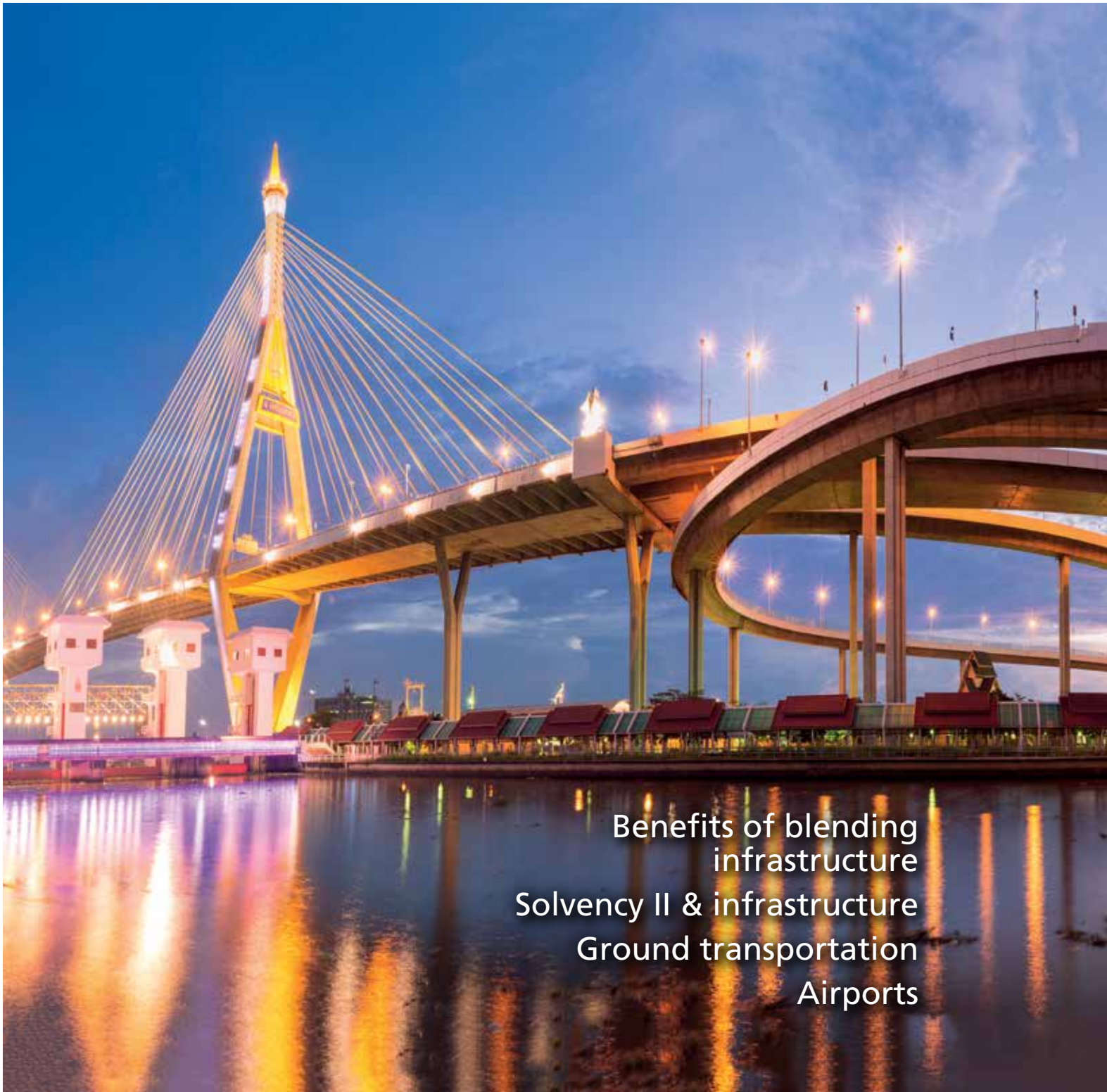




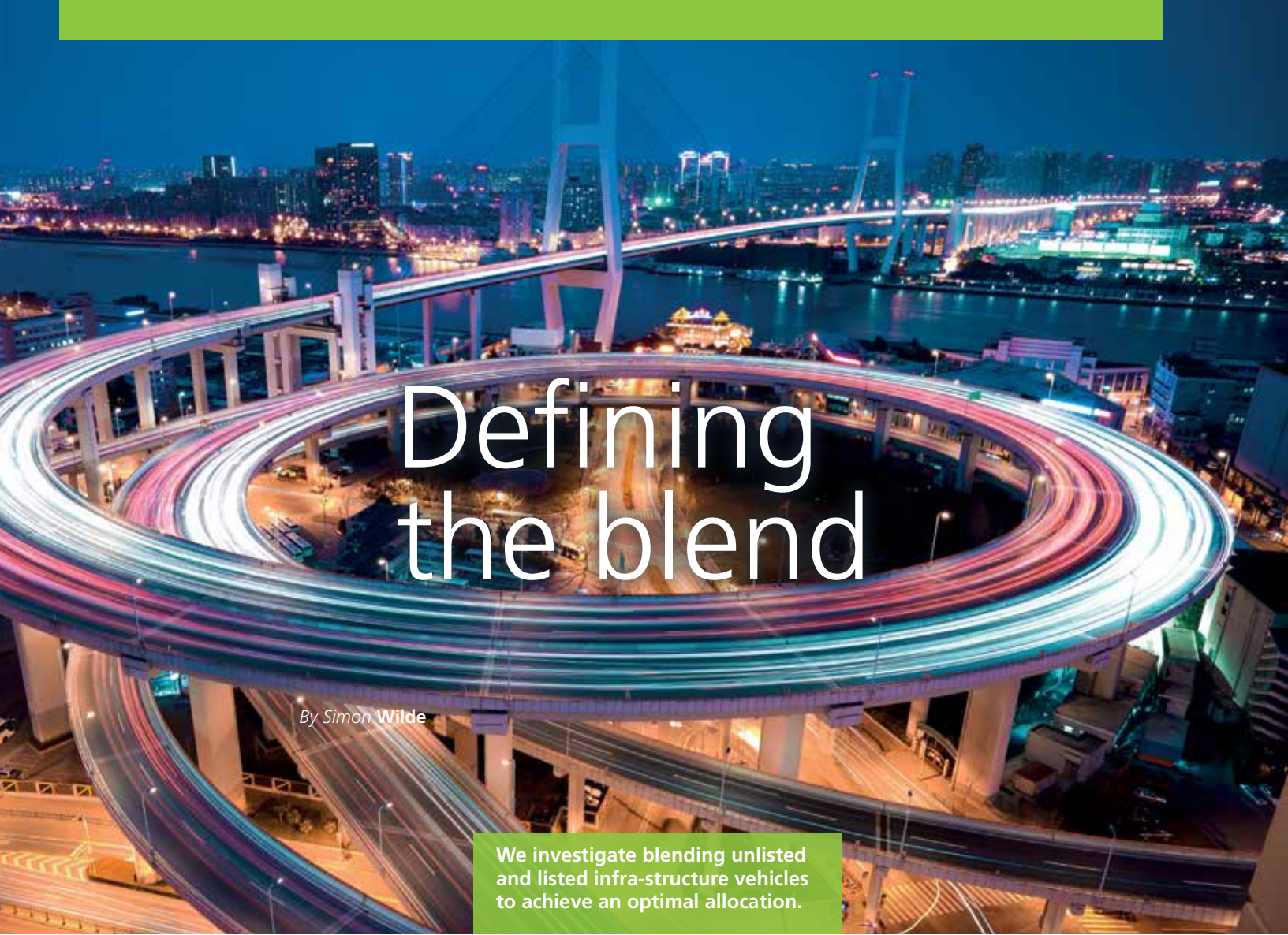
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*issue 01*



Benefits of blending  
infrastructure  
Solvency II & infrastructure  
Ground transportation  
Airports



# Defining the blend

By Simon Wilde

We investigate blending unlisted and listed infrastructure vehicles to achieve an optimal allocation.

Recent years have seen an increasing focus on infrastructure as an asset class by institutional investors worldwide. Much attention has been focused on unlisted infrastructure assets, where capital in unlisted funds rose 18-fold from \$17bn in 2004 to \$373bn by 2016. Direct investment into unlisted assets by the largest investors is also accelerating. However, it should not be forgotten that the listed infrastructure sector is far older – with the need for infrastructure investment driving the growth of stock and bond markets in C19th Great Britain and the USA. It also remains far larger, with an equity market capitalization approximately \$2tn, according to the GLIO coverage.

This article offers one way of thinking about how listed and unlisted infrastructure compare, and the role they play in improving diversified portfolio returns. We look forward to exploring alternative perspectives going forward with companies, investors, advisers and researchers.

