

**STOXX**

# STRATEGY INSIGHT

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**"All things flow, nothing abides."**

– Heraclitus (c. 535 BC – 475 BC)

## OVERVIEW

### GLOBAL INFRASTRUCTURE LURES INSTITUTIONAL INVESTORS AS AN ATTRACTIVE ASSET FOR PORTFOLIO DIVERSIFICATION. INFRASTRUCTURE INVESTMENTS CAN MATCH PENSION FUNDS' LIABILITY-DRIVEN INVESTMENTS AND PROVIDE DURATION AND INFLATION-SENSITIVITY HEDGING.

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The demand for additional global infrastructure investment reflects a growing pattern, primarily determined by demographic and economic drivers as well as political trends. According to economic forecasts by Global Insight, S&P calculates a total gap between investment needs and available public funds of USD8.4 trillion by 2030, corresponding to an annual gap of USD500 billion in global infrastructure requirements, which private investors have an opportunity to plug.

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Global infrastructure spending is expected to receive a boost by the recent G20 leaders' initiative to establish a global infrastructure hub with a four-year mandate and the World Bank Group's global infrastructure facility, which is expected to complement the G20's infrastructure initiative.

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A strategic portfolio exposure to the STOXX Global Broad Infrastructure TR Index would have rewarded long-term investors. The STOXX Global Broad Infrastructure TR Index performed better than a number of market indices in return/risk terms by limiting drawdowns and posting considerably less volatility in annualized terms.

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The inclusion of the STOXX Global Broad Infrastructure Index in a mean-variance optimized portfolio of diversified assets shows an enhancement of the return/risk profile along the efficient frontier, for both the constrained and unconstrained versions.

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With a longer-term time horizon, taking into account expected investor allocations, the outlook for infrastructure is very positive. The results of the Preqin Investor Interviews—December 2014 show that a significant 40% of the surveyed investors plan to increase their allocation to infrastructure in 2015 compared to the current level.

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## 1 GLOBAL INFRASTRUCTURE

With this first edition of the *Strategy Insight Report*, STOXX intends to offer an independent asset-allocation perspective on relevant investment themes. The report aims to lead intelligence on market trends and provide thoughtful insight on portfolio-allocation strategies into selected STOXX indices.

### » RISK FACTORS

- PROJECT BONDS MARKET, LIMITED ISSUANCE OF PROJECT FINANCE CAPITAL MARKET DEBT, ILLIQUIDITY FACTORS, GOVERNMENT INTERFERENCE AND POLITICAL RISK, GREENFIELD PROJECTS, REGULATION (INSURANCE COMPANIES' RISK CAPITAL CHARGES UNDER SOLVENCY II, BANKS' DIMINISHED APPETITE FOR RELATIVELY ILLIQUID ASSETS UNDER BASEL III), CREDIT MARKET CONDITIONS AND DEFAULT RATES

### » RISK LEVEL

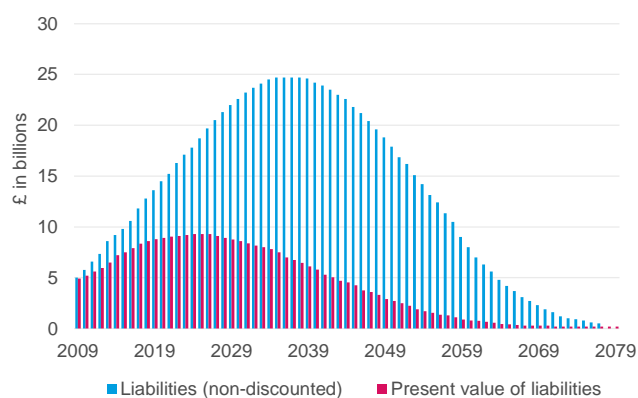
- LOW (US, UK, ASIA PACIFIC DEVELOPED)
- MEDIUM (EUROPE ex UK)
- MEDIUM TO HIGH (EMERGING ECONOMIES)

Infrastructure is a term that refers to a variety of fixed assets (*economic* infrastructure) used in transportation, energy, telecommunications and services, as well as to the systems and facilities needed to support the social and economic activities of a society (the so-called *social* infrastructure).

However, as an asset class, infrastructure appears to lack a proper definition that is widely recognized<sup>1</sup>.

As pension funds increasingly take into account correlation drivers in their factor-based asset-allocation modeling, infrastructure investment is more and more considered by institutional investors as an attractive asset for portfolio diversification. Infrastructure is widely considered as a liability-matching asset class as pension funds have access to a limited pool of 'matching assets' that generate long-dated uncorrelated inflation-linked returns. Infrastructure investments can match pension funds' liability-driven investments and provide duration and inflation-sensitivity hedging, since they can generate long-term cash flow and, for inflation-linked infrastructure assets, hedge the portfolio against the cost of paying inflation-protected pensions.

FIGURE 1 TYPICAL PENSION FUND LIABILITY SCHEDULE



Source: Credit Suisse

The demand for additional global infrastructure investment reflects a growing pattern, primarily determined by demographic and economic drivers as well as political trends. At the macro level, the key drivers of infrastructure investing reflect the following: growth in population, impact of a rising middle class

<sup>1</sup> Inderst, Georg, "Infrastructure as an Asset Class," EIB Papers, Volume15 (1), 2010.

in emerging economies, GDP-per-capita growth rates, stimulus to growth of infrastructure investment and climate change and sustainability. According to OECD estimates, infrastructure investment will average 3.5% of global GDP for 2015.

Three main categories of infrastructure investments can be identified: volume-driven assets whose fundamentals are tied directly to output and more indirectly to macroeconomic conditions; regulated companies, mainly in the utilities sector, whose revenues are explicitly linked to formal regulatory regimes; and contracted assets with a significant percentage of revenues tied to long-term contracts.

S&P's ratings service estimates that the current average infrastructure investment by governments globally stands at about 3% of GDP. With the world economy set to grow to USD122 trillion by 2030 from around USD70 trillion today, according to economic forecasts by Global Insight, S&P calculates a total gap between investment needs and available public funds of USD8.4 trillion by 2030. This corresponds to an annual gap of USD500 billion in global infrastructure requirements, which private investors have an opportunity to plug. In this context, as new capital

and liquidity rules under the Basel III framework decrease banks' appetite for more illiquid assets such as project finance, institutional investors can play a greater role. Further, in Europe, infrastructure loans have experienced a significant cutback in volume as governments cope with tight budgets under stringent fiscal rules on the path to recovery from the recent financial crisis. In this context, we might expect that an increased interest by institutional investors will likely sustain the growth of project finance capital market debt.

The OECD has estimated that less than 1% of pension funds worldwide are invested in infrastructure projects, excluding indirect investment in infrastructure via stocks of listed utility and infrastructure companies. Generally speaking, large institutional investors prefer to co-invest in brownfield (existing) projects to minimize potential risks and gain a better match against their long-term liabilities. Thus, support of governmental institutions to ensure that segments of the risks are properly managed and shielded is critical to guarantee that greenfield (new) projects see the light and attract institutional investors' interest.

