Can Infrastructure Investing Enhance Portfolio Efficiency?

May 2010 WHITE PAPER

Executive Summary

The 2008 global financial crisis has laid bare two key challenges for institutional investors in general, and pensions in particular: First, the steep drop in asset prices has created funding gaps for many pension plans. Second, the exogenous shocks from the market dislocations worldwide have negatively impacted risk budgets, with investors now seeking ways to increase the efficiency of their portfolios.

The strong rallies in the equity and credit markets in 2009 have helped to ameliorate the situation, but uncertainty remains. What can investors do, then, to help reduce the funding gap, while providing diversification to shore up the efficiency of their portfolios? Our research suggests that some exposure to infrastructure—within the context of a diversified portfolio—can help address these challenges from both tactical and strategic perspectives. Here’s why:

- Infrastructure, our analysis indicates, has low correlations to a plethora of commonly held asset classes—including US equities, global bonds, Treasury Inflation-Protected Securities (TIPS), commodities, private equity and hedge funds. As such, the asset class might help improve a portfolio’s Sharpe ratio when deployed strategically.

- The long-term nature of infrastructure investments can help mitigate duration risk for pension portfolios, an especially appealing characteristic in times of potentially rising inflation and escalating interest rates.

- Our analysis also suggests that default rates in infrastructure investments are relatively low, as historically captive customer bases and generally stable demand for certain types of infrastructure tend to provide comparatively steadier cash flow streams than more economically sensitive business and sectors.

- Infrastructure is a diverse asset class in and of itself, presenting a range of risk/return profiles and characteristics. Investors, for instance, can focus on private equity-style fund managers, including some that specialize in making operational improvements on the assets with the aim of increasing the values of their investments. These investments tend to produce a J-curve-like profile of cash flows, and traditionally offer potentially higher risk-adjusted returns.

- Lastly, we believe that the Great Recession has produced multiple factors that are creating global investment opportunities for private investors in this space.

This paper also delves into the details and characteristics of infrastructure as an asset class. Specifically, we explore the many types of investments in the space, and how they differ in characteristics, scope and potential uses in portfolios. We also analyze how investors can obtain exposure to the asset class, and the many roles it can play in one’s strategic investment policy.

Additionally, we provide our view on the current opportunity set for the asset class, and explain why we believe that gaining exposure to infrastructure might make sense from an opportunistic perspective. We conclude with a case study that highlights the “real-life” implications of adding infrastructure to a representative portfolio, as well as the trade-offs and decision-making process investors are likely to face when investing in the asset class.

Infrastructure Investments Are Diverse

As an asset class, infrastructure encompasses investments in the underlying, essential networks and services that are necessary for the proper functioning of global economies. These include transportation, communication systems, water, energy production, energy distribution, waste management, and public institutions, such as schools, post offices and prisons. The key features of infrastructure-related businesses include:

- **A captive customer base:** Infrastructure assets typically provide basic services with relatively stable demand that are often more resistant to business cycles than many other asset classes, due to traditionally recurring revenue streams.

- **High barriers to entry:** Infrastructure typically requires high initial investments, and regulatory parameters can often limit competition.

- **Assets with long life spans:** Roads, bridges and tunnels, for example, typically have 50-year life spans; telecommunication cables can last up to 10 years, whereas electricity gridlines can go 60 years before requiring major maintenance.

The asset class is typically divided into two major groupings: economic and social infrastructure. Display 1 provides a detailed view on the various types of investments that usually fall under those large categories. Within these broader categories, infrastructure investments are often classified depending on their stage of development. From this perspective, they are traditionally seen as "greenfield" or "brownfield" assets. Sometimes referred to as "growth infrastructure," greenfield investments refer to new facilities that require design, financing, building and operating. Brownfield investments essentially refer to existing, aging assets that require rehabilitation, and are sometimes referred to as "mature infrastructure."