*“We are agnostic when it comes to listed versus unlisted infrastructure and property, as we do not believe being priced daily changes the underlying asset, its income stream or its risk.”*

Ken Robbins, UniSuper

**Table 1: Annualized Returns, Volatility, Sharpe Ratios and CAPM Results**

	Unlisted Infra	Listed Infra	MSCI World	Risk Free
Mean return	8.6%	12.7%	9.8%	1.3%
Standard deviation	8.0%	14.7%	16.8%	0.9%
Sharpe Ratio	0.9	0.8	0.5	
CAPM beta	0.2	0.8	1	
CAPM alpha	5.8%	4.8%	0%	

**Table 2: Correlation of Asset Class Returns**

	Unlisted Infra	Listed Infra	MSCI World	Bonds
Unlisted Infra	1			
Listed Infra	0.5	1		
MSCI-World	0.4	0.9	1	
Bonds	0.1	0.1	-0.1	1

### Thinking beyond the Labels

Investors can of course utilize both listed and unlisted vehicles, an approach adopted by UniSuper, an Australian superannuation fund with 420,000 members and assets of \$54bn. As Ken Robbins, UniSuper’s Head of Property & Private Markets, explains: “At UniSuper, we allocate to specific risk profiles based on the underlying assets rather than through the traditional asset class allocation approach. Labelling all infrastructure investments as one category of risk and return, in our view, is inappropriate. We are agnostic when it comes to listed versus unlisted infrastructure and property as we do not believe being priced daily changes the underlying asset, its income stream or its risk.”

This view is shared by Oskar Backman, Investment Manager Real Assets at the First Swedish National Pension Fund

(AP1), “we use the listed companies to gain exposure to infrastructure. We like the transparency and liquidity of the listed companies, but moreover, we are looking at gaining exposure to well managed high-quality underlying infrastructure assets.”

We compare the financial risks and returns of listed and unlisted infrastructure, assessing the view that they are not necessarily the same. We then look at the impact of allocating capital to both for large, well-diversified investors. To the extent listed and unlisted infrastructure perform differently, there may be diversification benefits from having allocations to both areas.

Our listed infrastructure data is taken from the aggregated GLIO database, addressing the issue of how to choose from the plethora of alternative listed indices.

Data for unlisted infrastructure returns is harder to come by. IPD publish a time series based on 23 unlisted funds, although they have a heavy weighting towards Australia (59%<sup>3</sup>). Preqin’s quarterly infrastructure return index is based on a large global sample of over 150 funds but only dates from December 2007. Using detailed monthly cash flow and NAV data from a sample of 66 funds tracked by Preqin (with total capital in excess of \$100bn), we have constructed our own index for the 12-year period from June 2003 to June 2015. This allows a longer-term assessment to be made, still based on a large global fund sample.

Before looking at the asset returns, one should note that unlisted funds do not, by definition, have listed prices and so we use quarterly reported Net Asset Values (NAVs). However, NAVs are appraisal values based on the long-term expected value of a fund’s assets and differ conceptually to daily market prices; a fundamental issue we consider later.

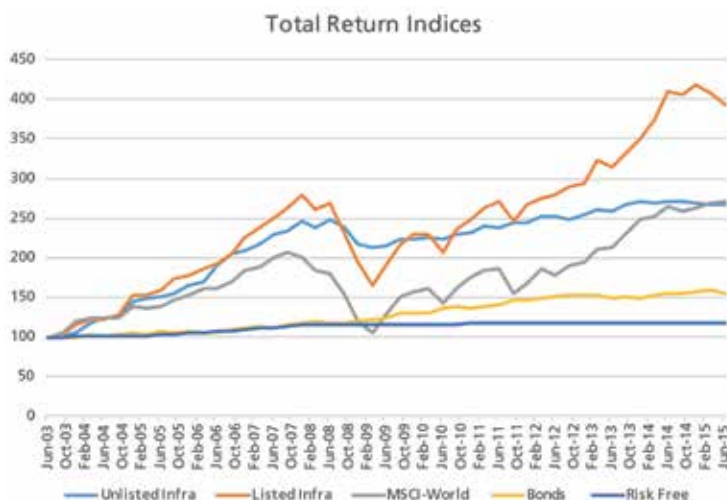
The total return time series of listed and unlisted infrastructure – along with global equities (MSCI World), bonds (Fidelity bond fund) and the risk-free rate – are shown in Figure 1.

Proponents of listed infrastructure will be heartened by its strong outperformance: \$100 invested in listed infrastructure in June 2003 would have increased to \$394 twelve years later. This is significantly higher than the \$270 from global equities, \$268 from unlisted infrastructure, \$154 from bonds and \$117 from risk-free assets.