FIGURE 2 FIVE TOP PENSION PLANS' INVESTMENT IN INFRASTRUCTURE BY CURRENT ALLOCATION (DECEMBER, 2013–AUSTRALIAN SUPER AT JUNE, 2014)

Rank	Investor	Type	Location	Current allocation (bln USD)	Current allocation (AUM %)
1	OMERS	Public pension plan	Canada	12.76	20.4
2	Ontario Teachers' Pension Plan	Public pension plan	Canada	11.04	8.3
3	National Pension Service	Public pension plan	South Korea	10.94	2.7
4	CPP Investment Board	Public pension plan	Canada	10.66	5.6
5	Australian Super	Superannuation scheme	Australia	7.35	10.0

Source: STOXX calculation on annual report data

According to the 2015 Preqin Global Infrastructure Report, investors' allocations to the asset class trended higher for the 2011-2014 period. The average allocation of investors to infrastructure rose from 3.5% for 2011 to 4.3% for 2014, with the average target allocation rising from 4.9% to 5.7% for the same period. Preqin estimates that allocations to

infrastructure are likely to continue to grow in coming years, with 67% of investors planning to increase their allocation to infrastructure with a longer time horizon.

Institutional investors' interest in infrastructure is evident from recent activities by pension funds. In Canada, local pension funds have tripled their exposure to infrastructure since 2010. In November,

2011, a new platform in the UK—the Pensions Infrastructure Platform Ltd (PIP)—to support pension funds' investing in infrastructure projects secured ten funds as founding investors and reached GBP1 billion of investment capital. The ten founding members are British Airways Pension Scheme, BAE Systems Pension Funds, BT Pension Scheme, Lloyds TSB, London Pension Fund Authority (LPFA), National Association of Pension Funds (NAPF), Pension Protection Fund, The Railways Pension Scheme, Strathclyde Pension Fund and West Midlands Pension Fund. With a target size of GBP2 billion, the PIP is expected to invest on an availability basis in core infrastructure and in projects that are free of construction risk to avoid excessive GDP risk. Investments will be inflation-linked, and the fund is seeking long-term cash returns of RPI +2% to 5%. At the end of Q3 2014, PIP had nearly a third of a billion pounds' worth of investments committed to its first appointed investment manager, with over GBP200 million of this already funding 41 separate infrastructure assets. The PIP's reputation was negatively impacted when in 2013 three of the original founding pension plans pulled out of the platform. The London Pensions Fund Authority (LPFA) along with BAE Systems Pension Funds and BT Pension Scheme left the PIP, arguing that its cost structures no longer matched their own requirements.

Also in the UK, six large insurers announced recently they will invest GBP25 billion in the British government's national infrastructure plan over the next five years.

Similarly, UK local authority pension schemes made infrastructure investment their top asset allocation for 2014. According to MandateWire, for the period Jan. 1, 2014-Dec. 1, 2014, ten local-authority pension schemes awarded 15 separate infrastructure mandates, with two water supply companies handing out two more infrastructure briefs. Most of these mandates, worth a total of GBP680 million, were for infrastructure equity investment.

Proposals to stimulate global infrastructure spending announced by the G20 in Brisbane before the end of November last year have had a positive reception. In setting the ambitious goal to lift the G20's GDP by at least an additional 2% by 2018, the G20 leaders' communiqué stressed how "tackling global

investment and infrastructure shortfalls is crucial to lifting growth, job creation and productivity." To support the global infrastructure initiative, the G20 leaders agreed to establish a global infrastructure hub with a four-year mandate. In its original concept, the hub should contribute to developing a knowledge-sharing platform and a network between governments, the private sector, development banks and other international organizations. In addition, to attract more private-sector investment in developing countries, the G20 leaders welcomed the launch of the World Bank Group's global infrastructure facility, which is expected to complement the G20's infrastructure initiative. Bertrand Badré, who is leading the World Bank Group's global infrastructure facility, has recently pointed out that despite a number of governments having made infrastructure investing a priority, banking regulations have caused banks to stay away from emerging-markets infrastructure and favor short-term, lower-risk credits. As a consequence, emerging-market lending at the end of 2013 dropped more than 19% compared to the previous year's reading, from USD186 billion for 2012 to USD 150 billion for 2013.

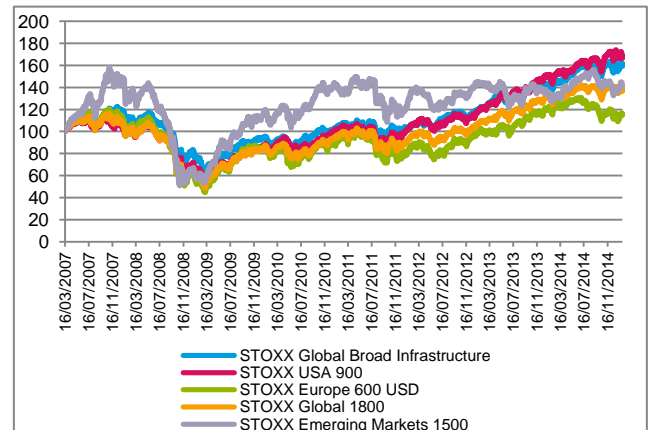
Market participants argue that increased involvement by institutional investors in infrastructure is essential, with an estimated USD57 trillion needed by 2030 to finance energy, water, transportation and social projects globally, according to McKinsey.

In Europe, the recently unveiled EUR315-billion plan from Jean-Claude Juncker to counter a scenario of faltering European economic growth by pumping investment into infrastructure has received a generally positive reception. The European Fund for Strategic Investment will receive seed money, including EUR16 billion from the EU's existing budget and EUR5 billion from the European Investment Bank. The seed money will come in the form of guarantees and will be used to raise private funding that will be invested in higher-risk projects. The vehicle that will be set up to drive infrastructure investment in Europe reflects the concept of European long-term investment funds (Eltifs). Eltifs were designed to facilitate investment into asset classes that are too illiquid to be served by existing fund structures such as Ucits, which must offer investors the chance to exit at least twice a month.

Through its Global Broad Infrastructure Index, STOXX offers investors the opportunity to access the infrastructure sector globally. The Infrastructure Index includes the largest companies, according to their free-float market cap. STOXX relies on the analysis by Revere Data LLC, a supply-chain analysis specialist, to properly identify companies eligible for the index. All companies are subject to a minimum liquidity threshold and need to earn at least 50% of their revenue from the infrastructure industry, which is divided into five supersectors and 17 subsectors. The index decreases the risk of supersector and geographic concentration by capping countries at 40% and supersectors at 30%.

