

New Normal Investing: Is the (Fat) Tail Wagging Your Portfolio?

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WHITE PAPER



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Executive Summary

The 2008 crisis has undoubtedly reshaped the global financial landscape, compelling investors to adapt to a “new normal”¹ environment, characterized by anemic economic growth, rising unemployment and low interest rates in many developed countries. This aberrant combination has created many new challenges for institutional investors, but two stand out for their high degree of intricacy and complexity: the search for yield, and the need to better manage—and account for—“fat-tail” events.

We have written extensively about these issues in previous papers,² and have stressed that, in our view, there is no one-size-fits-all solution to these problems. Instead, we believe that investors should consider alternative techniques—such as increasing exposure to real assets, re-designing parts of their fixed income portfolio and modifying risk frameworks—that can potentially mitigate the negative impacts of the new normal on their portfolios.

In this paper, we extend our discussion of how investors can modify their risk framework to adjust for the new normal by providing a deeper dive into fat-tail risk. First, we define what we believe are key drivers of the new-normal environment, and assess the market impact on different asset classes. Then, we discuss how incorporating higher moments³ (i.e., skew and kurtosis) of a return distribution has become increasingly important, as traditional measures of risk based on mean-variance optimization have failed to fully characterize return behavior. Then, we propose alternative investment approaches that we believe can minimize risk from fat tails, and are likely to be more effective in today’s environment, including:

- ✓ The selection of strategies that, when blended with traditional beta, can reduce downside risk and mitigate unfavorable return distributions;
- ✓ Optimization of investments through the use of extreme value theory, and expected shortfall (CVaR optimization); and
- ✓ The application of tail-risk hedges to protect against market volatility.

Lastly, we show empirical analysis of these modified risk techniques. We demonstrate that by shifting the risk-management framework to accommodate fat-tail events and diversifying sources of return, investors can minimize potential portfolio drawdowns, and help protect assets against substantially negative returns.

For more information on the views expressed here, please write to us at csam.insights@credit-suisse.com

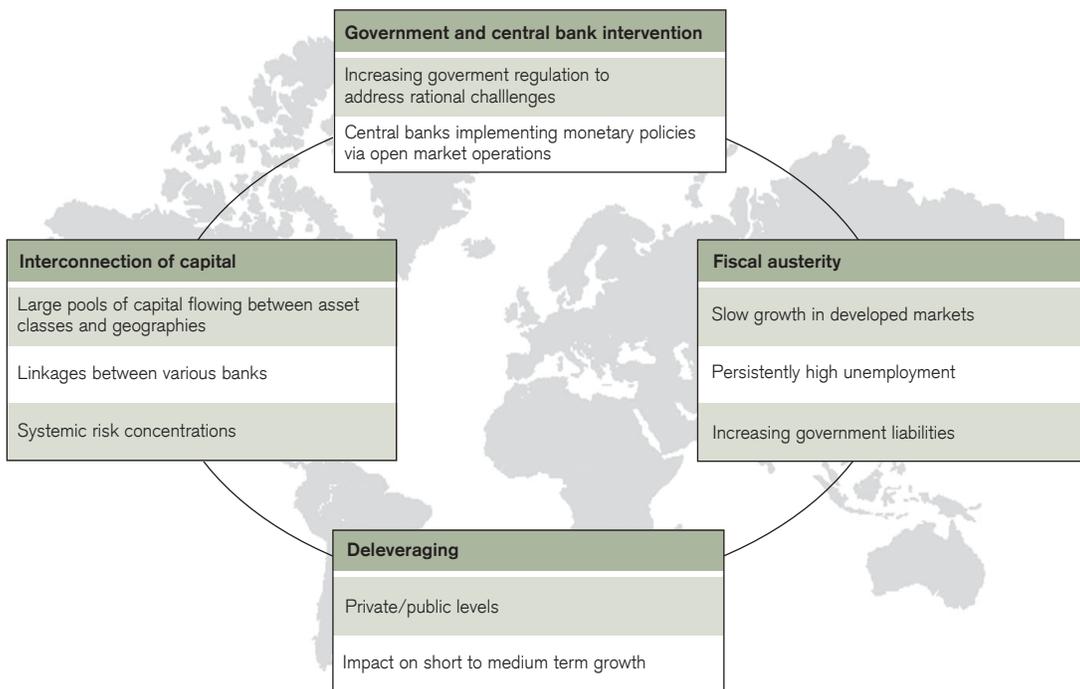
- (1) “New normal” is a term first introduced by Pacific Investment Management Co. (PIMCO) in March 2009
- (2) The following publications are available at credit-suisse.com or please contact your Credit Suisse relationship manager: Real Assets: Inflation Hedge Solution Under a Modified Risk Framework (September 2011); Managing Fixed Income Investments in a Rising Inflation and Interest-Rate Environment (March 2011); The Anatomy of a Modern Emerging Markets Portfolio (November 2010); and Risk Parity – A Risk-Based Approach to Portfolio Structuring (October 2009).
- (3) In mathematics, a moment is a quantitative measure of the shape of a set of points. The first and second moments are denoted by the mean and variance. The third and fourth moments consider skew and kurtosis.

What are the Key Drivers of the “New Normal”?

The 2008 financial crisis triggered a series of unconventional monetary and fiscal policies designed to help stabilize the global financial system and revive growth in developed countries. Although these policies were intended to shore up confidence in the markets as a whole, they have introduced a new set of challenges for investor portfolios, including increasing volatility and low-yielding assets.

In our view, these government policies—combined with ongoing deleveraging and a need for fiscal discipline in the long term—are likely to bolster the new normal environment for the foreseeable future (*Display 1*). Specifically, we see four key macroeconomic trends supporting our view:

Display 1: The new normal is characterized by increasing volatility and slow growth



For illustrative purposes only.
Source: Credit Suisse Investment Strategy Americas

1. *Government and central bank intervention:* Central banks in developed regions, such as the US, Eurozone and Japan, have engaged numerous expansionary monetary policies (i.e., quantitative easing, Operation Twist⁴ and zero-interest-rate policies⁵) to help restore both funding and market liquidity.

