Unlisted Infrastructure Performance Contribution, Attribution & Benchmarking

EDHEC*infra*
building benchmarks
for infrastructure investors

EDHEC*infra* Use Case Series - July 2020

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1. Objectives

In this case study, we use the EDHEC*infra* index data to better understand the performance of two peer groups of infrastructure investors: large asset managers and large asset owners.

Leveraging the granularity of the families of EDHECinfra indices and the TICCS® taxonomy of infrastructure investments, a complete analysis of the sources of risk and performance of any infrastructure portfolio can be conducted.

This case study documents how two peer groups of infrastructure investors perform relative to the market, and to each other and why they perform the way they do.

In what follows, we will describe:

- The formation of peer group portfolios of large Asset Managers and large Asset Owners (section 2)
- The risk-adjusted performance of each peer group (section 3.1)
- A performance contribution and attribution analysis for each peer group (section 3.2)
- An analysis of systematic vs idiosyncratic risk (section 3.3)
- The case for selecting the right benchmark by looking at a peer group portfolio of contracted projects only (section 3.5)

Section 4 also explains how to use the EDHEC*infra* index data to perform a return contribution and attribution analysis of *any* unlisted infrastructure equity portfolio.

Also note that for this analysis,

- We use the TICCS® classification system of infrastructure investments to categorise individual assets in peer group portfolios.
- We use the data from the EDHECinfra platform to determine the right benchmarks
- We report local currency returns only (excluding the impact of FX on returns and volatility) [1]
- All return computations are the standard calculations made for any financial asset given time series of prices and cash flows
- All results are presented gross of fees or investment costs
- We compute portfolios of individual equity investments in infrastructure companies (not funds) and there is no extra leverage at the portfolio level.

1 - However, all these indices are available in seven different currencies in the EDHEC*infra* platform, including USD, GBP, CAD, EUR, JPY and AUD

2. Peer Group Portfolios

The two peer groups examined are:

- large unlisted infrastructure asset managers, and;
- asset owners with the largest unlisted infrastructure portfolios.

For each peer group, a pooled portfolio is built using the following approach:

- We take the list of the largest infrastructure asset managers (top 20 AM) and largest asset owners (top 20 AO) investing in infrastructure by AUM.[1]
- We take the EDHEC*infra* broad market universe– which includes more than 630 firms in 22 countries – as the reference universe.
- We take the intersection of the list of infrastructure investments made by each peer group and the constituents of the EDHEC*infra* broad market.
- For each investment made by members of each peer group, we also obtain entry and exit dates, as well as the percentage stake invested.[2]
- Using EDHEC*infra* data for quarterly mark-to-market valuations and dividend payouts, we use each investor's stake and investment dates to compute the value and returns of pooled portfolios of the top AO and top AM, going back ten years from Q1 2020.

It is important to highlight that the two peer portfolios do not include *all* the investments made by top AO or Top AM. Instead, they are the intersection of the EDHEC*infra* broadmarket universe and the list of investments made by the largest infrastructure investors (the full list is available at the end of this section). Nevertheless, when pooled together these portfolios capture the kind of investment decisions that the top 20 infrastructure asset managers and top 20 asset owners tend to make.

Looking at the Top AM pooled portfolio in more details, there are several structural differences with the market benchmark.

- Figure 1a shows that Top AM have a greater exposure by value to merchant assets;
- Figure 2a shows a clear bias towards transport at the expense of smaller sectors like renewables and social infrastructure.
- Figure 3a shows a small bias towards project finance (even though the majority of the portfolio is made of corporates, like the market benchmark);

The top AO pooled portfolio also exhibit structural differences with the board market:

- Figure 1b reveals is a small bias towards regulated assets but more contracted and less merchant infrastructure than in Top AM portfolios;
- Figure 2b shows the same bias towards transport than in the top AM portfolio but less pronounced.
- Figure 3b shows a small bias towards corporates, which is the opposite than in the top AM portfolio;

Table 1 shows the profile of each peer group pooled portfolio compared to the broad market index.

The Top AM pooled portfolio includes investments in 118 assets over ten years, with 54 exits and 64 assets in the latest quarter (Q1 2020) representing USD53bn of market value and USD21 bn of actual investment (taking into account actual equity stakes).