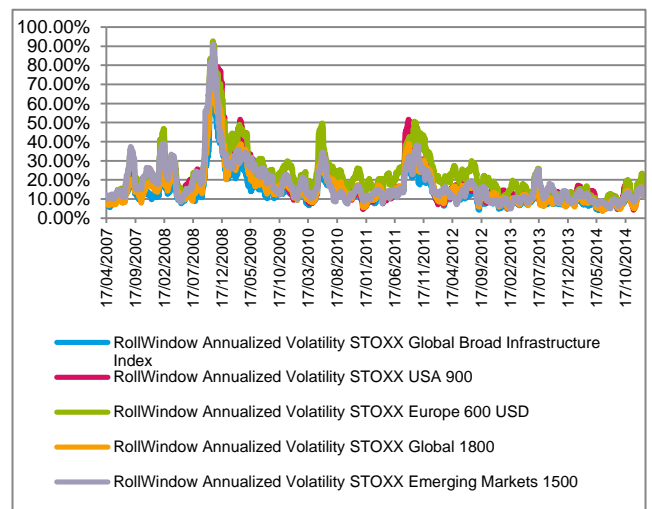
Infrastructure investment continues to deliver healthy performance over short- and longer-term time horizons. For various performance periods (at the Jan. 30, 2015, close), including year to date, three months, six months, overall 2014, three years and since the rebase of the time series on Mar. 16, 2007, the STOXX Global Broad Infrastructure Gross Return Index outperformed in absolute terms and in comparison to the main global, European and emerging stock market indices. The STOXX Global Broad Infrastructure Index only underperformed the STOXX Emerging Markets 1500 year to date at the end of January, 2015. Also, it outperformed the STOXX USA 900 year to date at the end of January, 2015, while it underperformed the same index for the remaining performance periods. In USD terms, it returned a negative 0.19% year to date at the end of January; 0.31% and minus 1.13%, respectively, for the three-month and six-month periods ended Jan. 30, 2014; a solid 11.28% for the whole of 2014 and remarkable 53.04% and 59.50% returns over the three-year period and since the rebase of the time series on Mar. 16, 2007, respectively. Year to date at the end of January, the STOXX Global Infrastructure TR Index outperformed the STOXX USA 900 TR Index by 255 basis points (bps) and the STOXX Global 1800 TR Index by 144 bps.

FIGURE 3 STOXX GLOBAL BROAD INFRASTRUCTURE VS. SELECTED STOXX INDICES – INDEXED PERFORMANCE (REBASED AT MAR. 16, 2007-JAN. 30, 2015)



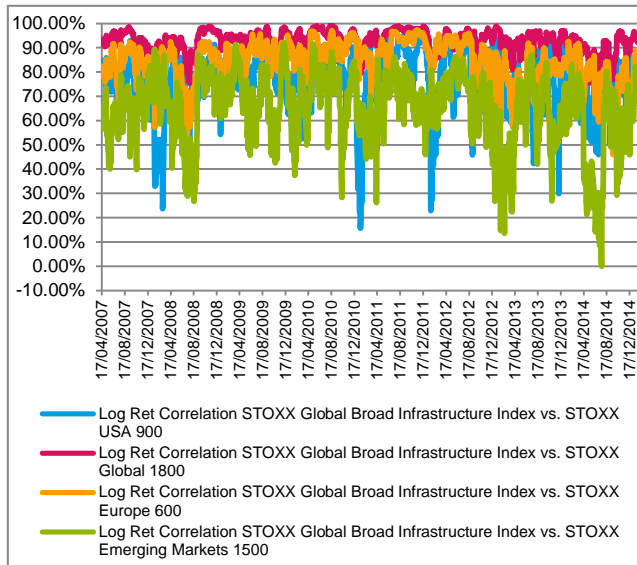
Source: STOXX

FIGURE 4 STOXX GLOBAL BROAD INFRASTRUCTURE VS. SELECTED STOXX INDICES–20-DAY ROLLING WINDOW ANNUALIZED VOLATILITY (APR. 17, 2007-JAN. 30, 2015)



Source: STOXX

FIGURE 5 STOXX GLOBAL BROAD INFRASTRUCTURE VS. SELECTED STOXX INDICES—20-DAY ROLLING WINDOW LOG-RETURN CORRELATION (APR. 17, 2007-JAN. 30, 2015)



Source: STOXX

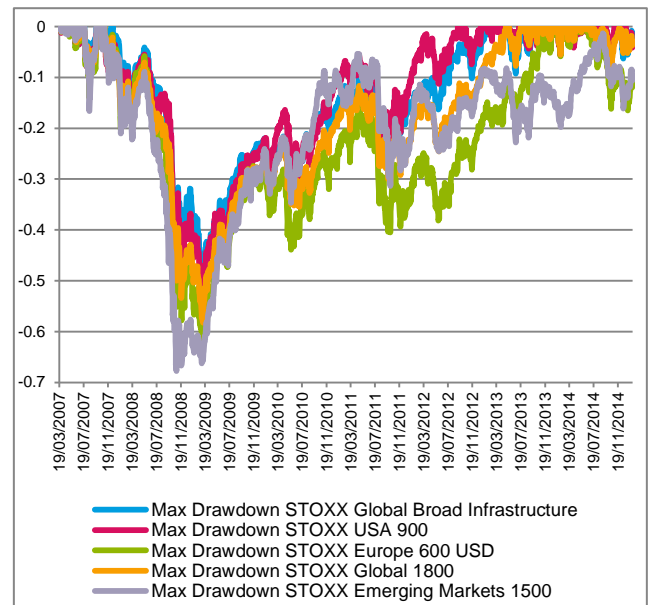
An analysis of performance corrected for risk showed that for 2014 overall, the STOXX Global Broad Infrastructure Gross Return Index performed better than the market indices in return/risk terms by limiting drawdowns and posting considerably less volatility in annualized terms. Among others, for 2014 in annualized USD terms it posted a better return/risk profile than the STOXX USA 900, the STOXX Europe 600, the STOXX Global 1800 and the STOXX Emerging Markets 1500 Index to the tune of 21 bps, 171 bps, 69 bps and 123 bps, respectively. As expected, for the overall period since the rebase of the index on Mar. 16, 2007, the STOXX Global Broad Infrastructure Gross Return Index posted a drawdown lower than the indices considered in the return/risk analysis above. The table below shows the annualized return/risk and drawdown readings for the various STOXX indices analyzed.

FIGURE 6 STOXX GLOBAL BROAD INFRASTRUCTURE VS. SELECTED STOXX INDICES—RETURN/RISK ANNUALIZED AND MAX DRAWDOWN

	STOXX Global Broad Infrastructure	STOXX USA 900	STOXX Europe 600 USD	STOXX Global 1800	STOXX Emerging Markets 1500	
Return/Risk Annualized - 2014		1.27	1.07	-0.44	0.58	0.05
Max Drawdown Mar. 16, 2007-Jan. 30, 2015		-50.26	-54.80	-62.76	-58.23	-67.76

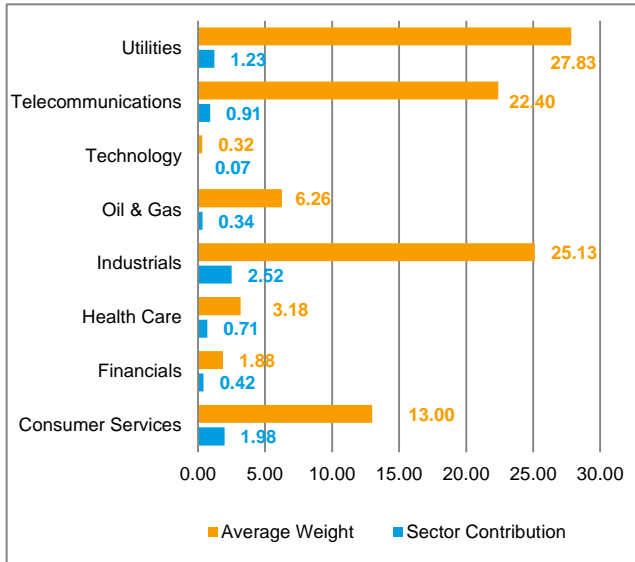
Source: STOXX

FIGURE 7 STOXX GLOBAL BROAD INFRASTRUCTURE VS. SELECTED STOXX INDICES - MAX DRAWDOWN (MAR. 19, 2007-JAN. 30, 2015)