At the same time, government intervention—in the form of bank support and financial packages—has helped to further bolster financial markets. In our view, we believe the aggressive tactics undertaken by policy makers over the past several years have driven economies and markets to become increasingly reliant on these interventionist measures. This may, in turn, contribute to an extended period of market uncertainty and volatility. Also, the US Treasury market has been in a decades-long, secular bull run. Any unwinding of this bull trend—including a halt of Fed purchases of government securities—may generate high levels of volatility.

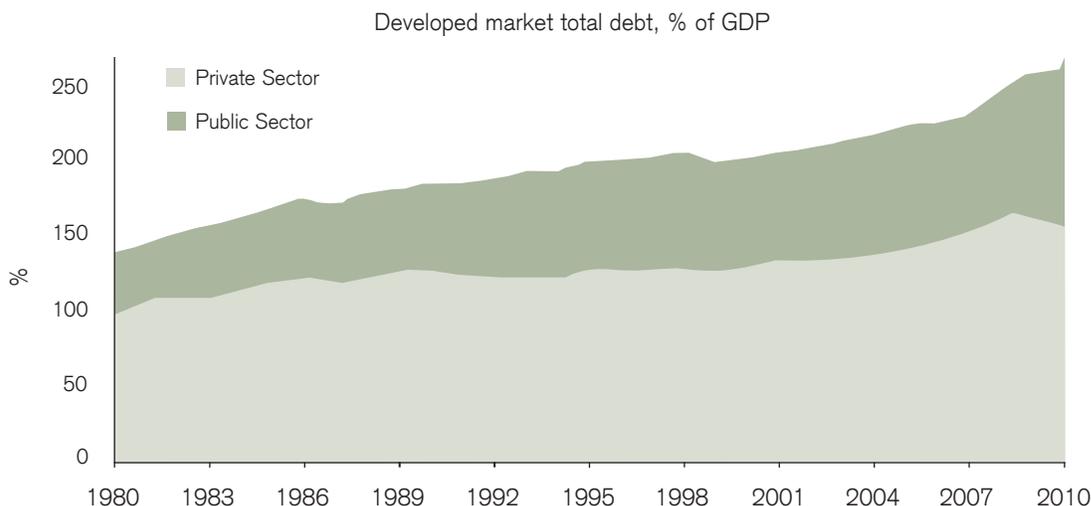
2. *Fiscal austerity:* In order to offset increasing debt levels, developed economies have embarked on what appears to be a multi-year, fiscal tightening policy of deficit-cutting, lower spending and a reduction in public services. Governments in developed countries may need to re-think

pensions, healthcare, and long-term care promises for aging populations. If this fiscal tightening is not accompanied by rising private sector spending and growing employment, the withdrawal of government support could lead to further economic weakness. Due to the complexities surrounding these efforts, we believe the financial markets may respond to the uncertainty with more volatility.

3. *Private deleveraging:* Apart from government deleveraging, the new regulatory environment⁶ in developed markets will require banks and other financial entities to shed assets and hold more capital per unit of assets. However, when many financial intermediaries are seeking to disgorge assets, market prices tend to weaken, bid-ask spreads to widen, liquidity to evaporate and perceived counterparty risk to rise. As such, the market syndrome that has manifested repeatedly since 2008 may continue to weigh on economic growth.

Furthermore, we believe that markets have not fully realized the degree of public sector deleveraging that still needs to be done, particularly in developed markets (*Display 2*).

Display 2: Public debt rising, private debt declining in the developed markets



"Developed markets" correspond to G4 economies (US, UK, Germany and Japan).

Source: Thomson Reuters, Credit Suisse

- (4) Operation Twist, commencing in September 2011, entails purchasing long-end Treasuries and selling shorter-dated Treasuries. It is designed to lower yields on long-term bonds, while keeping short-term rates little changed. The intent is to depress interest rates, giving consumers and companies an additional incentive to borrow and spend money.
- (5) In 2008, the US Federal Reserve (Fed) lowered its operating target—the federal funds rate—to a range of 0% to 0.25%. In January 2012, the Fed extended the policy through 2014.
- (6) The Dodd-Frank Wall Street Reform and Consumer Protection Act aims to promote the financial stability of the US financial system. It was signed into law by President Barack Obama on July 21, 2010. BASEL III is a global regulatory standard on bank capital adequacy, stress testing and market liquidity risk. The phasing-in of minimum capital requirements will begin in 2013.

4. *Financial interconnectedness*: The “risk-off” sign that flashed towards the latter half of 2011 led many investors to wonder if a recession in the Eurozone area would drag the rest of the world into a renewed downturn. While the risk of a global slowdown has eased since then, we caution that the health of global economies—in particular emerging markets—can still be impacted by Europe’s ongoing fiscal challenges. The contagion from the Eurozone debt crisis, if disorderly, may lead to tighter credit conditions globally, causing a potential contraction in global economic activity.

The conflation of these trends is likely to fuel market uncertainty. This “risk-on/risk-off” market pattern causes prices to rise or fall in lockstep with little regard for fundamentals, generating further volatility and increasing correlations among asset classes. As such, in the new normal, investors need to be aware of, and prepared for: 1) more frequent fat-tail events; and 2) asymmetric return distributions based on skew and kurtosis. Next, we discuss these implications in detail and their impact on portfolio construction.

Mean Reversion is Less Effective in a World of Asymmetric Returns

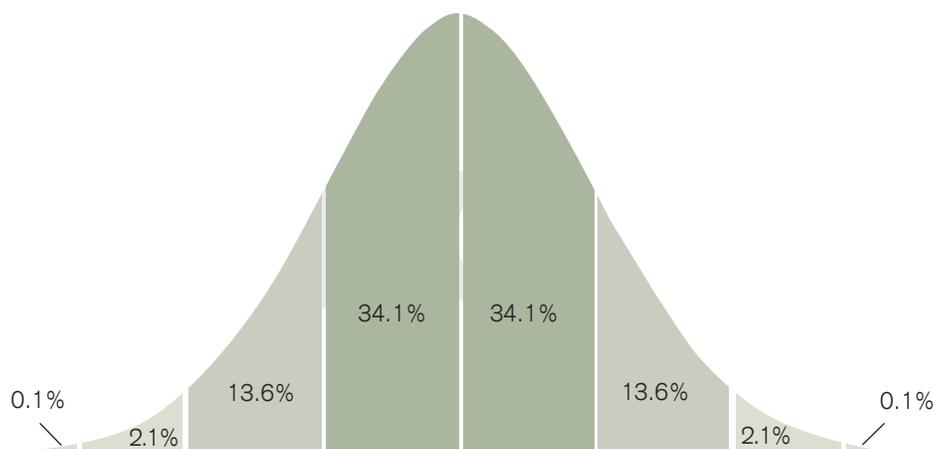
One of the most significant consequences for investors from the global credit crisis has been the fact that average outcomes—for asset class returns, growth and inflation—will become less meaningful, in our view. In the new normal world, we believe the tail ends of distribution outcomes will increasingly drive returns due two overarching factors:

Increasing frequency of fat tails

Fat tails are defined as rare but significant market events which can cause extreme gains or losses in a portfolio. In recent years, these events can be attributed to unconventional policy intervention, partisan divide in local governments and geopolitical risk factors.