1 - Source: IP&E Real Asset
2 - Source: Inframation

Table 1: Characteristics of the two peer group portfolios and the broad market index

	Top AM	Top AO	infra300 Index
Number of constituents (since inception)	118	31	300
Number of constituents (latest quarter)	64	30	300
Number of constituents exited	54	1	115
Portfolio market cap (USD, Q1 2020)	52bn	47bn	200bn
Amount invested (USD, Q1 2020)	22bn	8bn	200bn
Overlap with benchmark (by market cap)	26%	23.5%	-
Effective number of constituents* (portfolio concentration)	19.2	7.9	300
Effective number of TICCS® industrial classes* (portfolio concentration)	6.7	4.9	13.9

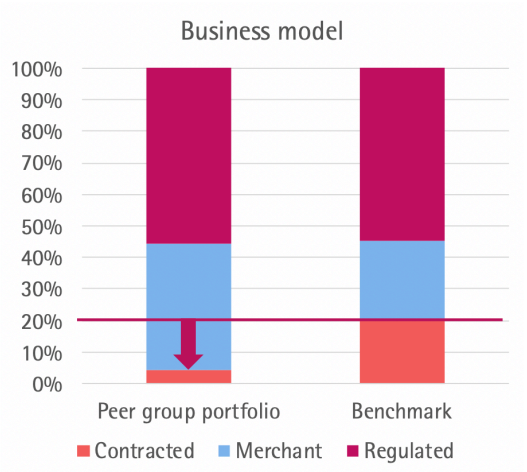
* inverse of the portfolio Herfindahl-Hirschman Index (HHI) of concentration. The mean value for Q1 2010- Q12020 is reported. TICCS® includes 29 industrial classes.

Table 2: Top ten weights in peer group portfolios and the broad market index

Top Asset Managers Peer Group		Top Asset Owners Peer Group		Broad Market	
Investment Name	Weight	Investment Name	Weight	Investment Name	Weight
Ausgrid Group	11.4%	Scotia Gas Networks	20.8%	Heathrow Airport TopCo	7.3%
Gatwick Airport	10.0%	Associated British Port	15.8%	Aeroportos de Portugal	3.8%
Open Grid Europe TopCo	6.6%	Gatwick Airport	13.6%	50Hertz Transmission	3.6%
Edinburgh Airport	5.9%	Open Grid Europe TopCo	8.4%	Gatwick Airport	3.5%
Dalrymple Bay Coal Terminal	4.7%	Thames Water Utilities	7.2%	ASF Motorways	2.8%
Sydney M1 Eastern Distributor	4.6%	EastLink	5.4%	Thames Water Utilities	2.8%
Elizabeth River Crossings	4.6%	Westlink M7	3.9%	Scotia Gas Networks	2.7%
Electricity North West	4.0%	HS1 high speed rail	3.9%	Yorkshire water services	2.6%
M5 South West Motorway	3.8%	Anglian Water	3.8%	APRR motorways	2.4%
APRR motorways	3.4%	Autopista Central	3.0%	Associated British Port	2.4%

Figure 1: TICCS® Business Risk Exposures: Peer Group Portfolios vs. Unlisted Infrastructure Universe, as of Q1 2020

(a) Asset Managers



(b) Asset Owners

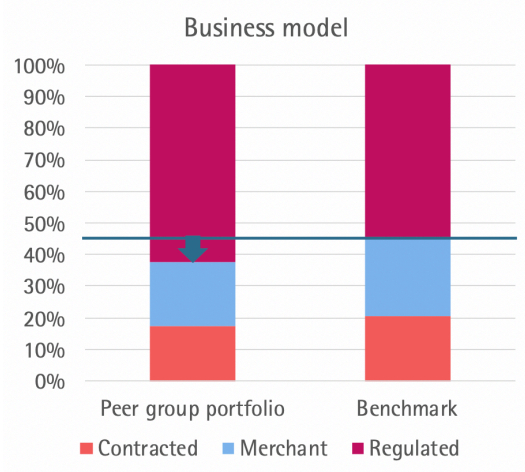


Figure 2: TICCS® Industrial Class Exposures: Peer Group Portfolios vs. Unlisted Infrastructure Universe, as of Q1 2020