Source: STOXX

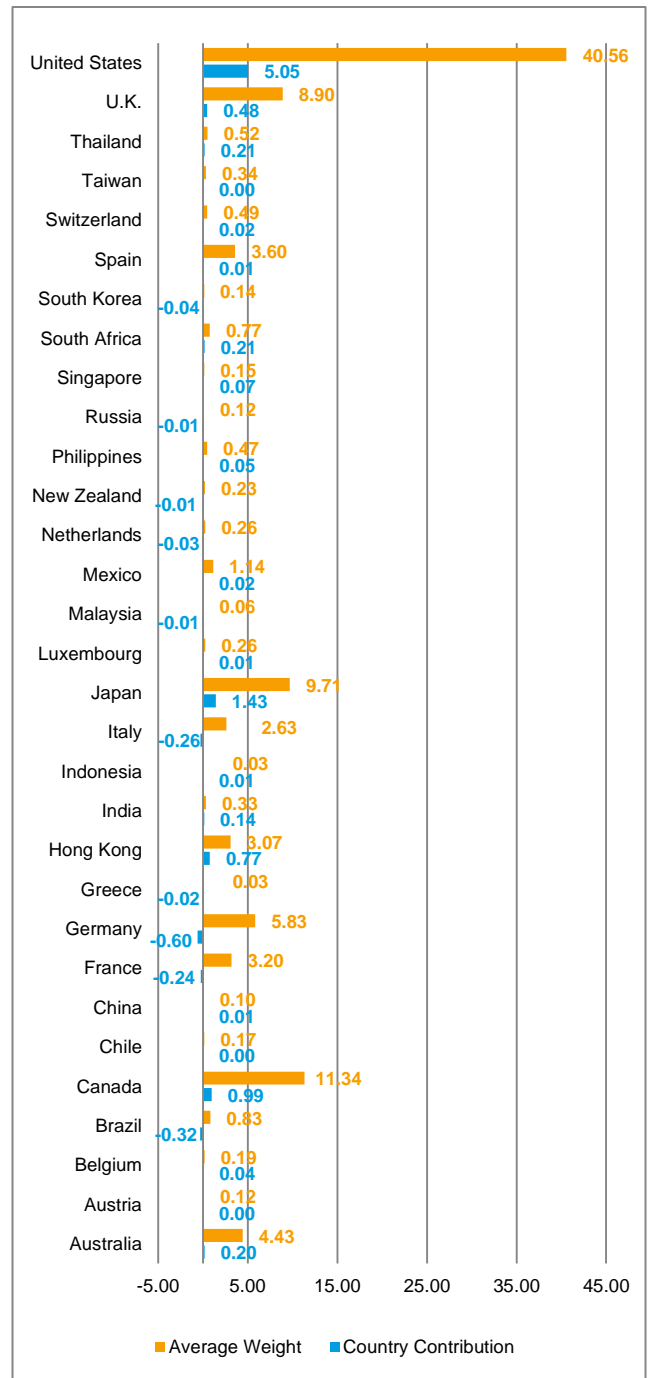
FIGURE 8 STOXX GLOBAL BROAD INFRASTRUCTURE-INDUSTRY SECTOR PERFORMANCE CONTRIBUTION (DEC. 31, 2013-JAN.23, 2015)



Source: STOXX

In performance attribution terms, returns of the STOXX Global Broad Infrastructure price index for the period Dec. 31, 2013- Jan. 23, 2014 were sustained the most by the Industrials sector (+2.52%). Consumer Services (+1.98%) and Utilities (1.23%) were the runners-up. Technology (+0.07%), only bettered by Oil & Gas (+0.34%), bottom performed for the same period. At country level, U.S. (+5.05%) held the top spot in the performance contribution league table, with Japan (+1.43%) ranking in the second place.

FIGURE 9 STOXX GLOBAL BROAD INFRASTRUCTURE-DOMICILE COUNTRY PERFORMANCE CONTRIBUTION (DEC. 31, 2013-JAN.23, 2015)



Source: STOXX



The correlation matrix below has been structured to include, in the upper diagonal, the correlation coefficients for the overall period since the rebase of the index on Mar. 16, 2007 and, in the lower diagonal, the correlation coefficients for the one-year period at the end of January, 2015. Generally speaking, the correlation coefficients between the STOXX Global Broad Infrastructure Index and the selected STOXX Indices considered in the analysis showed a decline in

the one-year period, compared with the readings for the overall period. Nonetheless, although easing from historical highs, the positive correlation between the STOXX Global Broad Infrastructure Index and the STOXX Global 1800 stood at a significant level for the one-year period ended Jan. 30, 2015 (0.91, down from 0.95 for the period started on Mar. 16, 2007).

FIGURE 10 STOXX GLOBAL BROAD INFRASTRUCTURE VS. SELECTED STOXX INDICES—CORRELATION MATRIX (UPPER DIAGONAL: MAR. 16, 2007–JAN. 30, 2015; LOWER DIAGONAL: JAN. 30, 2014–JAN. 30, 2015)

	CORRELATION MATRIX				
	1 year (lower diagonal) and overall period (upper diagonal) to Jan. 30, 2015				
	STOXX EMERGING MARKETS 1500	STOXX EUROPE 600 USD	STOXX GLOBAL 1800	STOXX GLOBAL BROAD INFRASTRUCTURE	STOXX USA 900
STOXX EMERGING MARKETS 1500	1	0.73	0.73	0.71	0.46
STOXX EUROPE 600 USD	0.55	1	0.88	0.87	0.60
STOXX GLOBAL 1800	0.55	0.80	1	0.95	0.88
STOXX GLOBAL BROAD INFRASTRUCTURE	0.58	0.78	0.91	1	0.80
STOXX USA 900	0.33	0.51	0.89	0.76	1

Source: STOXX calculations

Also, the inclusion of the STOXX Global Broad Infrastructure Index in a mean-variance optimized portfolio of diversified assets (where proxy indices are representative of the various asset classes) shows an enhancement of the return/risk profile along the efficient frontier for both the constrained and unconstrained versions. In particular, for a level of standard deviation at 5.60%, the expected return in the constrained version adding the asset class global infrastructures to the risky portfolio totaled 200 bps. The constrained optimization cap the allocation to individual proxy indices at 30%. Negative (short) positions have been ruled out in the search for efficient portfolios. The calculation of expected returns in US dollar terms, as well as the input of the covariance matrix, were based on historical returns for the three-year period ended Dec. 31, 2014.

