Diversification across asset classes and investment strategies is a frequently employed technique to mitigate portfolio risk, and it remains a useful tool. In this paper we advance the argument that in today’s world, traditional diversification is simply not enough. There is an important aspect of risk that diversification does not explicitly address: time horizon. Of course no investor wants to sustain losses—as normal as they are in any market cycle. But loss over a short time horizon can be deeply jarring. It can even send the most steadfast investor to the sidelines from whence it’s not easy to return. By proactively preparing portfolios for more severe markets, investors stand a better chance of staying invested, rather than reacting in the moment.

To be sure, traditional diversification still typically works fairly well to mitigate risk over longer horizons in “normal” market conditions. And yet as the world expands and solidifies its interconnectedness, diversification has lost power. What's going on? In simplest terms, a “one-world” market has caused correlations to increase. Now, a different approach is necessary to address more frequent spikes in volatility and correlation across assets. By using hedging, also known as “return-shaping,” techniques to manage shorter term crash risk—like what we saw in the fall of 2008 and the summer of 2011—we can provide a potentially powerful and effective complement to diversification. The idea is to let investors get valuable exposure to growth-oriented asset classes like equities (which they may need to meet their goals), while aligning risk management at the strategy level more closely with the risk perceptions of real-world investors.

This paper explains the philosophy, mechanics and potential advantages of return-shaping strategies. Since derivatives can (and should) be used to efficiently access market upside as well as for potential protection, we prefer to use the term “return shaping” over “hedging.” Similar strategies could play an important risk management role in a wide variety of portfolios, and prove especially useful when the traditional benefits of diversification are eroded by adverse market conditions.
Transform Volatility into Advantage

Diversification is an important risk management consideration in designing multi-asset portfolios, and can be especially effective over longer time horizons. The concept is not complicated: Including an assortment of asset classes whose prices do not always move together can limit portfolio volatility. This is true because as the market value of one component declines, another may act as an offset by increasing.

However, over short- to medium-term horizons, and in adverse economic conditions like the 2008 global financial crisis, diversification is often less effective because different asset classes share features and characteristics. For example, both domestic and international stocks depend on global growth to power higher earnings. This common connection reduces diversification benefits because if global growth slows, most stocks are likely to be negatively impacted.

As markets became more interconnected and correlations between asset classes increased, investor demand called for a broader range of powerful diversifiers. As a result, we saw the rise of exchange-traded funds (ETFs) and exchange-traded notes (ETNs) that attempt to track a variety of themes. Commodities, for their tendency to trade according to their own set of fundamentals, were also good diversifiers. With large numbers of investors now trading commodities alongside more traditional investments, investors are rightly in the market for the next strong diversifier. Enter multi-asset strategies, which aim to use volatility as an opportunity.

Traditional diversifiers are simply not useful in big downturns, especially sudden ones, as we saw in 2008 or the summer of 2011. As investors need liquidity and/or seek to preserve their capital, they tend to sell anything they can across their entire portfolio—stocks, high yield bonds, commodities, and so forth. Such behavior pushes cross-asset correlation up, because everything is traded as if it were the same. This severely limits the effectiveness of diversification just when it is most needed. As the chart shows, traditional diversification can be less effective over shorter time horizons. Chart 1 ▼

Finally, initial conditions matter: Given how low U.S. Treasury yields are now, the 40% bond allocation in a traditional 60/40 balanced portfolio is not likely to be as effective an offset as it may have been in past decades. After all, how much lower can yields go?

Chart 1

Diversification Alone Is Not Enough

Diversification across traditional asset classes is becoming less effective, especially in extreme events. The purple line displays the average of the correlations between each of U.S. high yield bonds, emerging market equities and commodities to the S&P 500 Index. The black trendline shows that correlation has increased, eroding the risk management benefits of diversification. Correlation can spike especially quickly in times of market stress, which is what we saw in the credit crunch of 2008.