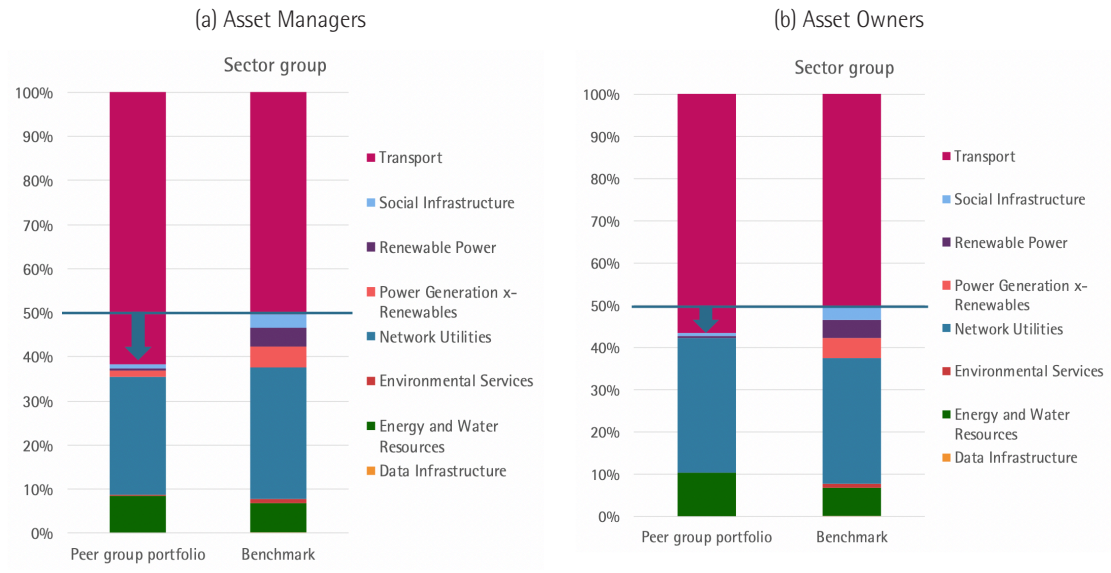
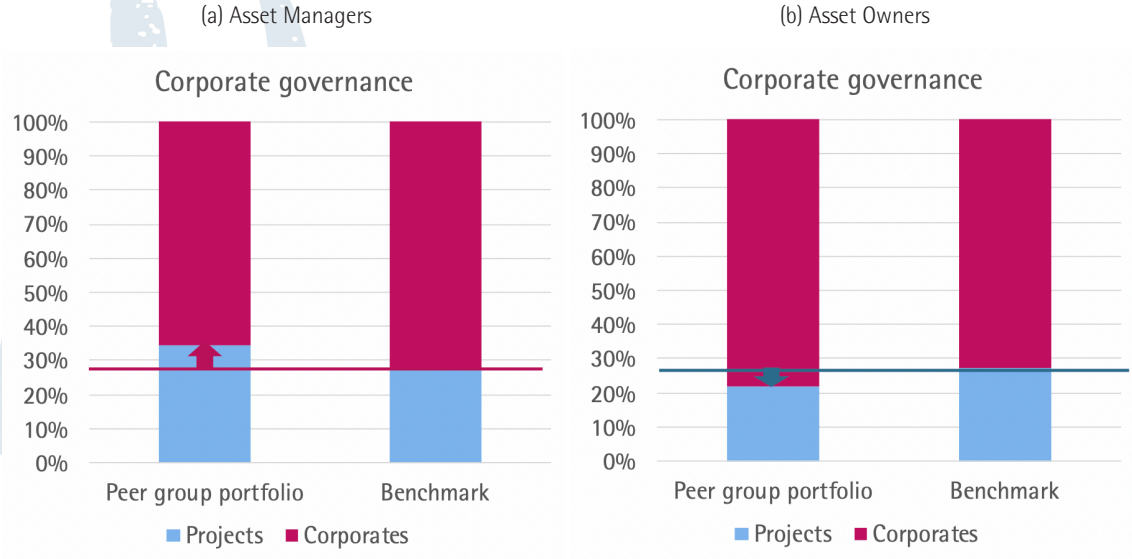


Figure 3: TICCS® Corporate Governance Exposures: Peer Group Portfolios vs. Unlisted Infrastructure Universe, as of Q1 2020



The top AO pooled portfolio includes 31 investments made over the same period but only one exit, leaving 30 assets in the portfolio today or USD47bn of market value and USD8bn of actual investment taking equity stakes into account.