The asset classes and their respective proxy indices that were considered in the portfolio optimization

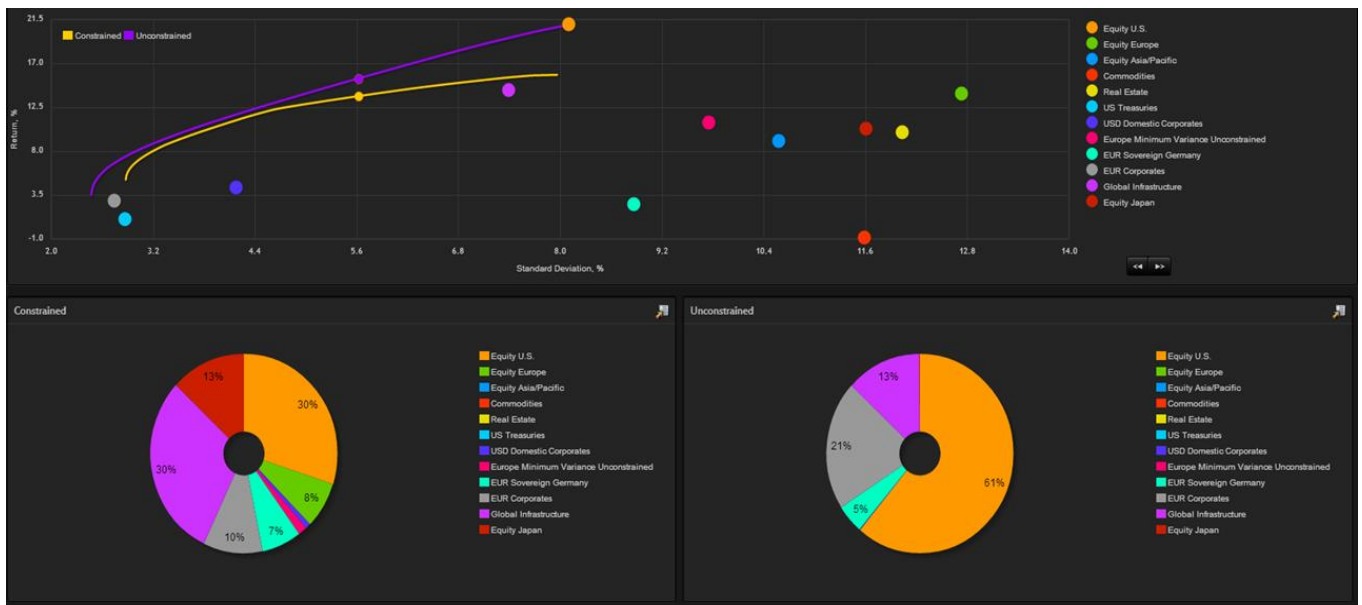
include the following: Equity U.S. (STOXX USA 900 Index); Equity Europe (STOXX Europe 600 Index); Equity Asia Pacific (STOXX Asia/Pacific 600 Index); commodities (Thomson Reuters CRB Commodity Equity Index); real estate (STOXX Global 3000 Real Estate Index); US Treasuries (iBoxx USD Treasuries Index), US dollar domestic corporates (iBoxx USD Domestic Corporates Index); Europe minimum variance unconstrained (STOXX Europe 600 Minimum Variance Unconstrained Index); euro sovereign Germany (iBoxx EUR Sovereign Germany Index 10+); euro corporates (iBoxx EU Corporates Overall Index); global infrastructure (STOXX Global Broad Infrastructure Index); Equity Japan (STOXX Japan 600 Index).

The figures below show the efficient frontiers of risky assets, including and excluding, respectively, the asset class global infrastructure. Also, the asset class weightings, along with expected portfolio returns and standard deviations for both the constrained and the

unconstrained versions are shown in correspondence of a given level of standard deviation fixed at 5.6%. Clearly, the return/risk combination differs for the opportunity set of risky assets along the efficient frontier. For any risk level, depending on the degree of

risk aversion, investors are interested in the portfolio with the highest expected return. Alternatively, the efficient frontier represents the set of portfolios that minimize the variance for any target expected return.

FIGURE 11 CONSTRAINED AND UNCONSTRAINED VERSIONS OF THE EFFICIENT FRONTIER OF RISKY ASSETS INCLUDING GLOBAL INFRASTRUCTURE, ASSET CLASS WEIGHTINGS, STANDARD DEVIATION AND PORTFOLIO RETURN (EXPECTED RETURNS BASED ON HISTORICAL RETURNS JAN. 2012-DEC. 2014)

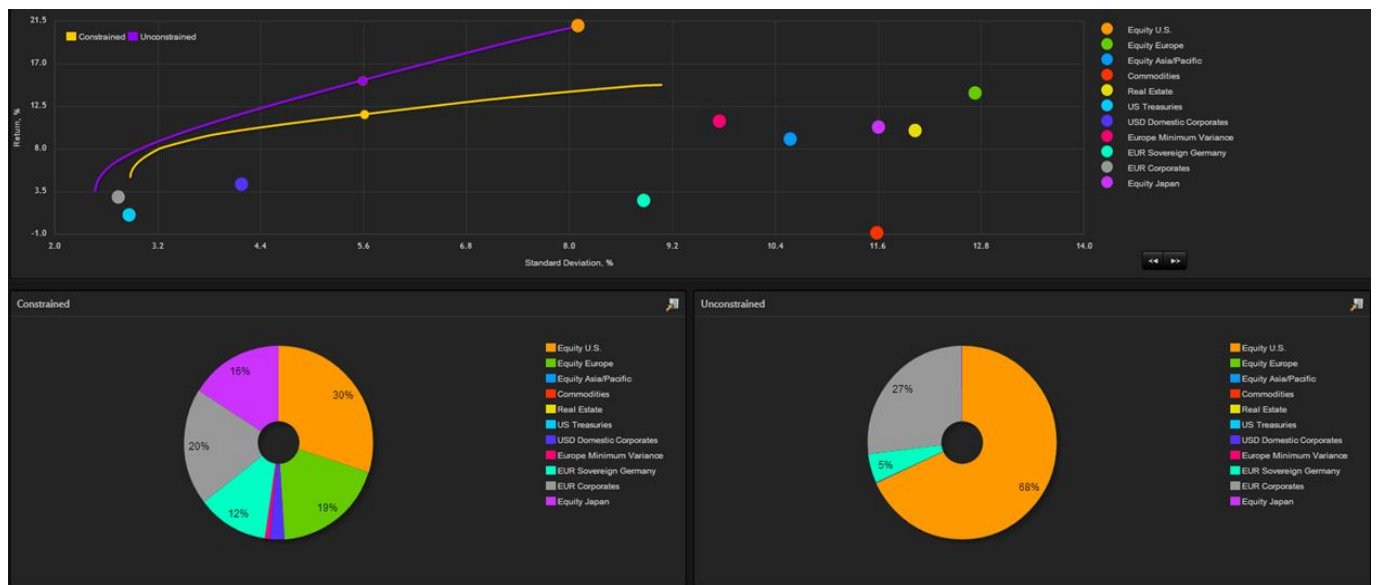


Asset Class	Constrained	Unconstrained
Equity U.S.	30.00%	60.84%
Equity Europe	6.71%	0.01%
Equity Asia/Pacific	0.02%	0.02%
Commodities	0.00%	0.00%
Real Estate	0.03%	0.01%
US Treasuries	0.02%	0.04%
USD Domestic Corporates	0.84%	0.07%
Europe Minimum Variance Unconstrained	1.61%	0.03%
EUR Sovereign Germany	6.22%	4.63%
EUR Corporates	11.87%	21.34%
Global Infrastructure	29.99%	12.90%
Equity Japan	12.69%	0.11%

Constrained	
Standard Deviation	5.60%
Portfolio Return	13.60%
Unconstrained	
Standard Deviation	5.60%
Portfolio Return	15.30%

Source: Thomson Reuters on STOXX and market indices data

FIGURE 12 CONSTRAINED AND UNCONSTRAINED VERSIONS OF THE EFFICIENT FRONTIER OF RISKY ASSETS EXCLUDING GLOBAL INFRASTRUCTURE, ASSET CLASS WEIGHTINGS, STANDARD DEVIATION AND PORTFOLIO RETURN (EXPECTED RETURNS BASED ON HISTORICAL RETURNS JAN. 2012-DEC. 2014)