Brownfield assets typically fall in the lower risk/lower return end of the spectrum, while greenfield projects usually boast a higher risk/higher return profile, with potential investment gains coming in later years. Geographically, greenfield infrastructure investments are more prevalent in emerging markets, while brownfield assets are more characteristic of developed markets. Activist private-equity-style investors (who add value to investments by increasing their operational efficiency) can invest in either greenfield or brownfield, but will have a greater focus on appreciation of the asset than a steady cash flow component.

As illustrated in Display 2 (next page), the risk/return profile of infrastructure investments depends on a number of variables, including the maturity of target projects, the extent of geographical diversification, sector diversification and expected impact of asset-specific factors. For example, airports usually present greater risk and returns because of the higher discretionary component to air travel than seasoned toll roads, which present relatively stable and circumscribed risk/return profiles due to the more captive nature of their customer base.

**Display 1: As an Asset Class, Infrastructure Is Traditionally Divided Between Economic and Social Types of Investments**

<table>
<thead>
<tr>
<th>Economic Infrastructure</th>
<th>Social Infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transport</strong></td>
<td><strong>Energy and Utilities</strong></td>
</tr>
<tr>
<td>Airports</td>
<td>Gas networks</td>
</tr>
<tr>
<td>Bridges</td>
<td>Storage facilities</td>
</tr>
<tr>
<td>Parking systems</td>
<td>Electricity networks</td>
</tr>
<tr>
<td>Ports</td>
<td>Power generation</td>
</tr>
<tr>
<td>Toll roads</td>
<td>Renewable energy</td>
</tr>
<tr>
<td>Tunnels</td>
<td>(wind, solar power, etc.)</td>
</tr>
<tr>
<td></td>
<td>Water and sewage</td>
</tr>
</tbody>
</table>

Source: Credit Suisse Asset Management
### Several Ways to Access the Asset Class

Investors essentially have four options for investing in infrastructure: publicly listed funds, direct investment, private fund or private fund of funds. Each offer their own pros and cons and are traditionally used by investors—either individually or as a group—to fill specific needs in their portfolios (i.e., liquidity, returns, income, among others). They also offer varying levels of liquidity. A brief assessment of each option follows:

- **Publicly listed funds:** These are traditionally listed vehicles, and include both mutual funds and exchange traded funds. This option is primarily attractive to retail investors. Advantages include high liquidity, relatively low transaction costs and market pricings.

- **Private infrastructure funds (General Partnerships or GPs):** This type of investment works essentially like a private equity fund, where investors commit capital to an investment pool, which is then drawn upon by the general manager as required for investment opportunities along with periodic management and operating fees. Like private equity, funds have limited liquidity and average life spans ranging from five to 15 years. GPs usually seek to enhance the value of the assets by improving the management or operations of the underlying business (i.e., airports, toll roads, bridges, water systems, etc.). GPs also structure the investment and manage risk, including determining appropriate levels of leverage, hedging and analyzing cost of capital.

- **Private infrastructure fund of funds (FoFs):** These structures offer investors the option to allocate to several GPs at once (typically numbering between eight and 12 per FoF). Similar to investing in a single GP, capital is committed and then drawn on an as-needed basis. Liquidity is limited and life spans are comparable to individual GPs. FoF managers generally specialize in due diligence and diversification. Their contribution is more on the financial and risk-management side rather than operational expertise. FoFs can also provide opportunities for co-investments and secondary purchases.

- **Direct investment:** Traditionally available only to large institutional investors, this option gives the investor direct ownership (either total or partial) of the infrastructure asset. Investors usually seek this option as a potential source of steady income streams.
Can Infrastructure Investing Enhance Portfolio Efficiency?

Regardless of the vehicle used, investors considering the asset class should also be mindful of the many investment philosophies among infrastructure fund managers. Based on the manager’s focus and area of expertise, the asset class can exhibit investment characteristics of private equity, fixed income or real estate. This means that infrastructure investment can technically be placed in several different “buckets” in a portfolio, depending on the characteristics of the underlying assets and the needs of the investor.