Both peer groups represent about 20% of the broad market universe by market capitalisation.

There are some clear differences in style between the two peer groups:

- Top AM invest in more assets and exit more often;
- Top AO invest in a fewer, larger assets and tend to hold them;
- Both peer groups are more concentrated than the market as the effective number of bets indicates, but Top AO are much more concentrated in a few large assets than Top AM.

Table 2 shows the list of the top 10 weights in each peer group pooled portfolio. The largest weights in peer group portfolios are very large (more than 10% for Top AM, more than 20% for Top AO) compared to the broad market.

We note that this is a realistic picture of what unlisted infrastructure investment has been like for the top 20 asset owners and managers in the infrastructure sector over the past two decades.

The Top AM peer group pooled portfolio is typical of what a large infrastructure fund manager would hold over a period of ten years through multiple funds. Likewise, a large asset owner (and direct investor) in infrastructure would have built a buy-and-hold portfolio of a smaller size, with more larger ticket deals on average and more concentrated positions.

For both peer groups, we use the EDHEC*infra* broad market index as the benchmark for two main reasons: 1) it is the natural market for large investors to operate in, 2) for the sake of this exercise it allows more direct comparisons between the two peer groups.

Table 3: List of constituents in the Top AM Peer Group portfolio

2i Rete Gas SpA	Electricity North West	Northern Gas Networks
50Hertz Transmission GmbH	Elenia Group	North Tarrant Express I-820 and SH 121 / 183 (Segments 1 and 2A)
A2 Motorway: Nowy Tomysl to Swiecko Section	Elizabeth River Crossings Project	North Tyneside Schools PFI
A63 Salles-Saint Geours de Maremne	Energy Power Resources	NTE Segment 3
Adelaide Airport	Exeter Crown and County Courts PFI	Open Grid Europe TopCo
Affinity Water	Firenze Tram	Peel Ports
Airwave Radio System	First Hydro Company	Penwith Leisure PFI
Allenby/Connaught Accomodation	Gateway motorway and Logan motorway	Perth CBD Courts PPP
Amey Birmingham Highways PFI	Gatwick Airport	Perth International Airport
Amliden Wind Farm	George Best Belfast City Airport	Powerco
AndaSol Solar Power Project	Glasgow Schools	Regasificadora del Noroeste
Anglian Water	Goonhilly wind farm	Severn Power Station
Arlanda Express	Greater Manchester Police Stations	SH 288 Toll Lanes Expansion
Associated British Port	Hobart International Airport	Singapore Sports Hub
Ausgrid Group	Home Office & Prison Service Accomodation	Sjisjka Wind Farm
Autopista Vespucio Norte Express	HS1 high speed rail	Societa Gasdotti Italia
Autoroutes Paris-Rhin Rhone (APRR) motorway	HSL High Speed railway Link Project (Hogesnelheidslijn-Zuid)	Sorne Wind Farm
Autovia del Camino (A-12)	IH 635 Managed Lanes Project	South East Queensland (SEQ) Schools
Barnet Hospital Development	Isle of Wight Highway Maintenance PFI	South East Water
Benavente to Zamora A-66 Shadow Toll Road	L'autoroute A28	Southern Water
Bexley Schools	Linea 9 Metro Barcelona Tramo II PPP	South Europe Atlantic High-Speed Line (SEA HSL) Tours-Bordeaux High Speed Rail PPP
Birmingham Acute and Adult Psychiatric Hospitals PFI	Linea Nueve Tramo Cuatro	Sussex Custodial Centre PFI project
Bishop Auckland Hospital	London City Airport Limited	Sutton And East Surrey Water
Blackburn Hospital UK	London Luton Airport	Sutton Bridge Power Plant
Bournemouth Library	Lynn wind farm	Sydney M1 Eastern Distributor
Brisbane Airport	M40 Motorway	Tasmanian Gas Pipeline
Central Middlesex Hospital	M45 Motorway - Section B	Taurbeg Wind Farm
Connect A30/A35 Limited	M5 South West Motorway	Thames Water Utilities
Connect M1-A1 Limited	M6 Birmingham Expressway	Thyssengas Gmbh
Connect Project PFI	M6/M74 DBFO	Toscana Floating Storage Regasification Unit (FSRU Toscana)
Conwy Schools PFI	M8/M73/M74 Motorway Network PPP	UK Highways A55 Limited
Dalmuir Sewage Treatment Works	Madrilena Red de Gas	Universal Terminal
Dalrymple Bay Coal Terminal	Marseille L2 Motorway	University of Hertfordshire Student Accommodation
Defence Headquarters Joint Operations Command Project (complex known as General John Baker Complex)	Melbourne Airport	Victorian Desalination Plant PPP
Doncaster Mental Health	Mercurio Solar Tinajeros	Wales & West Gas Networks
Drakelow Solar Farm	Metropolitan Police Specialist Training Centre (MPSTC)	Walsall Street Lighting
Ealing Schools	MoD Main Building (Whitehall Building)	Westrail
EastLink	Naples Airport	Ytterberg Wind Farm
Ecogen Energy	Newham Hospital	
Edinburgh Airport	New Tyne Crossing Project	