Asset Class	Constrained	Unconstrained
Equity U.S.	30.00%	68.68%
Equity Europe	18.96%	0.01%
Equity Asia/Pacific	0.02%	0.02%
Commodities	0.00%	0.00%
Real Estate	0.02%	0.01%
US Treasuries	0.02%	0.04%
USD Domestic Corporates	2.48%	0.07%
Europe Minimum Variance Unconstrained	0.83%	0.01%
EUR Sovereign Germany	12.16%	5.07%
EUR Corporates	19.53%	26.00%
Equity Japan	15.98%	0.09%

Constrained	
Standard Deviation	5.60%
Portfolio Return	11.60%
Unconstrained	
Standard Deviation	5.60%
Portfolio Return	15.20%

Source: Thomson Reuters on STOXX and market indices data

A specific analysis of the return series of the STOXX Global Broad Infrastructure Index and the selected STOXX Indices considered in the analysis has been performed to consider higher moments of the distribution of returns. Usually, the analysis of financial instrument series returns focuses on mean and variance, under the hypothesis of "compactness" of the distribution of returns (Samuelson, P. A. [1970], "The Fundamental Approximation Theorem of Portfolio Analysis in Terms of Means, Variances, and

Higher Moments," Review of Economic Studies, Vol. 37).

Compactness represents a continuity or inertia of stock prices. In the absence of particular shocks to the series the uncertainty of stock returns over increasingly shorter periods decreases. Under these circumstances investors who can rebalance their portfolios frequently will seek to make higher moments of the stock return distribution so small as to be negligible. In this way the action of the investors

in frequently revising their portfolios limits higher moments (even moments representing bad moments in the utility function for the investor) to negligible levels. However, in the presence of shocks or high volatility the usual mean/variance analysis is inadequate, and higher moments of the utility function of the investment need to be considered. In particular, odd moments (third moment, i.e., skewness) represent good moments, since they define the measure of asymmetry. Positive numbers are associated with positive skewness and hence are desirable.

Positively skewed return distributions are characterized by more likely but smaller losses and less likely but extreme gains. In other words, “bad surprises” are more likely but are limited in

magnitude. In a negatively skewed distribution, on the other hand, bad surprises are more likely to be extreme, even if they occur less frequently. Skewness is important because of its impact on portfolio choices and also because kurtosis (fourth-moment skewness, i.e., bad news) is not independent of skewness—the latter may induce the former.

In a normal market situation based on a portfolio analysis of three moments, investors should have a preference for positive skewness, since they prefer portfolios with a higher probability of greater returns. On the contrary, in episodic market crashes it is expected the asymmetry would be characterized by negative skewness, with a higher probability of large falls in prices.

FIGURE 13 STOXX GLOBAL BROAD INFRASTRUCTURE VS. SELECTED STOXX INDICES—LOG RETURNS DESCRIPTIVE STATISTICS (DEC. 31, 2013–JAN. 30, 2015)

	STOXX EMERGING MARKETS 1500	STOXX EUROPE 600 USD	STOXX GLOBAL1800	STOXX GLOBAL BROAD INFRASTRUCTURE	STOXX USA 900
Mean	0.000337	-0.000107	0.000271	0.000521	0.000522
Median	0.000293	-0.000071	0.000915	0.000763	0.000707
Maximum	0.018256	0.026477	0.019915	0.018575	0.023406
Minimum	-0.016918	-0.029522	-0.019075	-0.022215	-0.023933
Std. Dev.	0.006585	0.008131	0.005824	0.005431	0.007455
Skewness	-0.097981	-0.159456	-0.216263	-0.377022	-0.331383
Kurtosis	2.845551	4.706413	4.136835	4.523895	3.944156
Jarque-Bera	0.669243	32.395650	15.904320	31.076520	14.304910
Probability	0.715609	0.000000	0.000352	0.000000	0.000783
Sum	0.087064	-0.027648	0.069945	0.134410	0.134676
Sum Sq. Dev.	0.011144	0.016992	0.008716	0.007581	0.014283
Observations	258	258	258	258	258

Source: STOXX calculations

The distribution of returns of the STOXX Global Broad Infrastructure Index and the selected STOXX Indices considered in the analysis exhibited negative skewness with excess kurtosis. The shape of the distribution of the return series was leptokurtic, indicating that a larger portion of the variance of the distribution of the returns was attributable to infrequent extreme deviations as opposed to more frequent modest deviations.

As highlighted in figures 13 and 14, despite the magnitude of the peakedness and the asymmetry of the distribution of the series changed, there were no major differences between the two periods considered in the analysis. Also, under the null hypothesis of a normal distribution, the Jarque-Bera statistic, which is distributed as  $\chi^2$  with 2 degrees of freedom, led to the rejection of the null hypothesis of a normal distribution. The unique exception was given by the

STOXX Emerging Markets 1500, for which the hypothesis of a normal distribution was accepted for

the period Dec. 31, 2013–Jan. 30, 2015.

FIGURE 14 STOXX GLOBAL BROAD INFRASTRUCTURE VS. SELECTED STOXX INDICES—LOG RETURNS DESCRIPTIVE STATISTICS (MAR. 16, 2007–JAN. 30, 2015)

	STOXX EMERGING MARKETS 1500	STOXX EUROPE 600 USD	STOXX GLOBAL 1800	STOXX GLOBAL BROAD INFRASTRUCTURE	STOXX USA 900
Mean	0.000170	0.000069	0.000155	0.000231	0.000253
Median	0.000704	0.000435	0.000970	0.000760	0.000596
Maximum	0.109579	0.106940	0.089750	0.101478	0.106840
Minimum	-0.100420	-0.101878	-0.071713	-0.067504	-0.096322
Std. Dev.	0.013577	0.016351	0.011845	0.010172	0.014112
Skewness	-0.506991	-0.063549	-0.421625	-0.217336	-0.360527
Kurtosis	11.919590	9.068093	10.670770	13.496270	11.963600
Jarque-Bera	6792.838000	3105.128000	5019.717000	9302.484000	6816.338000
Probability	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	0.344669	0.139534	0.312613	0.466874	0.511152
Sum Sq. Dev.	0.372725	0.540578	0.283690	0.209220	0.402662
Observations	2023	2023	2023	2023	2023

Source: STOXX calculations

The traditional mean-variance approach to performance measurement and portfolio optimization is based on an approximation of normality in returns. Financial asset returns are at times better represented by hyperbolic distributions. The hyperbolic distribution decreases exponentially—more slowly than the normal distribution—being suitable to model financial patterns, where numerically large values are more probable than is the case for the normal distribution. Thus, the hyperbolic distribution provides the possibility of modelling heavier tails.

Since in the traditional Sharpe ratio measurement not all asymmetries of the distribution of returns and risk-averse investors' preferences are taken into account, some investments may mistakenly appear better or worse than they are. In light of the non-normal distribution of the return time series of the STOXX indices considered in the analysis, in this section we present an alternative and more powerful performance measure—the Omega ( $\Omega$ ) measure (originally presented in a research paper by Keating, C. and F. Shadwick [2002], A Universal Performance Measure, The Journal of Performance Measurement, 6 [3]).