Infrastructure: Characteristics and Roles in a Portfolio

As an asset class, infrastructure has specific characteristics of which investors can take advantage when analyzing their portfolios. When deployed within a diversified set of investment instruments, we believe that the asset class has the ability to help investors improve the overall efficiency of their portfolios against both their risk/return targets and cash-flow needs. In the remainder of this section, we outline the main traits of the asset class and detail the most common ways infrastructure has been traditionally employed in portfolios.

Low Correlations to Other Asset Classes

The Great Recession has shown that correlations are dynamic and can change dramatically, particularly if affected by exogenous shocks. As a result, investors are increasingly seeking ways to diversify their portfolios so as to maintain a relatively low level of correlation among the many asset classes to which they have exposure.

As an asset class, infrastructure has proved to be an attractive diversifier when paired with a number of traditional asset classes. As shown in Display 3, infrastructure correlations stayed relatively low against most analyzed asset classes in the period between July 2000 and March 2010, with the exception of non-US equities. We examined correlations against two broad measures of the asset class: First, the Macquarie Global Infrastructure Total Return Index, which covers publicly listed funds in 48 markets around the world; second, we examined correlations of a customized infrastructure mix of airport, port and energy returns, so as to illustrate what the results would likely be for an infrastructure strategy with a tilt towards greenfield/growth assets.

Display 3: Infrastructure Has Traditionally Exhibited Relatively Low Correlation with Other Asset Classes

(July 2000 – March 2010)

<table>
<thead>
<tr>
<th></th>
<th>US Equities</th>
<th>Non-US Equities</th>
<th>Global Bonds</th>
<th>REITs</th>
<th>Commodities</th>
<th>Hedge Funds</th>
<th>Inflation-Linked Bonds</th>
<th>Private Equity</th>
<th>Global Infrastructure</th>
<th>Customized Infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td>US Equities</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-US Equities</td>
<td>0.63</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Global Bonds</td>
<td>0.23</td>
<td>0.17</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>REITs</td>
<td>0.56</td>
<td>0.45</td>
<td>0.22</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commodities</td>
<td>0.15</td>
<td>0.45</td>
<td>0.14</td>
<td>0.18</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hedge Funds</td>
<td>0.46</td>
<td>0.61</td>
<td>0.23</td>
<td>0.30</td>
<td>0.43</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inflation-Linked Bonds</td>
<td>0.19</td>
<td>0.21</td>
<td>0.86</td>
<td>0.24</td>
<td>0.32</td>
<td>0.25</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private Equity</td>
<td>0.84</td>
<td>0.63</td>
<td>0.01</td>
<td>0.61</td>
<td>0.11</td>
<td>0.52</td>
<td>0.01</td>
<td>0.68</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Global Infrastructure</td>
<td>0.44</td>
<td>0.83</td>
<td>0.32</td>
<td>0.44</td>
<td>0.40</td>
<td>0.71</td>
<td>0.42</td>
<td>0.56</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Customized Infrastructure</td>
<td>0.44</td>
<td>0.76</td>
<td>0.18</td>
<td>0.35</td>
<td>0.69</td>
<td>0.50</td>
<td>0.31</td>
<td>0.39</td>
<td>0.68</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Source: Credit Suisse Asset Management