Table 4: List of constituents in the Top AAO Peer Group portfolio

Anglian Water	LONDON CITY AIRPORT LIMITED
Associated British Port	MoD Corsham PFI
Autopista Central	Northumbrian Water
Autopista del Pacifico (Interconexion Vial Santiago - Valparaiso - Vina del Mar)	Open Grid Europe TopCo
Birmingham Airport	Perth International Airport
Brisbane Airport	Single Living Environment and Accommodation Precinct (LEAP) - Phase 2
Bristol Airport	Redexis Gas
Camino Internacional Ruta 60 CH	Scotia Gas Networks (SGN)
Concesion Internacional Ruta 5 Tramo Los Vilos-La Serena	Single Living Environment and Accommodation Precint (LEAP) - Phase 1
Dalrymple Bay Coal Terminal	Solar PV Plant of La Coste Portfolio
EastLink	Sydney Airport Link
Edinburgh Airport	Thames Water Utilities
Forth Ports	Universal Terminal
Gateway motorway and Logan motorway	Ventos do Araripe 3 Wind Complex (357.9MW)
Gatwick Airport	Westlink M7 (formerly Western Sydney Orbital)
HS1 High Speed Rail	

3. Applications

3.1 Risk-Adjusted Performance of top Infrastructure investors

Looking at the performance of the peer groups relative to each other and the broad market index benchmark, we see that both peer groups perform better than the market as whole.

Table 5 shows the total returns, risk and risk-adjusted returns of each portfolio. While historical performance is better for both peer groups of large infrastructure investors, they also exhibit higher volatility, in particular the Top Asset Owner peer group portfolio, which we know to be more concentrated than the other peer group portfolio.

The Top AM peer group has the highest risk-adjusted return (Sharpe ratio): while it has higher returns (and as we will see later it is exposed to more risk) than the market it also manages to achieve a higher degree of diversification and thus earns a higher return per unit of risk. In terms of extreme risk, measures like Value-at-Risk suggest that the top AM and top AO peer portfolios are more alike, and that both tend to have a VaR close to that of the market. However, another measure of extreme drawdown is the impact of the Covid-19 lockdowns. This reveals that the performance of both peer groups was quite different during Covid-19 lockdowns even though, on a year-to-date basis, is in line with the market.

The Top AM peer group is highly exposed to transport and merchant assets as shown above and was impacted by the Covid-19 lockdowns in Q1 2020 much harder than the top AO peer group or the market. However, their higher allocation to projects enables them to outperform the market in the second quarter.

Next, we perform a performance contribution and attribution analysis to better understand why the two peer groups consistently outperform the market benchmark.

3.2 Performance Contribution and Attribution Analysis

Simply beating the benchmark is not necessarily the sign of better-informed investment decisions. It is important to understand what the return drivers are, so that any investment strategy can be adapted, and a portfolio can be expected to outperform in the future.

There are several ways to explain the returns depending on an investor's focus areas and the strategy. We analyse the returns by the three TICCS® pillars: Business risk, Industrial activity and Corporate governance.