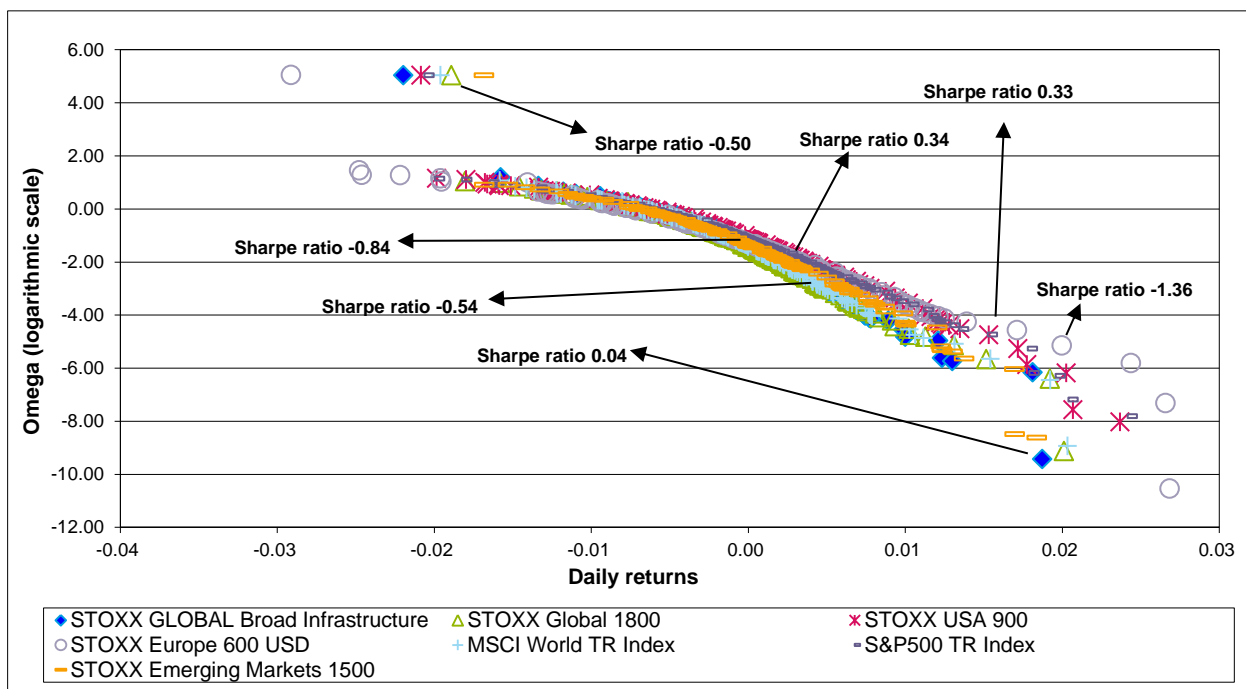
The Omega measure incorporates all the moments of the distribution, since it is a direct transformation of it. The Omega measure splits the distribution of returns into two subparts, according to a return threshold. Thus, returns are divided into losses and gains above and below a return threshold, and then the probability-weighted ratio of returns above and below the partitioning is considered. The relative ranking of the various assets depends on the threshold value. The evaluation of an investment in financial assets with the Omega function should be considered for thresholds between 0% and the risk-free rate. Intuitively, this type of threshold corresponds to the notion of capital protection.

In addition to incorporating all the moments of the distribution of returns, the Omega function has two interesting properties. Firstly, when the threshold return is set to the mean of the distribution, the Omega measure is equal to 1.0. Secondly, whatever the threshold return is, all financial assets may be ranked. Conversely, in the context of the Sharpe measure the ranking leads to cumbersome interpretation for negative ratios.

The figure below shows the log Omega values corresponding to a series of daily return thresholds for the STOXX Global Broad Infrastructure Index,

compared to the relevant STOXX indices, the S&P 500 Index and the MSCI World Index.

FIGURE 15 STOXX GLOBAL BROAD INFRASTRUCTURE VS. SELECTED STOXX AND MARKET INDICES—OMEGA FUNCTION AND SHARPE RATIOS (JUL. 3, 2014-JAN. 30, 2015)



Source: STOXX calculations

For the short-term period considered in the Omega analysis above, the S&P 500 Index and the STOXX USA 900 provided the best investment choice as they reflected the positive performance momentum for the US stock market in 2014. At the return threshold of 0.0014% daily or 0.5% annually, the S&P 500 TR Index and STOXX USA 900 Gross Return Index posted 0.2296 and 0.2263 Omega values, respectively. The STOXX Global Broad Infrastructure Gross Return recorded a 0.1694 Omega reading. Differently from an analysis based merely on the Sharpe ratio, which makes reference to a single reading for the overall period of the analysis, it is interesting to note how the relative ranking depended on the threshold value. For instance, the STOXX

Global Broad Infrastructure Gross Return versus the global indices was a typical case where, whatever the threshold return, the financial assets could be graded benefiting from the use of the Omega function, taking into account that the Sharpe ratio for the measurement period was negative for both the STOXX Global 1800 Gross Return (-0.50) and the MSCI World TR (-0.54). Conversely, in the context of the Sharpe measure any ranking based on the reading for the overall period might have been ambiguous. The STOXX Global 1800 Gross Return and the MSCI World TR posted 0.1623 and 0.1588 Omega values, respectively, for the period Jul. 3, 2014-Jan. 30, 2015. Both Omega readings were

below the value recorded by the STOXX Global Broad Infrastructure (0.1694).

Extending the Omega function analysis to a three-year period ended Dec. 31, 2014, the gap between the STOXX Global Broad Infrastructure Index and the MSCI World TR Index increased as their respective Omega values stood at 3.06 and 2.80. For the same period the S&P 500 TR Index posted a 3.84 Omega reading.

The recently unveiled "London Infrastructure Plan 2050" outlines the GBP1.3-trillion capital-expenditure needs in infrastructure, in addition to GBP937 billion for ongoing infrastructure costs for the capital to retain its current status as one of the world's leading cities. Transport (GBP973 billion) and housing (GBP800 billion) together account for over three-quarters of the total investment, with energy, water, green space, schools and digital connectivity also requiring major funding.

In December, 2014, the UK government launched the National Infrastructure Plan 2014. The GBP466-billion plan laid down a radical new approach to housing, more investment in rail and energy, GBP2.3 billion of investment in flood defense and GBP15 billion of road improvements. The addition by the UK House of Commons in January of a national "cycling and walking investment strategy" requirement for the infrastructure bill paves the way for an investment in safe routes to school and work places to escalate it to the same pecking order as big infrastructure projects such as High Speed 2 and major roads.

In the US infrastructures are at a tipping point; a USD11-billion highway bill is scheduled to expire in May, 2015. Bipartisan calls urge the US Congress to pass a multi-year USD1-trillion infrastructure bill to rebuild decaying roads and bridges and to invest in other infrastructure-modernization projects. The American Society of Civil Engineers estimates that USD3.6 trillion would be needed by 2020 to get US infrastructure to a fair standard. Since more than 30% of US bridges have exceeded their 50-year design life, it is estimated that funds in excess of USD1.7 trillion would be needed to improve roads, bridges and transit.