However, Figure 1. also shows that global equities and listed infrastructure exhibit greater volatility than unlisted infrastructure, or bonds. This is confirmed in Table 1, which shows listed infrastructure’s standard deviation was 14.7% (close to the 15.8% of MSCI World), versus 8.0% for unlisted infrastructure. As a result of the volatility, unlisted infrastructure has a higher Sharpe Ratio (excess returns above the risk-free rate, divided by standard deviation of returns) of 0.91 than listed infrastructure’s 0.77.

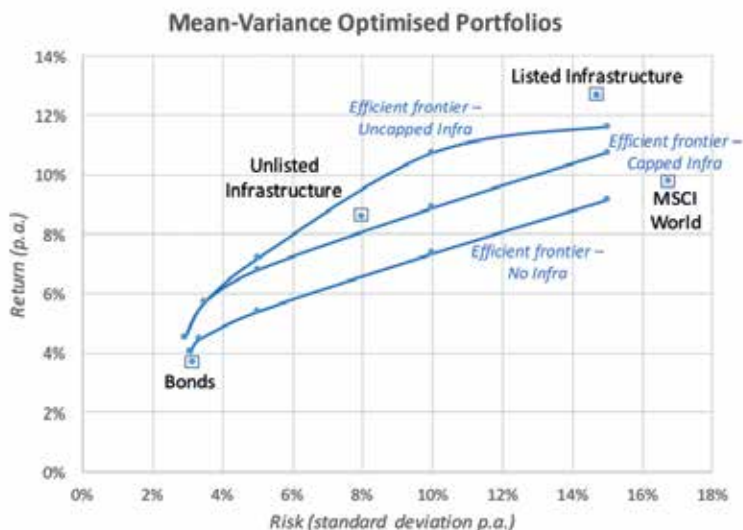
Likewise, listed infrastructure returns are far more correlated with global equities than unlisted infrastructure, seen >

**Figure 1: Unlisted & Listed Infrastructure, Equities and Risk-Free Total Returns (June 2003-June 2015)**



1. The portfolio return and risk impact discussed herein was prepared specifically for this GLIO Journal based on risk-adjusted returns in Wilde S. and Wilde J. (2017) ‘Measuring risk-adjusted returns for unlisted and listed infrastructure’, Infrastructure Investor, May 2017.  
 3. See <https://goo.gl/tKsrVn>

Figure 2: Portfolio and Asset Risk-Return Optimization



by their CAPM betas of 0.76 and 0.18, contributing to unlisted infrastructure having a higher CAPM alpha of 5.8% compared to 4.9% for listed infrastructure.

So on a risk-adjusted return basis, unlisted infrastructure outperforms listed infrastructure, due to its low volatility and CAPM beta. Both however outperform global equities, with higher Sharpe Ratios and positive CAPM alphas. So either listed or unlisted infrastructure seems to offer better risk-adjusted returns than global equities. The question for investors is which they should choose (or a combination of both) and how much capital to allocate?

To answer this question, we need to look at the correlations between the alternative asset classes, shown in Table 2.

Unlisted infrastructure has low correlations with equities and bonds. This is interesting as it is sometimes marketed as a higher yielding bond substitute. Whilst listed infrastructure also has a low correlation with bonds, it has a higher correlation with equities, seen earlier from its relatively high CAPM beta. The imperfect correlation of both types of infrastructure with other asset classes means there should be a significant diversification benefit from including infrastructure into an equity and bond portfolio.

The correlation between unlisted and listed infrastructure returns is 0.51, which is moderate. This suggests that two categories are related, as one would expect. However, as the correlation is not particularly high, there are also likely diversification benefits available within an infrastructure allocation by including both listed and unlisted.

### Listed and Unlisted Partnership

This insight is borne out in our, admittedly simplistic, portfolio optimisation analysis. We modelled potential portfolios based on the return, volatility and correlation data described above, and considered three cases: (1) no infrastructure allocations ("No Infra"), (2) infrastructure can form any amount of a portfolio ("Uncapped Infra") and (3) infrastructure is capped at a maximum of 40% of the portfolio ("Capped Infra"). In all cases, investors can select from unlisted and/or listed infrastructure. Portfolios are constructed using standard mean-variance optimisations. The results are shown in Figure 2, which also shows the risk/return of the constituent asset classes.