Source: Bloomberg, 8/31/13. Data from January 2000 to August 2013. U.S. high yield bonds are represented by the JPMorgan Domestic High Yield Bond Index, emerging market equities are represented by the MSCI Emerging Markets (EM) Index, and commodities are represented by the Dow Jones UBS Commodities Index. We calculated the rolling 12-month correlation of each asset class to the S&P 500 Index, and then equal-weighted those three time series to create the purple line. See back page for index definitions. Indices are unmanaged and cannot be purchased directly by investors. Index performance is shown for illustrative purposes only and does not predict or depict the performance of any investment. Past performance does not guarantee future results.
Position Options Against Short-Term Risk

Crash Preparedness

So how can we aim to manage risk over shorter horizons? A traditional solution adds options to a portfolio to mitigate the negative impact of sudden market declines. Instruments such as put options are designed to limit the impact of bad outcomes. However, buying such options has a cost, which can become especially burdensome if one overpays and the markets subsequently rally, making the option unnecessary (think of buying home insurance right after a hurricane when prices are high, only to discover the government is building a new levee that dramatically decreases the likelihood your house will be damaged by future storms).

One way to achieve the benefit of options minus the cost is to take advantage of pricing dislocations between various markets and asset classes. Instead of hedging a portfolio with a high allocation to large-cap U.S. equity with S&P 500 options, we may be able to create an attractive “proxy” hedge by buying options on a different asset class. For example, buying put options on an index of South Korean equities may be a cheaper hedge if the growth outlook for South Korea is better than the U.S., and investors underestimate the likelihood of a negative domestic shock spreading to other markets. Proxy hedging does involve basis risk, which refers to the chance the hedge doesn’t perform as expected because the underlying asset is different. But the further out-of-the-money, or more “tail-oriented” the hedge is, the higher the likelihood that by the time the hedge becomes effective, cross-asset correlation has already increased, reducing basis risk concerns.

This way we can use the tendency for correlations to spike in crises to construct hedges that cost less if they turn out to be unnecessary.

In momentum-driven market regimes, another solution is to incorporate call options. Calls can mitigate hedge underperformance in a market rally by allowing additional upside participation and offsetting some of the costs of unneeded hedges (*hedge the hedge*, so to speak). Although this increases the cost if nothing happens, as long as there are trends with some persistence, this strategy can work well. Positioned this way, a portfolio should outperform its benchmark during both large moves up and large moves down.

As the chart shows, there is a curvature to portfolio outcomes. The technical term for this is convexity. Think of the large up and down shocks on the horizontal axis as increases in volatility. By adding options, we are also layering in long exposure to volatility. In other words, we make higher profits when there are either large positive or large negative moves.

Such return-shaping strategies are designed to add an important layer of shorter term risk control to the longer term diversification benefits we seek via asset allocation. Options can perform particularly well during sudden events, and potentially provide some protection to a portfolio when it is most needed and traditional diversification fails.

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The Right Way to Invest

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**Chart 2**

Return-Shaping Strategies Anticipate Large Events—Negative or Positive

<table>
<thead>
<tr>
<th>Relative Performance</th>
<th>Market Return</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large Negative Event</td>
<td>Hedging cost if no large move occurs.</td>
</tr>
<tr>
<td>Large Positive Event</td>
<td></td>
</tr>
</tbody>
</table>

This is a hypothetical example and is shown for illustrative purposes only and does not predict or depict the performance of any particular investment.
Volatility’s Historical Homing Tendency Helps

As can be seen in the convexity chart (Chart 2), such strategies do have a cost, especially if nothing happens (volatility declines and we don’t get a large move in either direction). Chart 2 makes this evident in the area below the horizontal axis that represents benchmark under-performance. Active management of return-shaping strategies attempts to reduce this cost in part by taking advantage of volatility’s historical handy tendency to revert to a mean. This homing tendency has been more predictable than price because it has tended to return to a base level associated with “normal” market risk after a spike (academics call this “mean reversion”). Chart 3 ▲

In addition to including cheap proxy hedges for tail risk mitigation and potential upside participation to reduce cost (we don’t expect to totally negate it), we also take advantage of the mean-reverting property of volatility. To do this we “lean” against market expectations. “Leaning against the market” means we trade against market consensus and search across geographies and asset classes to find cheap hedges others may not notice because they are blinded by the “consensus” view.