Fat tails have major implications for investors trying to establish asset exposures using normal distribution models. Statistically, a normal distribution assumes returns cluster around the mean and the probability curve is bell shaped. In this scenario, a fat-tail event is three standard deviations (“three sigma”) away from the mean and has only a 0.1% probability of happening, or once every 1,000 return periods (*Display 3*).

Display 3: Normal distribution curves are symmetric and have bell-shaped density curves



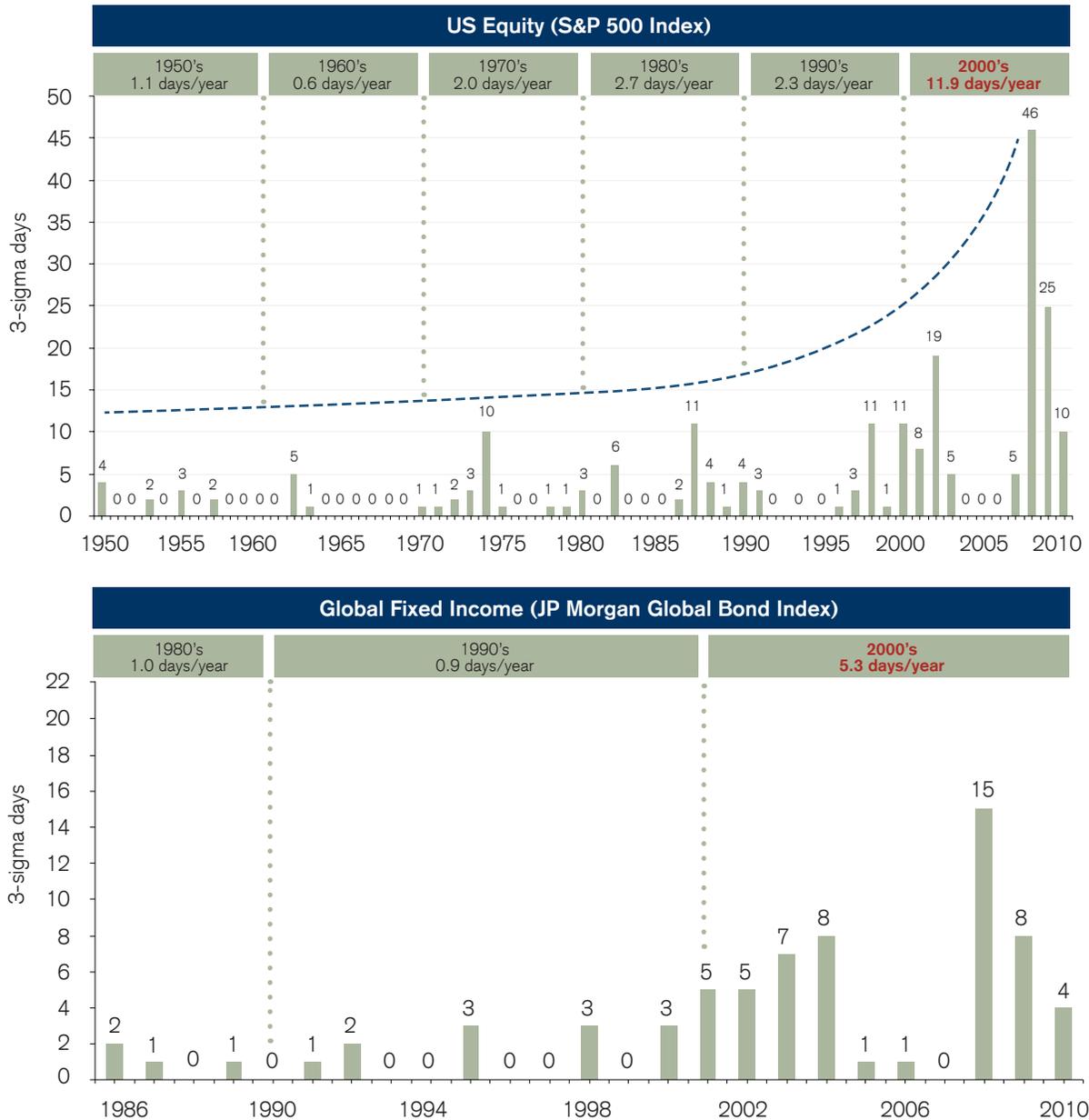
Note: Although there are many normal curves, they all share an important property: the Empirical Rule, which states that all normal density curves satisfy the following properties: 68% of the observations fall within one standard deviation of the mean, 95% of the observations fall within two standard deviations of the mean, and 99.7% of the observations fall within three standard deviations of the mean. Thus, for a normal distribution, almost all values lie within 3 standard deviations of the mean.

Source: Credit Suisse Investment Strategy Americas

In reality, these fat-tail events have occurred more frequently, and have been exacerbated by the 2008 credit crisis. For example, *Display 4* shows that, for US equities and global fixed income, the number of three-sigma days per year has

increased, reaching a peak of 46 and 15 days in 2008, respectively. As such, the probability of a fat-tail event occurring under a normal distribution is actually much higher—at 4.7%—just during the last decade.

Display 4: Extreme events are occurring more frequently



Last data point: December 31, 2010

For illustrative purposes only. Please see important information regarding performance and index definitions at the end of this presentation.