2 We focused our analysis on the Macquarie Global Infrastructure Total Return Index because of the benchmark’s long-term track record since July 31, 2000, and broad coverage across 48 markets. The Macquarie Global Infrastructure Index (MGII) Series calculated by FTSE is designed to reflect the stock performance of companies worldwide within the infrastructure industry, principally those engaged in management, ownership and operation of infrastructure and utility assets. Although global aggregate correlation data for private investments in infrastructure (e.g., GPs and FoFs) are not as widely available, our experience working with many investors worldwide suggest that the asset class correlation characteristics hold true for private investments as well. In fact, our intuition suggests that—due to the less efficient nature of private markets—private infrastructure investments could, in fact, show an even lower correlation to traditional assets classes. Examples of such phenomena have indeed been found in academic research. For example, Peng and Newell (2007) found that unlisted infrastructure funds based on investments in Australia between the third quarter of 1995 and second quarter of 2006 showed level of correlations ranging from 0.06 to 0.26 against a set of traditional assets classes. See Wen Peng, Hsu, and Newell, Graeme, University of Western Sydney, “The Significance of Infrastructure in Investment Portfolios,” Pacific Rim Real Estate Society Conference, 21-24 January 2007.

3 Please see “Important Information Regarding Performance” section at the end of this paper for a description of the indices used as proxies for the asset classes in this display.

4 | Credit Suisse Asset Management
Duration Management and Potential Inflation Protection
We believe that exposure to infrastructure can also help address two perennial concerns in investors’ portfolios in general and pension investors in particular: the threat of rising inflation and asset/liability duration risk.

Let’s first address the inflation threat. Regulation governing revenues of many global infrastructure businesses tend to have embedded pricing formulas allowing these companies to raise the prices of their services according to the path of inflation. That factor—combined with the captive customer base we mentioned previously—tends to make the cash-flow streams of many infrastructure assets relatively insulated from the ups-and-downs of the economic cycle. From this perspective, infrastructure can be perceived as an inflation-linked asset class, alongside TIPS, commodities and timber.4

Taken a step further, this “inflation-protection”—and subsequent insulation from economic cycle volatility—can also help mitigate duration risk in pension portfolios as some long-term inflation-linked infrastructure assets can be matched to long-term liabilities. To better illustrate this point, we will look at this issue through a liability-driven investing (LDI) lens. In general terms, the idea behind LDI calls for minimizing surplus volatility in a pension plan in order to immunize the portfolio against changes in interest rates and inflation. Technically speaking, a high correlation exists between changes in interest rates and the net present value (NPV) of pension liabilities. In other words, if the duration of a pension plan’s liabilities is 20 years and its NPV is $100 million, then it is expected that, for every 1% increase in interest rates, a 20% decrease in the NPV of the plan’s liabilities (or $20 million) will likely follow.

Roles Infrastructure Can Play in a Portfolio
As a corollary to the various aspects of infrastructure depending on the philosophy and management focus of GPs, investors can also choose different roles for the asset class in their portfolios, depending on their risk/return targets. We list below a summarized rationale for each of the potential allocation buckets that can be filled or complemented by infrastructure investments:

- **Private equity:** An investor interested in the potentially higher payouts that are more common to growth (or greenfield) infrastructure may see a J-curve-like profile of cash flows that resemble that of private-equity investments, where returns tend to be low or negative in early years. In this scenario, investment profits tend to rise as the asset matures and/or gains are realized (i.e., through the partial or complete sale of the asset).5

- **Fixed income:** Some investors compare infrastructure to fixed income because many types of investment in the asset class produce relatively steady cash flows and relatively high yields with extended fixed-term contract periods.

- **Real estate:** Certain infrastructure investments can also be grouped with real estate, as they mainly deal with real assets that offer stable and income-oriented returns.

- **Inflation-linked investments:** Some large public pension plans, for example, are practitioners of this approach. When a plan places infrastructure investments in an inflation-linked bucket, existing infrastructure investments are reclassified from their previous allocations in private equity, real estate and fixed income. Traditionally, investors do this to capture both the protection from inflation and the diversification benefits that these types of investments can provide, similar to our description earlier in this section.

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The Growing Infrastructure Opportunity Set

We believe that the current opportunity for infrastructure is strong, and see tactical exposure to the asset class as a potential long-term benefit for investors. Our rationale is anchored on both secular and cyclical trends.