For example, as the market rallies, the cost of buying downside options generally declines. Investors want exposure to upside more than a hedge against a bad outcome and unwanted put options get cheaper. We take these opportunities to buy more options at lower prices. This sets us up well to weather a correction or crash should it come—the portfolio is already armored because we bought put options on the way up when no one wanted them. It’s like buying an umbrella when it’s sunny and sellers offer them at a discount.

Similarly, if prices decline in a risk-off event, we cash out potential profits on our hedges, and begin using the proceeds to buy cheap upside exposure. Like managing the portfolio during bull markets, we incrementally lift protection during a bear market to prepare for a potential rebound. Buying upside exposure (via calls) is cheaper because market sentiment is so negative—it is especially difficult for investors to see light at the end of the tunnel.
Proxy Hedge Example

In normal market environments, there is a trade-off between cost and basis risk because investors naturally place lower value on options that do not correlate closely with the major market risks they need to hedge. However, in tail events, correlation tends to increase and proxy hedges may be more effective than expected. Our goal is to find the least expensive hedge for a given level of basis risk. Chart 4 The following example walks through how we typically evaluate potential hedges along these dimensions.

Chart 4

Expecting Outperformance, and Planning for the Flip Side: Hypothetical Strategy, Overweight to EM Benchmark

Here, the horizontal axis shows returns across hypothetical scenarios for the MSCI Emerging Markets (EM) Index, and the vertical axis shows simulated strategy excess returns to its blended benchmark for each scenario. Because the hypothetical strategy holds more emerging markets equity than its benchmark, we expect it to outperform when MSCI EM appreciates, but underperform when MSCI EM depreciates.

Source: Barra. The blended benchmark consists of 30% Russell 1000 Index, 30% MSCI ACWI ex-U.S. Index, 20% Barclays U.S. Aggregate Bond Index, and 20% Barclays Multiverse ex-U.S. Index. See back page for index definitions. Indices are unmanaged and cannot be purchased directly by investors. Index performance is shown for illustrative purposes only and does not predict or depict the performance of any investment. Hypothetical strategy is comprised of a $1.0 billion portfolio allocated as follows: 4% to money market, 14% to emerging market equities, 50% to developed market equities, 31% to developed market corporate bonds and 1% to developed market currencies. Past performance does not guarantee future results.
If we wanted to introduce some convexity into the portfolio and limit our downside risk (the negative outcomes on the left side of Chart 4), one logical and liquid strategy would be to buy puts on an ETF that tracks MSCI EM. We can mock up a hypothetical version of this portfolio (EM equity plus MSCI EM puts) in our risk system and compare it to the non-hedged portfolio simulation above. Note that the system generates an instantaneous shock and thus the cost of the options is not shown in the chart because it accrues over time. We account for the cost separately.

The MSCI EM hedge is designed to remove almost all the downside risk from a negative shock to EM equities. However, it is very expensive. Is there a way to get more “bang for the buck”? At this point, we turn to proxy hedging. Our proxy hedge asset has to have two main characteristics. First, we need to find a market that has logical economic connection with EM growth (which, in turn, potentially translates into higher revenues and ultimately better earnings, which drive stock prices). Second, we look across this subset for markets with especially cheap options. The U.S. dollar (USD) to the Australian dollar (AUD) exchange rate appears to be promising. Options on the Australian dollar are fairly cheap versus EM options, and the commodity-centric Australian economy depends on large-scale exports of raw materials to faster growing China, which in turn is a major part of the emerging market (EM) economy. During EM growth scares, the AUD is thus vulnerable versus safe-haven currencies like the USD.