Business Risk and Performance

Figures 4a to 4c show the decomposition of five-year compounded returns using the three TICCS® business risk classes. We find that:

- Regulated infrastructure explains most of the strong performance in the peer group portfolios. This segment also contributes the most in the benchmark, but the proportion is relatively smaller as compared to the peer group portfolios.
- Top AM drive second largest return contribution from merchant assets, whereas contracted assets play that role in the top AO' portfolios.
- Another key point to note here is that while top AO have lower exposure to contracted assets as compared to the benchmark, they generate a larger proportion of return from contracted assets. This suggests that top AO

Table 5: Performance and risk metrics for both peer group portfolios and the broad market benchmark

Total Returns Horizon	Asset managers	Asset owners	Benchmark***
2020 Q2#	-2.67%	-5.65%	-5.19%
2020 Q1#	-7.89%	-4.50%	-6.06%
2020 YTD#	-10.35%	-9.90%	-10.94%
3 years	13.86%	11.23%	3.01%
5 years	15.31%	13.97%	6.04%
10 years	17.90%	17.14%	12.25%
Historical volatility Horizon	Asset managers	Asset owners	Benchmark***
3 years	15.06%	15.60%	12.63%
5 years	15.36%	15.90%	12.70%
10 years	15.43%	16.56%	14.01%
Sharpe ratio* Horizon	Asset managers	Asset owners	Benchmark***
3 years	0.88	0.68	0.20
5 years	0.96	0.84	0.43
10 years	1.09	0.97	0.81
Value-at-risk** Horizon	Asset managers	Asset owners	Benchmark***
3 years	22.50%	21.85%	25.52%
5 years	24.72%	24.89%	24.82%
10 years	24.49%	27.68%	25.43%

* Sharpe ratio: excess returns divided by standard deviation of returns, ** Value-at-Risk: one-year 99.5% Cornish Fisher VaR. ***EDHECinfra broad market value weighted index in local currency is used as the benchmark. All figures annualised except when indicated: # quarterly return, Source: EDHECinfra (updated as of 2020 Q2).

have been successful in picking "*winner*" contracted companies.

Asset Allocation vs. Selection

Table 6 breaks down the difference in the mean quarterly return (over the last five years) of the portfolio and the benchmark into the impact of asset allocation differences to each segment of the benchmark and individual investment selection choices (see Brinson, Hood and Beebower,1986[1]).

- First thing to note is that both peer groups derive their outperformance through selection of companies rather than the allocation by business models and the effect is very prominent with the total selection effect contributing 1.59% and 1.64% to the outperformance for top AM and top AO' portfolios respectively.
- In the top AM portfolio, bulk of the outperformance is driven by the selection of better merchant and regulated assets. Their portfolio also suffers from the smaller exposure to contracted investments contributing -18 bps.
- Top AOs suffer by being under exposed to both contracted and merchant business models, but derive some of their outperformance from selecting superior contracted companies. Here, interaction effect of -28 bps can be understood as a punishment for under-allocating to contracted business model even though they are better at company selection in this segment. A significant proportion of their outperformance also comes from the combination of allocating and selecting regulated investments.

Decomposing Returns by Industrial Activity

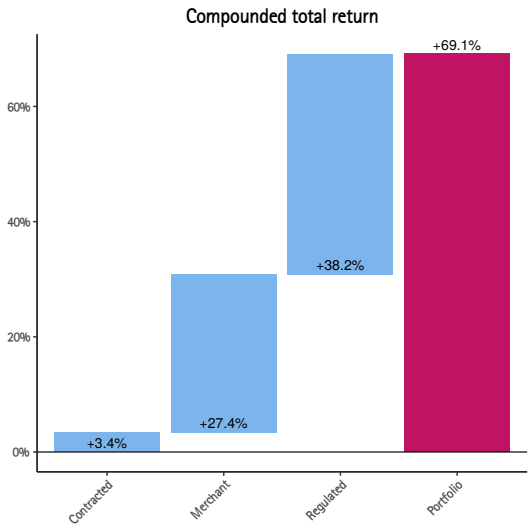
On the similar lines as business risk, we decompose the five year compounded portfolio return by industry type (Figures 5a-5c) and note that:

- Transport is the biggest contributor to the total cumulative return over the five years period in both the peer group portfolios. However, it contributes a much smaller fraction in the benchmark return.
- Network utilities is the second largest contributor of the portfolio return. Energy assets, both conventional and renewable, as well as Social infrastructure assets have contributed very little to the performance, owing to their smaller weights and lower relative returns.