From a secular perspective, we believe that infrastructure investment overall has not kept pace with economic growth. As a result, we expect urbanization and modernization to be the main global infrastructure drivers. The American Society of Civil Engineers, for example, estimates that roughly $2.2 trillion will be required to update the US infrastructure system alone over the next five years.6

Further, we believe that world governments have relatively limited resources—especially after the Great Recession—and restricted ability to raise both debt and/or taxes. We believe that this situation is likely to continue for some time, as we do not expect recent government stimulus packages to be enough to fill the global infrastructure financing needs. Further, burgeoning government deficits may spur privatization as governments sell assets to cover budget shortfalls.

In this light, we argue that the growing demand created by expected capital needs—vis-à-vis the expected limited public capital—opens an attractive window of opportunity for private investors contemplating infrastructure.

From a cyclical perspective, we believe that infrastructure is coming off of a difficult year in 2009 because, like private equity, the asset class tends to ebb and flow with the availability of leverage and credit. Yet, despite the recent reduction in the use of leverage to finance acquisitions, we believe that long-term potential returns for the asset class remain attractive due to the current discounted value of most assets.

Deal flow, however, has been relatively low. Infrastructure investors completed 130 deals in 2009, the lowest annual total since 2005. Europe led the flow with 79 deals completed; North America followed with 25, while the rest of the world accounted for the remaining 26 deals.7

In our view, managers appear to be particularly focused on Europe and the US, as a number of GPs have found that monetizing their investments in emerging markets and Asia has proven more difficult than originally thought.

Certain sectors are more attractive in different geographies largely because governments vary widely in their attitudes towards privatization. In the US, power generation is generally privately held while public transportation is in the hands of the state. In Europe the opposite is true. Privatization of energy assets is beginning to take place in Europe, while first steps have been taken in the US to privatize certain transportation assets with mixed results so far. Thus, having a global scope is a key strength for successful infrastructure investors.

Additionally, we believe that both private-to-private as well as public-private partnerships provide opportunities for investors. Display 4 shows a sampling of the range of global opportunities across infrastructure sectors.

Display 4: Global Infrastructure Opportunities Span Across Sectors

<table>
<thead>
<tr>
<th>Biggest Drivers</th>
<th>Potential Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Renewables</strong></td>
<td>Wind</td>
</tr>
<tr>
<td>Diversification of energy sources</td>
<td></td>
</tr>
<tr>
<td>Abundance of natural resources</td>
<td></td>
</tr>
<tr>
<td>“Green” importance</td>
<td></td>
</tr>
<tr>
<td><strong>Transport</strong></td>
<td>Roads</td>
</tr>
<tr>
<td>Increase in users</td>
<td></td>
</tr>
<tr>
<td>Increase in economic activity</td>
<td></td>
</tr>
<tr>
<td>Lack of public funding</td>
<td></td>
</tr>
<tr>
<td><strong>Water</strong></td>
<td>Water utilities</td>
</tr>
<tr>
<td>Increase in water usage</td>
<td></td>
</tr>
<tr>
<td>Limited water resources</td>
<td></td>
</tr>
<tr>
<td>Required upgrades</td>
<td></td>
</tr>
<tr>
<td><strong>Energy</strong></td>
<td>Power plants</td>
</tr>
<tr>
<td>Supply-demand imbalance</td>
<td></td>
</tr>
<tr>
<td>Regulatory changes</td>
<td></td>
</tr>
<tr>
<td>Inadequate transmission capacity</td>
<td></td>
</tr>
</tbody>
</table>

Source: Credit Suisse Asset Management


7 Jacobius, Arleen, Infrastructure Deal Total at 4-Year Low, Jan. 27, 2010, Pensions and Investments
Our Theory in Action

We have developed a case study to illustrate the impact of two different types of infrastructure allocations in a representative institutional portfolio. The first type shows the impact of exposure to publicly listed infrastructure investments on the portfolio. We have used the Macquarie Global Infrastructure Total Return Index as a proxy for infrastructure exposure due to the scarcity of data from private infrastructure investments. As noted previously, this index covers a broad swath of infrastructure and attempts to represent all investable stocks worldwide. The risk/return profile of the Macquarie index therefore covers a mix of brownfield/greenfield types of investments.