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**Chart 5**

**Planning Can Improve Downside Outcomes: Puts on MSCI EM Index Scenario Analysis**

Because we purchased puts to hedge our downside outcomes, we expect to outperform when MSCI EM appreciates but keep up when MSCI EM depreciates. The black line highlights simulated outcomes assuming we purchase $4.6m of puts in a $1.0 billion hypothetical portfolio.

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Source: Barra. The blended benchmark consists of 30% Russell 1000 Index, 30% MSCI ACWI ex-U.S. Index, 20% Barclays U.S. Aggregate Bond Index, and 20% Barclays Multiverse ex-U.S. Index. See back page for index definitions. Indices are unmanaged and cannot be purchased directly by investors. Index performance is shown for illustrative purposes only and does not predict or depict the performance of any investment. Hypothetical strategy is comprised of a $1.0 billion portfolio allocated as follows: 4% to money market, 14% to emerging market equities, 50% to developed market equities, 31% to developed market corporate bonds and 1% to developed market currencies. Past performance does not guarantee future results.
We can test this concept. Chart 6 shows conditional correlations. To create the chart, we sorted MSCI EM returns into deciles, with the first decile containing the highest returns, and the 10th decile the lowest returns. We then calculated the correlation between MSCI EM returns and Australian dollar returns for each decile, shown in the bars. The increase in correlation in the tails, particularly the worst 10% of outcomes (10th decile) is evident. The chart also highlights how proxy hedges can be less useful for hedging more frequent, day-to-day risks. Correlations during “normal” times, represented in the middle deciles, are fairly low and slightly negative in many cases. Chart 6

Here’s where smart diversification ideally steps in to augment portfolio hedging.

AUD screens cheaper yet is still an effective proxy hedge. Chart 7

Adding it in, assuming we equalize the premium spent and account for stressors, we see that the proxy hedge is preferable, especially for the more extreme outcomes.

![Chart 6](image)

**Correlations Higher in Extreme Events: Conditional Tail Correlation Between MSCI EM Index and the Australian Dollar**

This chart shows MSCI EM index returns, sorted into deciles. The first decile (marked 1 on the horizontal axis) contains the highest returns, and the 10th decile (marked 10) the lowest returns. We then estimate the correlation between MSCI EM returns and Australian dollar returns for each decile. Correlations are shown in the bars. The increase in correlation in extreme events, particularly the worst 10% of outcomes (10th decile) is evident. This characteristic can make proxy hedging more efficient.

![Chart 7](image)

**Knowing Where to “Put” Is Half the Battle: The Right Proxy Hedge Can Protect Overweights**

Although MSCI EM puts appear to be an effective hedge (black line), it appears we can do better. For the same $4.6m cost, puts on the USD to AUD exchange rate hypothetically offer a superior outcome profile according to our simulations (gray line). Thus, in this illustration a proxy’s hedge may be a more cost-effective way to potentially protect our emerging markets overweight.

![Excess Return Chart](image)
Keep Investors from Shortsightedness

For investors, return-shaping strategies can offer powerful peace of mind. Although no amount of hedging can definitively insulate a portfolio against loss, there is a fair bit of behavioral science at play in finance. The discipline of behavioral finance has shown that investors are emotional, and tend to make decisions based on perceptions. We know that, in the real world, investors’ aversion to risk is shaped by experiences with portfolio losses and is often dependent on whether the loss was sustained suddenly, in a steep drop, versus over time. A 3% drawdown suffered in a day is likely to be much more disconcerting than a 3% loss experienced over a month, even though the resulting wealth destruction may be equal. In addition, markets behave very differently in slow versus sudden drawdowns—in quick price declines, correlations tend to increase, rendering diversification less effective.