Source: Bloomberg and Credit Suisse Investment Strategy Americas

Skew and kurtosis can lead to asymmetric returns

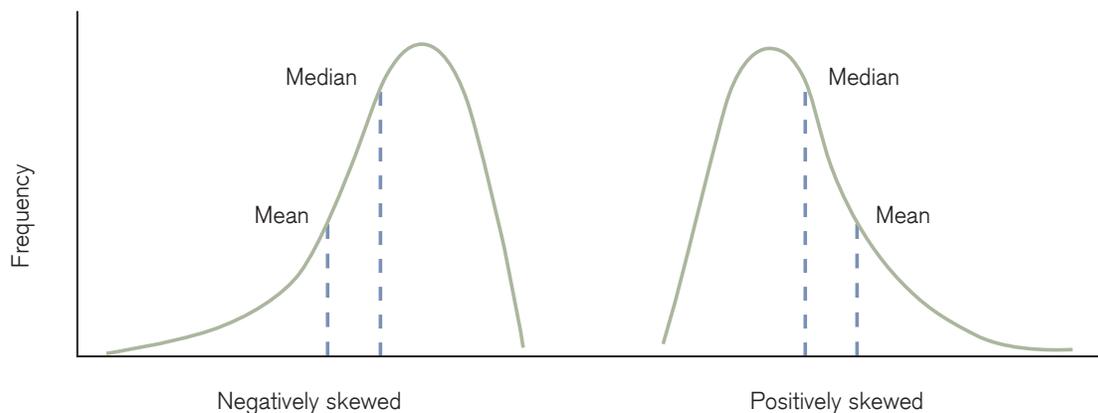
Skew is the degree to which a distribution departs from symmetry around its mean value (i.e., asymmetric return distributions). To illustrate, a distribution that is negatively skewed has returns concentrated on the right, with a longer left tail (*Display 5*). In this scenario, the mean return is less than the median. Conversely, a positive skew shows the majority of returns on the left, with a mean return that is greater than the median.

In a concept similar to skewness, kurtosis is the degree of “peakedness” of a distribution compared to the normal distribution with the same variance. A high kurtosis value means more of the variance is the result of infrequent extreme deviations.

There are varying degrees of kurtosis (*Display 6*):

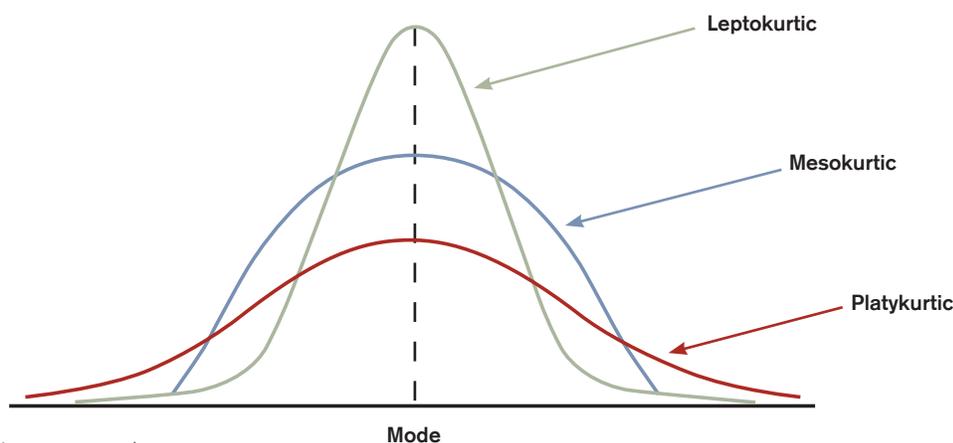
- ✓ *Mesokurtic*: A normal distribution where the kurtosis value equals zero;
- ✓ *Leptokurtic*: A higher peak around the mean and fatter tails; typical of a new normal, volatile environment; and
- ✓ *Platykurtic*: Lower, wider peak around the mean and thinner tails; typical of more stable, predictable market environments.

Display 5: Asymmetric return distributions can lead to skewness



For illustrative purposes only.

Display 6: Kurtosis is a measure of whether returns are peaked or flat, relative to a normal distribution



For illustrative purposes only.

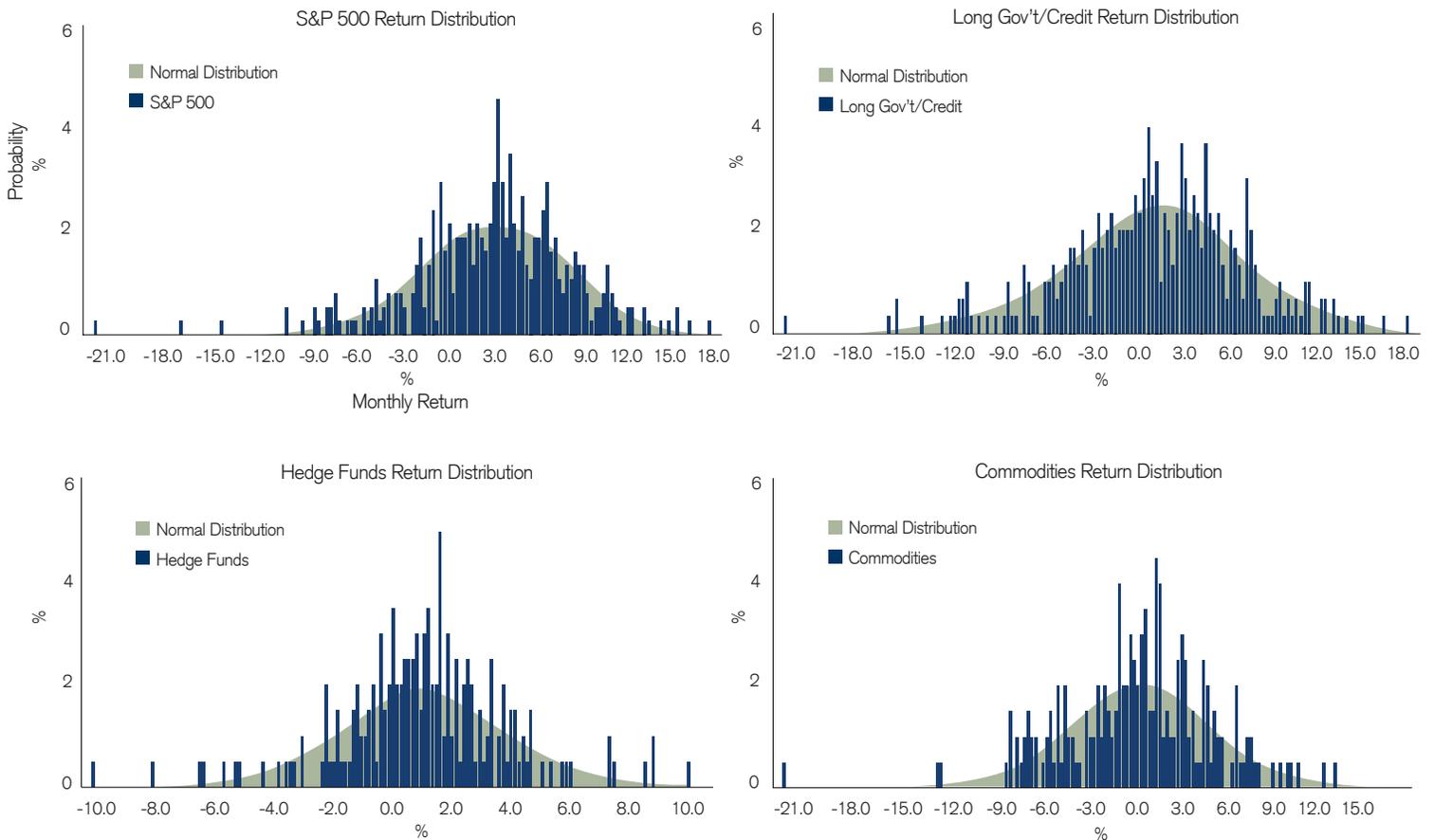
We believe “higher-moment” mathematics has become increasingly important in the new normal because skew and kurtosis might indicate that returns are not normal. To illustrate, we look at return distributions of various asset classes, using index return data as proxy (*Display 7*). We see that in a dynamic, volatile market environment, investors are faced with portfolio outcomes where return distributions may be skewed and are higher or flatter than the norm.