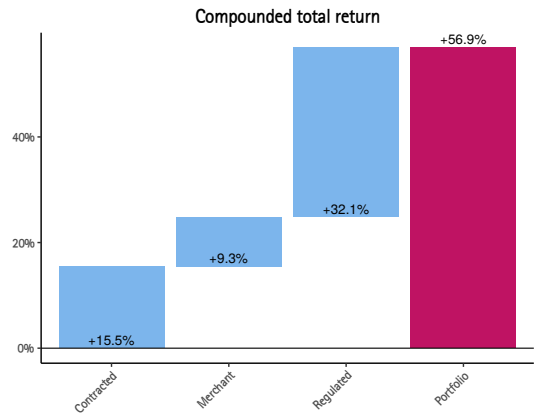
1 - Brinson, G.P., Hood, L.R. and Beebower, G.L., 1986. Determinants of portfolio performance. *Financial Analysts Journal*, *42*(4), pp.39-44.

Figure 4: Return Contributions by TICCS® Business Risk Segment - 2015-2020

(a) Asset Managers



(b) Asset Owners



(c) Market Benchmark

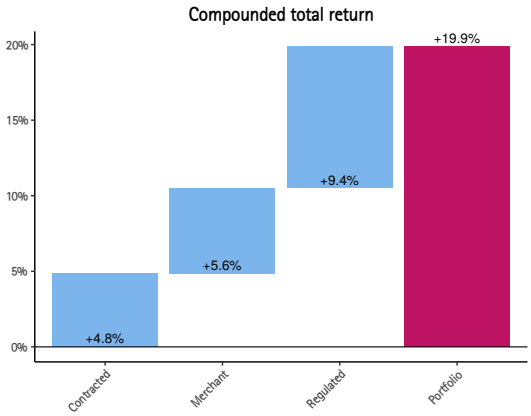


Table 6: Return Attribution by TICCS® Business Risk Segment - 2015-2020

Top Asset Managers Peer Group	Allocation	Selection	Interaction	Difference with benchmark
Contracted	-0.18%	0.16%	-0.10%	**-0.12%**
Merchant	0.07%	0.59%	0.22%	**0.87%**
Regulated	0.17%	0.84%	0.11%	**1.11%**
Total	**0.06%**	**1.59%**	**0.23%**	**1.87%**
Top Asset Owners Peer Group	Allocation	Selection	Interaction	Difference with benchmark
Contracted	-0.12%	0.81%	-0.28%	**0.42%**
Merchant	-0.08%	0.24%	-0.03%	**0.14%**
Regulated	0.23%	0.59%	0.12%	**0.94%**
Total	**0.03%**	**1.64%**	**-0.19%**	**1.49%**

- Energy and water resources companies, composed of some large gas pipelines, are the biggest contributor of negative returns in all the three portfolios.

Attributing between allocation and selection choices

Attribution of outperformance by industry types in Table 7 shows that:

- Both peer groups derive their super performance by the selection of transport and network utilities assets, rather than by trying to improve their industry allocation relative to the benchmark.
- Their asset allocation choices relative to the benchmark contribute little in the outperformance.
- Interestingly, transport sector has a small negative allocation effect (on average over five years) in the top AM portfolio. This is largely the result of the negative impact from Covid-19 in 2020 Q1. Top AO, on the other hand, had relatively lower allocation to transport and, thus, on a five-year basis, still benefit a little by over-allocating to this sector.
- In both the peer group portfolios, interaction effect rewards the better selection in the transport and network utilities sectors, where portfolios are also over-weighted as compared to the benchmark. At the same time, it rewards top AM for under-allocating to renewables, where they have poor asset selection, and it rewards top AO for their lower allocation to Power sector, in which their company selection was worse than the benchmark.

Breaking down returns by corporate governance segment

The decomposition of returns by corporate governance shown in Figures 6a to 6c reveals that:

- A large part of the outperformance is driven by corporates and this is the direct result of portfolios having higher exposure to corporate companies.
- Top AM derive a significant part of their returns from investing in infrastructure projects, whereas the contribution is much smaller for top AO.

Attributing between allocation and selection choices

Looking at the performance attribution in Table 8, we note that:

- Both the peer group portfolios derive their superior performance by the selection of better corporate companies.
- Top AM are also relatively better at selecting better projects.
- Top AO suffer from not investing as much in projects as the market. However, since they are better at selecting corporate companies, it might be in their interest to continue over-allocating to corporates. In the end, it is a trade-off between selecting better assets in one segment and diversifying between segments.

