment Group 2019 Asset Study.

The table above provides insights regarding the expected behavior of an RMS program. To start, RMS programs can be designed to improve the risk-adjusted characteristics of a portfolio (Sharpe Ratio) without having to drastically reduce its expected return. Additionally, from an asset allocation perspective, the weight of the RMS class in the portfolio informs the weights within the different strategies, since, as discussed previously, lower RMS weights require higher expected conditional performance during equity drawdowns in order to support the losses of the overall portfolio.

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