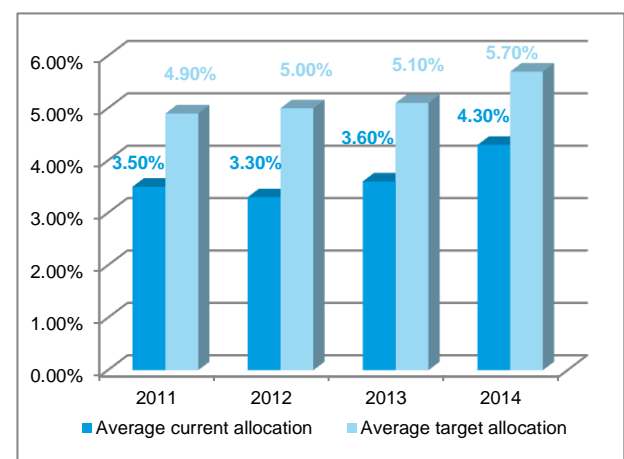
Recently Fitch, in its 2015 Global Infrastructure & Project Finance Outlooks, anticipated a stable outlook for global infrastructure in light of expected growth in

the US and macroeconomic demand drivers for global transportation.

In Australasia, Australia's federal government announced before the end of March last year that it will pay strapped-for-cash states the equivalent of 15% of the value of assets they sell in the next two years if they commit to use the money for new infrastructure investment. The Australian government's announcement reflected initiatives to attract local superannuation funds and overseas institutional investors to invest an estimated AUD100 billion in infrastructure.

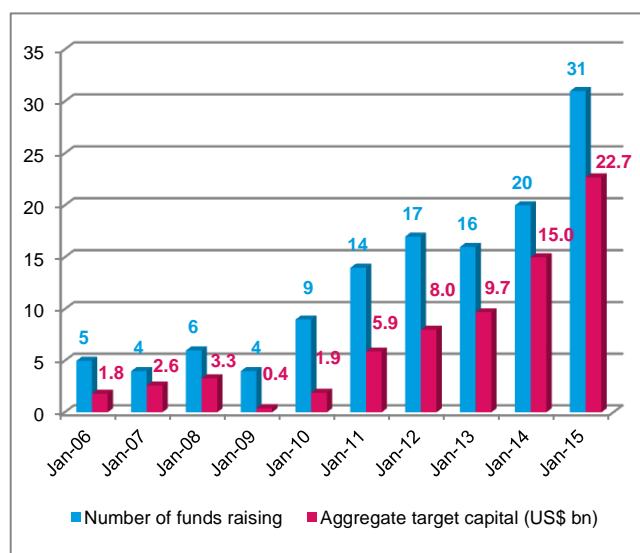
With a longer-term time horizon, taking into account expected investor allocations, the outlook for infrastructure is very positive. The results of the Preqin Investor Interviews—December, 2014 show that a significant 40% of surveyed investors plan to increase their allocation to infrastructure in 2015 compared to the current level. Only 16% of the polled investors expect to decrease their allocation to infrastructure in the future. In the longer term, the level of institutional capital flowing into infrastructure is expected to increase; 62% of investors are below their long-term target weightings to the asset class, with 67% expecting these target allocations to increase.

FIGURE 16 AVERAGE CURRENT AND TARGET ALLOCATIONS TO INFRASTRUCTURE OVER TIME (AS A PERCENTAGE OF AUM, 2011-2014)



Source: Preqin Infrastructure Online

FIGURE 17 UNLISTED INFRASTRUCTURE DEBT FUNDS IN MARKET AND AGGREGATE TARGET CAPITAL (JAN. 2006-JAN. 2015)



Source: Preqin Infrastructure Online

At the same time, Preqin data from the 2015 Preqin Global Infrastructure Report highlight the remarkable growth of the unlisted infrastructure-debt fund market since 2006. As of January, 2015, the aggregate capital sought by the 31 unlisted infrastructure-debt funds in the capital-raising process climbed 51% year on year to USD22.7 billion. The aggregate capital sought by infrastructure-debt funds in the capital-raising process rocketed 1,161% for the period January, 2009-January, 2015.

Global project finance bond volume hit USD54.7 billion for 2013, according to Dealogic data, climbing 114.5% compared with 2012's reading to the highest full-year volume on record. Global project finance volumes overall rose 3% for 2013 to USD418 billion, while project finance loan volume declined 4% to USD297 billion for the same period. Dealogic's data show that project bonds accounted for 13% of total project finance raised in 2013 and 16% of total project finance debt.

Activity in Asia (excluding Japan) and Australasia for 2014 remained buoyant. Nonetheless, at a global level, readings appeared to be less encouraging.

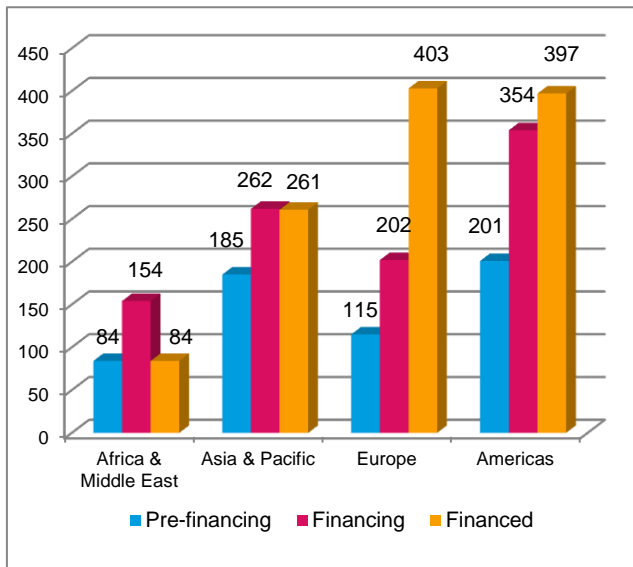
Following record readings for 2013, according to Dealogic's data, global project finance volumes for the first half of 2014 hit the bottom level of the last five years, with 30% less financing being made available year on year. In number-of-projects terms, 416 schemes were completed in the first half of the year, down from 586 in the first half of 2013. The reading for 2014 was the lowest recorded since the first half of 2009, when 363 projects completed.

In volume terms, there was USD160.4 billion in project finance secured in the first six months of 2014, a 30% plunge on the amount for the corresponding period of the previous year. Despite renewed confidence about recovery in the global economy, year on year at the end of June loan, bond and equity financing for projects dropped 25%, 32% and 48%, respectively, showing a faltering pattern in the financing channels' alternative to project finance.

Despite the volume for the first half of 2014 coming in at a reading that was the lowest in five years, the huge number of large projects signed in 2012 and 2013 may help explain the weak figure, in light of the relevant gestation time required for deals relating to large projects to come to realization. Also, the reading for the first half of 2014 suggests lending may come from other sources, since project finance reflects only funds that originate from the commercial banking sector. Among others, the German asset manager Allianz Global Investor announced before the end of June last year the launch of a GBP500-million investment fund to tap into financing requirements of the UK's infrastructure project plan. According to the scheme of the UK Infrastructure Debt Fund, institutional investors such as insurers and hedge funds will be entitled to purchase portions of debt, which will finance civil infrastructure projects such as roads, water and energy assets.



FIGURE 18 INFRASTRUCTURE TRANSACTION ACTIVITY FOR ALL SECTORS—2014



Source: IJGlobal

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The report was closed with information available as of the market close on Jan. 30, 2015.

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