Although diversification across asset classes and investment strategies is critical to success in multi-asset investing, return-shaping strategies are a useful way to potentially manage shorter term risks and aim to prevent sudden, sharp drawdowns (crashes). These techniques use options to potentially reduce downside by taking advantage of opportunities in correlation and volatility, while mitigating cost by proxy hedging tail risks, actively layering in upside participation in trending markets, and leveraging the mean-reverting nature of volatility. We view return-shaping strategies as a valuable way to potentially protect capital just when diversification is least effective, and also as a way to communicate to investors that a proactive and skilled portfolio manager spends a good part of the day, every day, positioning portfolios to efficiently and effectively bear—and potentially even make good use of—the gyrations of the marketplace. Without a doubt, the role of return-shaping strategies in complementing diversification strategies and mitigating loss aversion is developing as the world turns.
Glossary

**Basis risk** represents the potential that the offsetting investment in a hedging strategy will not experience price changes in entirely the opposite direction to the investment being hedged.

**Convexity** is a measure of the curvature of portfolio outcomes.

**Correlation** expresses the strength of the relationship between two data series.

**Credit crunch** is an economic event where investment capital is difficult to obtain.

**Derivatives** allow an investor to transact in a security without owning the underlying asset. Derivatives can be used to express bullish or bearish views in a cost-effective manner.

**Drawdown** is a peak-to-trough decline of an investment during a specified period of time.

**Exchange-traded notes** are debt instruments issued by financial institutions that offer returns based on the performance of an underlying asset.

**Lean against the market** refers to trading against prevailing market expectations. This allows investors to gain relatively inexpensive exposure to an asset because consensus expectations are going against it.

**Mean reversion** is a theory suggesting that prices and returns eventually move back towards the average.

**Options** give the buyer the right, but not the obligation, to either buy (calls) or sell (puts) an underlying investment.

**Out-of-the-money** refers to option pricing. A call is out-of-the-money when the market price is below the strike price. A put is out-of-the-money when the market price is above the strike price. Options would generate a loss if exercised when they are out-of-the-money.

**Proxy hedge** involves using an investment that is strongly correlated to another investment to hedge a particular risk. Proxy hedging is done when an investor does not wish to use a direct hedge.

**Risk-on/risk-off event** refers to a market environment where price moves are driven by changes in investor risk tolerance, primarily caused by macroeconomic patterns. During periods when risk is perceived as low, investors tend to engage in higher risk investments, and vice versa.

**Tail risk** is the possibility that an investment will realize more frequent extreme moves than a normal statistical distribution of outcomes might suggest.

**Volatility** is a measure of the variance in the price of a financial instrument.
The JPMorgan Domestic High Yield Bond Index is an index composed of non-investment-grade corporate bonds. The MSCI Emerging Markets (EM) Index captures large and mid-cap representation across 21 emerging market constituents. The Dow Jones UBS Commodities Index is composed of commodities traded on U.S. exchanges, with the exception of aluminum, nickel and zinc, which trade on the London Metal Exchange. The S&P 500 Index is a broad-based measure of domestic stock market performance. The Russell 1000 Index measures the performance of the large-cap segment of the U.S. equity universe. The Barclays U.S. Aggregate Bond Index is an investment-grade domestic bond index. The Barclays Multiverse ex-U.S. Index provides a broad-based measure of the global fixed income bond market not including the United States. Each index is unmanaged and cannot be purchased directly by investors. Index performance is shown for illustrative purposes only and does not predict or depict the performance of any investment. Past performance does not guarantee future results.

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Below-investment-grade (“high yield” or “junk”) bonds are more at risk of default and are subject to liquidity risk. Derivative instruments whose values depend on the performance of an underlying security, asset, interest rate, index or currency, entail potentially higher volatility and the risk of loss compared to traditional stock and bond investments. Commodity-linked investments are considered speculative and entail substantial risks, including the risk of loss of a significant portion of their principal value.

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