The first effect to note is that by allowing infrastructure investments, the efficient frontier (which shows the best possible portfolio return for a given level of risk) moves upwards, implying higher risk-adjusted returns. The upwards shift still occurs in the 'Capped Infra' case but to a lesser extent. As an illustration, if an investor is targeting 10% volatility, the best possible return under 'No Infra' is 7.3%. This increases to 8.7% under 'Capped Infra' and 10% with 'Uncapped Infra', both of which are material improvements.

The second interesting aspect arises from the allocation between listed and unlisted infrastructure in the optimised portfolios, shown in Table 3. For each case, we examine five target portfolios: minimizing volatility; maximizing Sharpe Ratio; and 5%, 10% and 15% volatility. Where infrastructure is allowed, there is always an allocation to infrastructure. In three out of five cases, it is a mix of listed and unlisted infrastructure, with one case each



*Either listed or unlisted infrastructure seems to offer better risk-adjusted returns than global equities, but which should investors choose and how much capital to allocate?*

**Table 3: Asset Composition of MV optimized portfolios**

	Min Vol	Max SR	5% Vol	10% Vol	15% Vol
<b>Uncapped Infra</b>					
Unlisted	13.7%	29.3%	43.3%	47.4%	0.0%
Listed	0.0%	6.5%	15.3%	52.6%	64.0%
<b>Total infra</b>	<b>13.7%</b>	<b>35.8%</b>	<b>58.6%</b>	<b>100.0%</b>	<b>64.0%</b>
Equities	2.5%	0.0%	0.0%	0.0%	36.0%
Bonds	83.8%	64.2%	41.4%	0.0%	0.0%
<b>Capped Infra</b>					
Unlisted	13.7%	29.3%	22.3%	5.6%	0.0%
Listed	0.0%	6.5%	17.7%	34.4%	40.0%
<b>Total infra</b>	<b>13.7%</b>	<b>35.8%</b>	<b>40.0%</b>	<b>40.0%</b>	<b>40.0%</b>
Equities	2.5%	0.0%	7.1%	30.0%	56.9%
Bonds	83.8%	64.2%	52.9%	30.0%	3.1%

for all-unlisted and all-listed. This bears out the expected diversification benefits within the infrastructure allocation, and argues for a blended approach to considering listed and unlisted vehicles, as argued by UniSuper's Ken Robbins. Manoj Patel of Deutsche Asset Management echoes Robbins' comments: "We believe unlisted and listed infrastructure go hand-in-hand, enabling investors to gain exposure across a diverse range of infrastructure assets and sectors. Any sensible allocation to infrastructure must consider all potential companies/vehicles, on a 'look-through' basis, focusing on the quality of underlying assets and management teams."

While this analysis is supportive of including infrastructure as a blend of listed and unlisted vehicles, we would add a few words of caution. First, this is based on *ex post* data for 2003-2015. This may – or may not – reflect current *ex ante* expectations, which should be the basis for current portfolio expectations. Listed infrastructure market values have risen strongly and investors must be comfortable about what offers good value, albeit other asset classes also look expensive by historical benchmarks. Likewise, for unlisted infrastructure commentators note the competition for attractive assets; the resulting return compression for core infrastructure; and the trend towards higher yielding, but higher risk assets.

Other concerns relate more strongly to unlisted funds, namely (1) the effect of NAV appraisal value on apparent return volatility, and (2) adjusting expected returns for illiquidity.

*The imperfect correlation of both types of infrastructure with other asset classes means there should be a significant diversification benefit from including infrastructure into an equity and bond portfolio.*


Firstly NAV, we noted previously the difference between NAVs and market prices. If NAVs systematically understate the true change in market value of funds' assets, then NAV volatility will also be understated, flattering risk-adjusted returns.

Secondly, the illiquidity of unlisted infrastructure is self-evident and it may be that investors should demand an illiquidity premium, which is not taken into account in the above analysis. Alternatively, time horizon constrained investors may not be able to consider unlisted funds or direct investing at all.

There is interesting academic research from other asset classes – such as real estate, private equity and illiquid listed

*GLIO is well placed to bring together investors, advisers and researchers.*

stocks – that can be applied to these issues, along with increasingly sophisticated forward-looking asset allocation models. GLIO is well placed to bring together investors, advisers and researchers to analyse these issues in more detail and take into account specific investor preferences and constraints.

Jeremy Anagnos, CBRE Clarion agrees that more research is required: "Better understanding of how the variety of infrastructure vehicles work and complement each other, is essential to the development of the asset class. As the GLIO library of infrastructure research and education evolves, investors will be better placed to fully understand the benefits and risks of the full range of infrastructure investment opportunities." 



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