The second infrastructure investment is a customized mix of funds that approximates the impact of an investment in infrastructure with a growth tilt. In this customized portfolio, we used a hypothetical equal-weighted investment in three sectors from infrastructure—airports, ports and energy.

As shown in Display 5, we started from a representative institutional pension portfolio with an allocation of 43% to equities, 24% to fixed income and 33% to alternatives. For the sake of this example, we called this portfolio A. The next step was to incrementally add infrastructure to the original portfolio to create portfolios B, C and D.

The results in Display 5 illustrate that the representative portfolios become slightly more efficient on a return-per-unit-of-risk basis as both public and customized infrastructure investments were incrementally added. We started off with an infrastructure allocation to portfolio B of 2.5%, which we achieved by reducing the non-US equities portion by that amount. Replacing this fairly modest piece of the equity allocation resulted in the portfolio returns remaining unchanged at 8.8%, while volatility fell by 20 bps from 11.7% to 11.5%. The inclusion of infrastructure improved the portfolio’s efficiency, as risk was lowered without sacrificing potential returns.

In portfolio C, we increased the allocation up to a 5% investment to infrastructure (also reallocated from non-US equities). In this case, returns were again not affected and volatility was reduced by another 10 bps to 11.4%, potentially further tamping down market risk.

Display 5: Adding Infrastructure to an Institutional Portfolio Improves Return per Unit of Risk

For illustrative purposes only. Forward-looking statements subject to a number of risks and uncertainties. Source: Credit Suisse Asset Management

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8 Please see “Important Information Regarding Performance” section at the end of this paper for a description of the indices used as proxies for the asset classes in this display.
Finally, we kept the same 5% allocation to infrastructure in portfolio D as we did in portfolio C, but this time added a 5% allocation to the customized airport/ports/energy portfolio. The results showed that expected returns increased by 30 bps to 9.1%, while volatility was reduced by 40 bps. In this case, we reduced US and non-US equities, each by 5%, to make room for infrastructure. This particular tilt may not be right for all investors, but the positive impact of infrastructure on the portfolio’s efficiency appears clear, with the return-per-unit-of-risk (also known as Sharpe ratio) increasing from 0.75 to 0.80.

The efficient frontier chart in Display 6 shows another illustration of the diversification benefits of adding infrastructure to the portfolio. Including a customized infrastructure bucket resulted in a further shift of the efficient frontier, allowing for higher potential returns for the same amount of risk.

### Conclusion

Due to its low correlations to other asset classes, we believe infrastructure can be a meaningful diversifier for sophisticated investors seeking to potentially improve risk-adjusted returns in their portfolios. Our case study showed incremental improvement in the efficiency of the portfolios as infrastructure investments were added to the base case. We also believe that the asset class’s risk/return characteristics could help pensions mitigate duration risk, due to the long-term nature of many of the sub-asset classes, as well as the return streams associated with certain types of infrastructure. The asset class’s potential to mitigate the impact of inflation on portfolios has also been a driver of investor interest, particularly as government responses to the Great Recession have triggered concerns that central bank policies and stimulus-aid packages may engender rising inflation and higher interest rates in the future. Different types of infrastructure projects can offer different financial characteristics and risk profiles, and it behooves investors to choose those types of assets that have the characteristics and risk/return profiles that will best fit their specific portfolio needs.