The breakdown in return distributions has major implications for investors managing risk and constructing portfolios in the new normal. Today, investors relying on mean-variance

optimization and normal distribution models can potentially underestimate a portfolio’s drawdown risk, and end up with sub-optimal portfolio allocations. In our view, it is clear that investors should supplement mean-variance optimization techniques with fat-tail and higher-order moment analysis. Ignoring these parameters may lead to portfolios with unintended risk concentrations and minimal diversification benefits.

We next drill deeper into how the new normal may potentially impact different asset classes going forward.

Display 7: Actual return distributions can differ greatly from the norm



For illustrative purposes only. Distributions are based on index return data. Please see important information regarding proxies and time periods at the end of this paper. Source: Bloomberg

Potential Impact of the New Normal on Various Asset Classes

The new normal has return implications across asset classes, posing significant challenges for risk management and portfolio construction.

As such, investors should be aware of potential implications for each asset class and the drivers for return behavior, going forward (*Display 8*).

Equities

We believe that equities in developed markets will be constrained by slow growth in underlying economies and increased volatility. To illustrate the former, we analyze the real equity risk premium⁷ based on three underlying components: income return stream (dividend), growth (GDP) and valuation dynamics (price-to-earnings ratio) of US equities. We then identify low-growth years, reflective of the US economy's current growth potential (e.g., 1.5% to 2.5% GDP growth) to proxy the new normal environment, and compare them against average growth years (3% to 4% GDP growth).

We see that during years of low growth, dividend and growth tend to be compressed, and multiple contraction takes place (*Display 9, next page*). In the new normal, increasing equity correlations and volatility can lead to an opaque market with little visibility in underlying fundamentals. In such a scenario, markets

tend to be cautious on repricing equities, keeping values low. Furthermore, equity premiums can be further pressured by other prevailing trends including corporate deleveraging, moderate growth and high levels of unemployment.

Fixed Income

US Treasury yields fell broadly in 2011 as investors sought “safe haven” assets under expectations of anemic economic growth. Recent declines are, in fact, emblematic of a longer-term trend—yields that were in the 12% to 14% range in the early 1980s have fallen to current levels of 0% to 2% (*Display 10, next page*). In our view, this yield narrowing can be attributed, in part, to broader global disinflationary trends due to improved credibility of central bank institutions and monetary control capabilities, particularly in emerging markets. Additionally, we believe globalization and the transfer of labor and production to lower-cost nations have also contributed to falling yields.

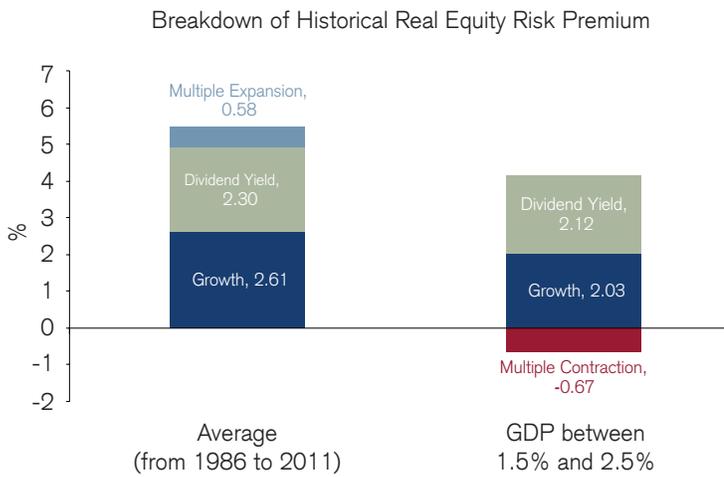
In the US, low yields are further supported by the Federal Reserve's recent announcement to extend its low interest-rate policy through the end of 2014. As such, investors in the US government and corporate bond markets may be facing low yields as the new normal for the next several years.