We see a growing opportunity set as the dilapidated state of global infrastructure suggests an increasing need for investment, which may help boost the asset class’s long-term returns. Lastly, the current discounted value of many assets is likely to keep the long-term potential returns of the asset attractive and help offset the recent reduction in the use of leverage to finance acquisitions. As is the case with traditional private equity, we see manager selection and sharp due diligence skills as critical success factors in creating a top-performing infrastructure portfolio.

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For illustrative purposes only. Based on historical data using the same asset classes (and proxies) described in Display 5.

Source: Ibbotson, Credit Suisse Asset Management
In Search of Liquidity and Transparency: Managed Accounts, Single Investor Funds and Custom Portfolios
October 2009—Investor interest in managed accounts has grown. This paper outlines four investment structures which may offer investors a range of solutions for greater liquidity and transparency in their hedge fund investments.

Preparing for Inflation – Is It Too Early to Position Your Portfolio?
September 2009—As governments continue to implement stimulus programs, some investors worry about potential future inflation. Positioning your portfolio for increasing inflation before it strikes is critical.

Equity Market Neutral – Diversifier Across Market Cycles
September 2009—The correlation of alternative investments to overall broad markets in 4Q 2008 has made investors aware that achieving diversification in volatile environments is more difficult than previously assumed. This paper examines the role that the Equity Market Neutral strategy can play in an alternatives portfolio, as it was one of the few strategies that remained uncorrelated to other asset classes during the 4Q 2008 market dislocation.

Capitalizing on Any Curve: Clarifying Misconceptions About Commodity Indexing
September 2009—One of the most common misconceptions regarding commodity index investing is that, over the long term, investors will profit if a market is in "backwardation" (downward sloping futures curve) and will lose money if a market is in "contango" (upward sloping futures curve). In this paper, we attempt to explain how investors can capitalize on their commodity index investments regardless of the shape of the futures curve, and can invest in the asset class whether the market is in backwardation or contango.

Convertible Arbitrage: Switching Gears
May 2009—Convertible Arbitrage went from being one of the worst-performing strategies in the Credit Suisse/Tremont Hedge Fund Index in 2008, to one of the best-performing strategies in 2009. This paper discusses the strategy’s ability to generate positive returns both during the declines in equity markets in January and February 2009, as well as during the global market rallies later in the year.

The views and opinions expressed within these publications are those of the authors, are based on matters as they exist as of the date of preparation and not as of any future date, and will not be updated or otherwise revised to reflect information that subsequently becomes available or circumstances existing, or changes occurring, after the date hereof.

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Important Information Regarding Performance

1. Description of Modeling

Deriving Long-Term Asset Class Expectations:

- Targeted Returns and Expected Risk refer to long term assumptions (5 years) on market indices which are considered representative of each asset class.

To derive these expectations, the Investment Strategies and Solutions team (ISS) relies on a quantitative approach that is built on the following precepts:

- Consistency with economic theory and practice: an array of economic and market factors are combined in order to derive return targets for each asset class.
- Consistency across business cycles: Macroeconomic factors are chosen for their ability to explain returns over multiple economic cycles.
- Consistency across asset classes: Target returns reflect congruent pricing of risk, measured by the exposure of each asset class to economic and financial factors.
- Capture dynamic market features: Interaction between economic and financial signals and the variations in asset classes’ potential returns and risks over time.

Factors Considered:

- Long-term economic forecasts anchored to potential growth are derived from a production function linking input and output variables of an economy.
- The short end of long-term forecasts reflects macroeconomic forecasts for the long term based on a demand-side approach.
- A fair-value-model approach is used based on long-term macroeconomic factors for our interest-rate forecasts. Also, countries’ regression equations are estimated simultaneously with a Three-Stage-Least-Squares (3SLS) procedure.
- Non-credit-related indices (government bond indices) are modeled as a function of a time trend, GDP and CPI indices using an error-correction framework. Credit-related indices are modeled as a function of a time trend, pure credit and government bond total-return indices, as well as equity volatility.
- Target returns for equities are estimated using a variant of the Gordon Growth model, which includes a mean-reversion component for the P/E ratio.
- In order to forecast commodity index and other alternative assets returns, a multiple linear-regression model is employed.

Methodology:

- In addition to the econometric model, we apply a scoring model as a consistency check and for scenario analysis.
- Relation to other asset classes are established using a stepwise regressive approach.
- In-sample and out-of-sample forecasts are made and residuals reviewed for consistency.
- Results provide relationship in terms of systemic risk.
- Expectations are then derived using a building block approach.
- Analyses are conducted in real terms.
- GARCH approach is used to model volatility.

There are limitations inherent in our model results. These results do not represent actual trading and they may not reflect the impact that material economic and market factors might have on the ISS decision-making process. Risks and limitations of our approach could consist in: Asset classes or indices may not reach the results described above, or may experience different behavior than forecasted as macroeconomic and financial conditions can change rapidly.

Some of these asset classes are not suitable for every investor, as they may involve a high degree of risk, and may be appropriate investments only for sophisticated investors who are capable of understanding and assuming the risks involved.

- The investment strategy described herein may limit the upside potential of your investments.
- The investment strategy described herein does not provide for a downside protection therefore the investor remains exposed to losses in their investments.

The investment strategy described herein relies on proprietary models and predictions with regard to the performance of an asset class or particular investment generated by these models, and may not be accurate because of imperfections in the models, their deterioration over time, or other factors, such as the quality of the data input into the model, which involves the exercise of judgment. Even if the model functions as anticipated, it cannot account for all factors that may influence the prices of the investments, such as event risk.

Investing entails risks, including possible loss of some or all of the investor’s principal.
2. Historical Data Input for Modeling

Past performance does not guarantee future results.

Historical data period covered 7/31/00 (earliest available Macquarie Global Infrastructure Total Return Index data) to 11/30/09. All data ends on September 30, 2009 for consistency because that was the last available date for some indices. Asset class-driven data was modeled using the following indices:

- **US Equities:** S&P 500 – Value weighted index published since 1957 of the prices of 500 large-cap common stocks actively traded in the United States.
- **Non-US Equities:** MSCI EAFE – is a free float-adjusted market capitalization index that is designed to measure the equity market performance of developed markets, excluding the US & Canada.
- **Global Bonds:** J.P. Morgan GBI Global index – Measures the total return from investing in 13 developed government bond markets – Australia, Belgium, Canada, Denmark, France, Germany, Italy, Japan, Netherlands, Spain, Sweden, UK, and US.
- **Commodities:** Goldman Sachs Commodities Index – A Benchmark for investment performance in the commodity markets calculated primarily on a world production-weighted basis and comprised of the principal physical commodities that are the subject of active, liquid futures markets.
- **Private Equity:** LPX50 Value Weighted Total Return Index – A value-weighted index for the 50 largest and most liquid listed private equity companies worldwide.
- **Hedge Funds:** Credit Suisse/Tremont Hedge Fund Index – An asset weighted hedge fund index comprised of data representing more than 4500 hedge funds.
- **REITs:** FTSE NAREIT All REITs – Equity index covers publicly listed REITs in North America.
- **Inflation-Linked Bonds/US TIPS:** US Government Inflation-linked Bond Index – Measures the performance of the US TIPS market. It is the largest market in the Barclays Global Inflation-Linked Bond Index. Inflation-linked indices include only capital indexed bonds with a remaining maturity of one year or more.
- **Cash:** USD 3-month LIBOR – filtered average of rates charged by banks for unsecured, 90-day loans to other banks. LIBOR stands for London Interbank Offered Rate and is compiled and broadcasted by the British Bankers’ Association (BBA)
- **Global Infrastructure:** Macquarie Global Infrastructure Index – Index designed to reflect the stock performance of companies within the infrastructure industry, principally those engaged in the management, ownership and or operation of infrastructure and utility assets.
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