Display 8: The new normal can impact asset classes differently

Asset Class Implications	
Equities	<ul style="list-style-type: none"> • Lower returns due to reduction in equity risk premium • More volatility given risk-on/risk-off periods • Increasing growth gap between emerging and developed markets
Fixed Income	<ul style="list-style-type: none"> • Lower short-term rates due to demand for safe assets • Volatility of credit and term premiums
Currencies	<ul style="list-style-type: none"> • Increasing volatility: structural risk in key economic regions • De-synchronization between emerging and developed economies
Alternatives	<ul style="list-style-type: none"> • Increasing demand for alternative risk premia • Longer periods of increasing unexpected inflation will likely attract inflows into inflation-hedging strategies • Increased focus on diversification potential and uncorrelated returns

(7) Real equity risk premium can be calculated using different methodologies. In our analysis: Real Equity Risk Premium = S&P 500 Index Dividend Yield + Real GDP Growth + S&P 500 Multiple Expansion/Contraction – 10-Year Treasury Yield

Display 9: US equity risk premiums are narrowing... Display 10: ...as well as bond premiums



Real Equity Premium: 5.49 → 3.47

Last data point: December 31, 2011
Source: Bloomberg and Credit Suisse



Data from January 1, 1981 to December 31, 2011
*Breakeven inflation is the yield difference between inflation-linked bonds and otherwise similar fixed-rate bonds. It can be viewed as the compensation to nominal bond investors for bearing the inflation risk.
Source: Bloomberg

Alternatives

In the new normal scenario where traditional asset classes and long-only strategies may provide lower returns, investors may look to strategies that can withstand or even benefit from challenging conditions. Going forward, we believe the emphasis will shift from returns that accrue from long-only positions in strong markets (beta) to alternative strategies that can extract different sources of risk premia. In our view, managers who will most likely succeed will be those who possess the flexibility to allocate assets nimbly across asset classes and who take advantage of trading opportunities.

To recap, we have discussed how we believe the new normal will impact different asset classes. We also presented the reasons behind what we think is a significant and enduring consequence of the new environment: Distribution of

outcomes have become flatter and the tails are fatter.

Against this backdrop, the key implications that investors should be aware of, in our view, are:

- ∨ Investment strategies based on mean reversion will likely be less effective or even unsuccessful in a world where realized returns rarely cluster around the mean;
- ∨ Fluctuations in risk appetite will be more frequent with portfolio returns coming from the tails; and
- ∨ The existence of fat tails and probability of increased losses means strategies will generally be less levered than prior investing periods.

The question remains: How can institutional investors structure their portfolios to help withstand and survive the new market environment?

Modifying a Risk-Management Framework to Accommodate Fat-Tail Events

In the new normal, identifying risk sources and thoughtful strategy selection have become paramount to help mitigate potential portfolio drawdowns, in our view. As such, we believe investors should select strategies that, when blended with traditional beta, can mitigate asymmetric distributions. In addition, investors can help optimize their portfolios by using extreme value theory⁸ and expected shortfall analysis (also known as CVaR optimization)⁹ to structure the portfolio. Using empirical analysis, we present a case study that illustrates these risk concepts.

To begin, we first perform a Jarque-Bera (JB)¹⁰ analysis to test whether sample data have the skewness and kurtosis matching a normal distribution. We use a data set of alternative strategy indices to test the null hypothesis that asset returns are normally distributed. In other words, we wondered if the analyzed strategies would have a skew and kurtosis value of zero. Our results show that the only strategy that exhibited normal

distributions in the analyzed period was managed futures. All other strategies fell outside normal distribution parameters (*Display 11*).

We then calculate the co-skewness beta and the co-kurtosis beta, which analyzes the skew and kurtosis behavior of an asset in conjunction with the skewness and kurtosis of another asset (reference asset). This can help identify strategies' linear and non-linear exposure to a great variety of risk factors (i.e., volatility, credit and liquidity risk), and can be used as a supplement to the co-variance calculation of risk estimation.

To put these terms into context, a positive co-skewness shows that the strategy's return distribution is skewed to the right of the market or the reference set, representing a higher probability of extreme positive returns of the strategy

Display 11: Select strategies that, when combined with traditional asset classes may reduce skew

Index	Hedge Funds	Directional	Tactical Trading	Relative Value	Event Driven	Convertible Arbitrage	Dedicated Short	Emerging Markets	Equity Market Neutral	Fixed Income Arbitrage	Global Macro	Long/Short Equity	Managed Futures	Multi-Strategy
Skewness	-0.18	-0.58	0.18	-4.68	-2.34	-2.69	0.67	-0.84	-11.76	-4.47	0.02	-0.02	0.03	-1.72
Kurtosis	2.62	4.09	2.00	31.22	11.12	15.80	1.45	5.29	158.11	31.03	4.02	3.35	-0.09	5.91
Is Jarque Bera Normal?	False	False	False	False	False	False	False	False	False	False	False	False	True	False
Co-skewness*	0.446	0.518	0.158	0.400	0.490	0.406	-0.728	0.917	0.253	0.447	0.295	0.545	-0.326	0.251
Co-kurtosis*	0.303	0.393	0.089	0.266	0.328	0.319	-0.788	0.683	0.187	0.279	0.182	0.428	-0.244	0.179

*Co-skewness and co-kurtosis beta are calculated relative to the S&P 500 Index.

For illustrative purposes only. Please see endnotes for important disclosures regarding hypothetical and simulated performance.

Indexes used as proxies for strategies are based on the Dow Jones Credit Suisse Hedge Fund Index, which is an asset-weighted hedge fund index and includes only funds, as opposed to separate accounts. The index uses the Credit Suisse Hedge Fund Database, which tracks approximately 9,000 funds and consists only of funds with a minimum of \$50 million under management, a 12-month track record and audited financial statements. The index is calculated and rebalanced monthly and reflects net performance. Data are from March 1, 1994 (when all hedge fund index data became available) to December 31, 2011.

"Hedge Funds" corresponds to the total Dow Jones Credit Suisse Hedge Fund Index. "Directional" corresponds to the combined strategies of "Dedicated Short," "Emerging Markets" and "Long/Short Equity." "Tactical Trading" corresponds to combined strategies of "Global Macro" and "Managed Futures." "Relative Value" corresponds to the combined strategies of "Convertible Arbitrage," "Equity Market Neutral," "Fixed Income Arbitrage" and "Multi-Strategy." "Event-Driven," "Convertible Arbitrage," "Dedicated Short Bias," "Emerging Markets," "Equity Market Neutral," "Fixed Income Arbitrage," "Global Macro," "Long/Short Equity," "Managed Futures" and "Multi-Strategy" are each constituents of the Dow Jones Credit Suisse Hedge Fund Index that measures the aggregate performance of the funds that comprise each hedge fund strategy.

- (8) Extreme value theory or extreme value analysis (EVA) is a branch of statistics dealing with the extreme deviations from the median of probability distributions. It seeks to assess, from a given ordered sample of a given random variable, the probability of events that are more extreme than any observed prior.
- (9) Conditional Value at Risk (CVaR) measures the average expected level of loss for an investment above the 95th percentile (VaR), thereby incorporating the tail end of the risk analysis.
- (10) The Jarque-Bera test (JB) is a statistical goodness-of-fit measure of departure from normality, based on the sample kurtosis and skewness. The test is named after Carlos Jarque and Anil K. Bera. JB is defined as: $JB = n/6 (S^2 + 1/4K^2)$ where n is the number of observations (or degrees of freedom in general); S is the sample skewness and K is the sample kurtosis.

over reference returns. A negative (or low) co-kurtosis value indicates that the strategy's returns would not be much different from the market's returns (i.e., low beta). As a result, by introducing a strategy with negative (or low) co-kurtosis, one can potentially reduce the overall skewness of the portfolio.

In our case study, we identify the strategies that fall within these criteria: managed futures, multi-strategy and global macro. The next step is to optimize these strategy allocations when combined with traditional asset classes.

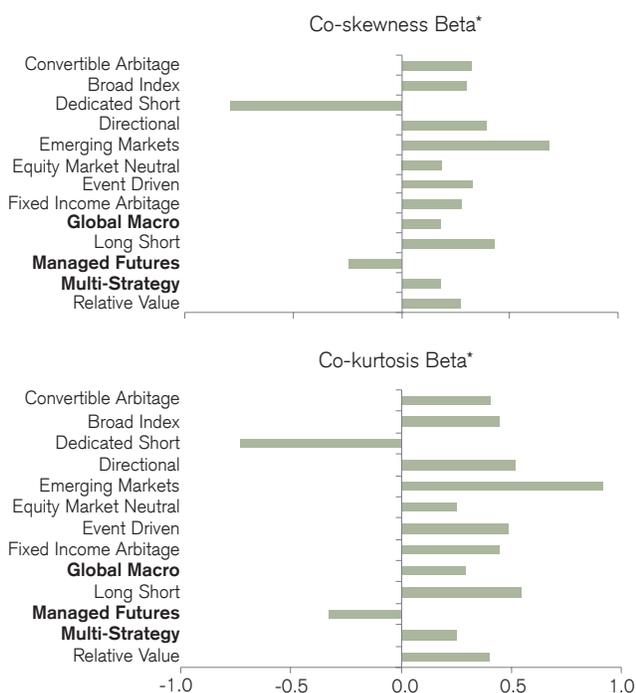
To do this, we begin with a simple portfolio invested in 100% equities. As such, we calculate co-variance beta relative to the S&P 500 Index. On a historical basis, we see that the return and risk are approximately 8% and 16%, respectively (*Display 12*). Over that same period, the maximum drawdown is about 51%. Our objective is to integrate the selected strategies from the co-variance risk

estimate and study the impact on downside risk, kurtosis and skew associated with this portfolio.

Through an expected shortfall optimization process, we establish portfolio weights for each strategy. We find that the optimized portfolio has a potential return of 8.36% percent—a marginal improvement on the return on a historical basis. However, the risk has been reduced substantially by about 600 basis points, which provides the hypothetical portfolio a return-per-unit-of-risk of roughly 0.95, with a drawdown that is approximately half of the original sample portfolio (with 100% of assets invested in equities).

The key to our analysis is this: By combining these strategies with traditional beta, investors can minimize the drawdown risk, and reduce the skewness and kurtosis associated with the traditional asset class in a portfolio. By introducing assets with negative skewness, we have decreased the overall skewness and improved risk-adjusted returns and return per unit of CVaR.

Display 12: Combine select asset classes to reduce skew and potentially increase risk-adjusted returns



Portfolio Statistics		
	100% S&P 500	CVaR Optimization
S&P 500	100.00	50.00
Managed Futures	-	25.00
Multi-Strategy	-	16.50
Global Macro	-	8.50
Total	100.00	100.00
Historical Return	8.05	8.36
Historical Risk	15.72	8.83
Return per Unit of Risk	0.51	0.95
Return per Unit of CVaR	0.23	0.48
Annualized Value at Risk	-27.13	-11.92
Maximum Drawdown	-50.95	-29.29
Kurtosis	0.96	0.22
Skewness	-0.66	-0.42

For illustrative purposes only. Please see endnotes for important disclosures regarding hypothetical and simulated performance. Based on monthly data from March 1994 to December 2011.

*Co-skewness and co-kurtosis beta are calculated relative to the S&P 500 Index.

Tail-risk hedging is another technique that can help reduce the volatility and the risk of a sudden loss in the event of a fat-tail event. The process involves the creation of positions within a portfolio to protect against downward market moves. While there is a wide array of tail-risk hedges available, some techniques may include:

- ✓ Variance swaps in which market volatility is hedged with derivatives;
- ✓ Tail-risk protection indices that can include a broader aggregation of variance swaps; and
- ✓ Equity option strategies (such as traditional put options, or option collars that combine puts and calls).¹¹

There are a number of considerations that investors looking to implement this approach should take into account—namely portfolio restrictions, potential costs, operational due diligence and ongoing monitoring—to correctly identify underlying risk exposures to market betas across different asset classes. However, we believe implementing tail-risk hedges can also help mitigate the risk of extreme negative returns in a portfolio.

Conclusion

Investors are facing a new-normal environment of low-yielding assets and more frequent fat tails. As such, we believe investors should re-assess whether standard risk techniques that employ normal distributions are sufficient to protect portfolio assets, as these are likely to be less effective or even unsuccessful in today's world. Standard mean-variance portfolio selection techniques are known to suffer from a number of shortcomings, and the problems are exacerbated in the presence of non-normal distributions.

In our view, a potential solution is to modify the risk-management framework to accommodate fat tails and non-normal distributions. This tactic, combined with selecting strategies that can mitigate asymmetric return distributions within the portfolio, should potentially improve risk-adjusted returns. By better managing sources of risk and tails, we believe portfolios can be well-positioned to withstand the challenges of the new normal.

(11) Deutsche Bank. May 2010. "Tail Risk Hedging: A Roadmap for Asset Owners."

Credit Suisse Asset Management Publications

European Debt Crisis in Focus: Time to Re-Risk Portfolios?

March 2012—Could an improvement in recent economic data and a rally in global equities indicate that investor risk aversion is waning? In his latest paper, Credit Suisse Senior Advisor Robert Parker tackles this question, arguing that the time might be right for investors to consider increasing their exposure to risky assets.

Asset Management's Q1 2012 Alternatives Quarterly

Q1 2012—Our Global CIO, Stefan Keitel, outlines key investment themes he believes will drive financial markets this year, specifically issues surrounding Europe, US and emerging markets. Additionally, our leading alternatives portfolio managers outline areas of opportunity in their respective strategies in the wake of ongoing market uncertainty.

Robert Parker, Credit Suisse Senior Advisor, January 2012 Market Update

January 2012—Robert Parker, senior advisor - Credit Suisse, outlines the market conditions going into 2012, the factors that could support riskier assets this year, as well as the potential risks.

Fixed Income Outlook: The Search for Yield

November 2011—In this white paper, John Popp, Global Head of the Credit Investment Group, reviews options for investors seeking returns in a low-yield environment.

Hedge Fund Investing: How to Optimize Your Portfolio

October 2011—In a post financial-crisis environment, how can investors address potential risks associated with hedge fund investing? The paper discusses how hedge fund replication can help address these challenges while potentially providing alternative-like returns.

The Way Forward: Measuring the Impact of Short-Term and Structural Growth Drivers on Emerging Market Investing

September 2011—In the aftermath of the 2008 global financial crisis, many emerging countries were able to recover more quickly than their developed counterparts. Can this scenario be repeated during the current slowdown?

Real Assets: Inflation Hedge Solution Under a Modified Risk Framework

September 2011—In the "new-normal" environment, what is the right mix for a real assets portfolio? The ISS team presents a modified risk framework with which to optimize the benefits of the asset class.

Commodities Outlook: Increased Volatility, Increased Opportunity?

August 2011—The paper examines the recent rise in the volatility of commodity prices within the context of a longer-term, secular trend of increasing volatility and how investors can best position their portfolios in this environment going forward.

Commercial Real Estate: Has the Tide Turned?

June 2011—After suffering through the credit crisis, US commercial real estate macro indicators are starting to improve. But how sustainable is this turnaround? The paper addresses this question, and examines how institutional investors can manage their exposure to this asset class during still uncertain times.

Managing Fixed Income Investments in a Rising Inflation and Interest-Rate Environment

March 2011—This paper addresses key challenges facing fixed income investors today: How to achieve higher returns in a still low-yield environment while mitigating the rising threats of inflation and interest-rate risks? The ISS team's analysis suggests that diversifying fixed income exposure into specific instruments as well as adding inflation hedges may present an efficient way to manage these challenges. A full case study helps to illustrate the team's findings.

How Commodities Can Help Investors Face the Uncertainty of the Inflation/Deflation Debate

December 2010—In this paper, our Commodities Team argues that uncertainty about the consumer-price outlook in developed economies creates challenges for capital markets to properly price in inflation expectations. The Commodities Team's research suggests that exposure to real assets can help investors cushion the impact on the portfolio of unexpected changes in the inflationary environment in the long run.

The Anatomy of a Modern Emerging Markets Portfolio

November 2010—This paper examines the quickly evolving emerging markets investment landscape and argues that the proliferation of sophisticated investment vehicles in these markets presents an opportunity for investors to augment the efficiency of their emerging markets portfolios.

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Information on Indices Used and Data Range

US Equities: (January 1980 to December 2011). The Standard and Poor's 500 Index is a capitalization weighted index of 500 stocks. The index is designed to measure performance of the broad domestic economy through changes in the aggregate market value of 500 stocks representing all major industries.

US Aggregate Fixed Income: (January 1986 to December 2011). The Barclays Capital US Aggregate Bond Index (formerly Lehman Brothers US Aggregate Bond Index) is a benchmark index composed of US securities in Treasury, Government- Related, Corporate, and Securitized sectors. It includes securities that are of investment-grade quality or better, have at least one year to maturity, and have an outstanding par value of at least \$250 million.

Global Fixed Income: (November 2008 to December 2011). The JP Morgan Global Aggregate Bond Index consists of the JPM GABI US, a U.S. dollar denominated, investment-grade index spanning asset classes from developed to emerging markets, and the JPM GABI extends the U.S. index to also include multi-currency, investment-grade instruments.

Commodities: (January 1991 to December 2011). The Dow Jones-UBS Commodity Index aims to provide broadly diversified representation of commodity markets as an asset class. The index is made up of exchange-traded futures on physical commodities and represents 20 commodities, which are weighted so that the relative proportion of each of the underlying individual commodities reflects its global economic significance and market liquidity.

Long Government Fixed Income: (January 1980 to December 2011) The Barclays Capital US Long Government/Credit Index (formerly Lehman Brothers U.S. Long Government/Credit Bond Index) measures the investment return of all medium and larger public issues of U.S. Treasury, agency, investment-grade corporate, and investment-grade international dollar-denominated bonds with maturities longer than 10 years. The average maturity is approximately 20 years.

Hedge Funds: (January 1994 to December 2011) The Dow Jones Credit Suisse Hedge Fund Index is an asset-weighted benchmark that measures hedge fund performance and seeks to provide the most accurate representation of the hedge fund universe.

60/40 portfolio: 60% S&P 500 Index, 40% Barclays Capital US Aggregate Bond Index

Calculation of Risk Contribution:

Contribution of Asset X to Portfolio Volatility (Portfolio composed by Asset X and Asset Y):

$Weight_x * (Weight_x * Volatility_x^2 + Weight_y * Covar_{x,y})$

VolatilityPortfolio

Periods of analysis – Periods of analysis – Normal defined by most recent 10-year period of data available (Sept '99 – Sep '09); Stressed period defined by the VIX index above 25 (Jun '02-Mar '03 and Jun '08- Jun '09).

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