3.3 Systematic vs Idiosyncratic Risk-Return Analysis

We also decompose portfolio returns in terms of systematic (beta) and idiosyncratic risks (alpha).

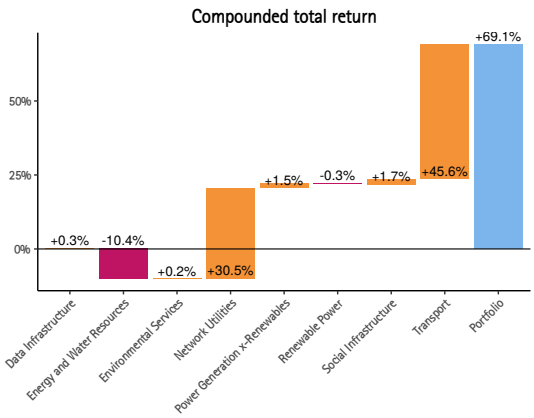
We regress the quarterly total returns of the two portfolios against the market benchmark (EDHEC*infra* broad market unlisted infrastructure equity index) for a period of ten years. The results are reasonably robust, achieving an adjusted-R^2 in the range of ~70-80%.

Looking at Figure 7, we see that:

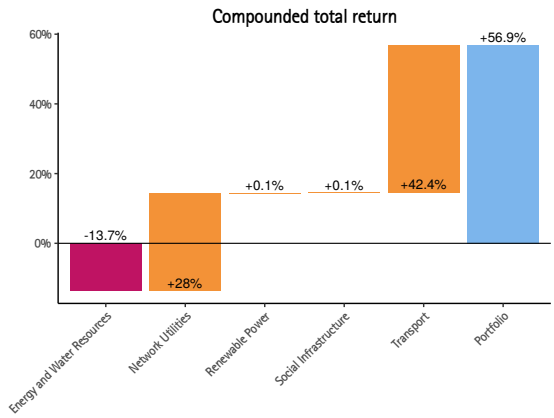
- Top AM have a beta very close to 1 and earn a much higher alpha of approximately 1.43% on a quarterly basis.
- Top AO, on the other hand, are more exposed to systematic risk, as indicated by their higher beta of 1.14, and they earn less than half the alpha as compared to top AM.

Figure 5: Return Contributions by TICCS® Industrial Activity Segment - 2015-2020

(a) Asset Managers



(b) Asset Owners



(c) Market Benchmark

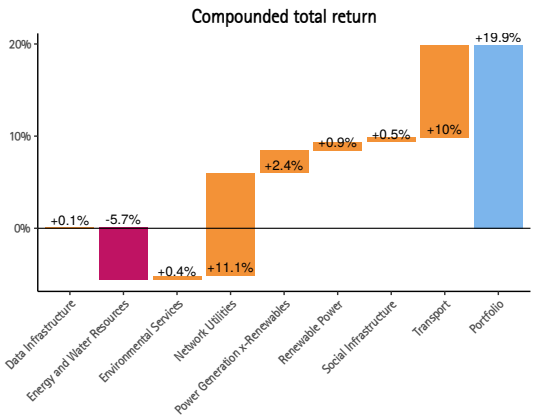


Table 7: Return attribution by Industrial Activity Segment

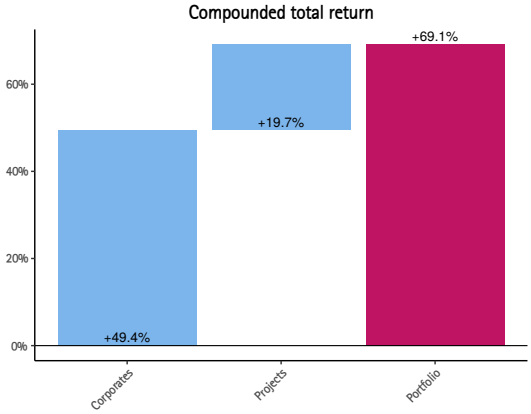
Top Asset Managers Peer Group				
	Allocation	Selection	Interaction	Difference with benchmark
Data Infrastructure	0.00%	0.01%	0.00%	**0.01%**
Energy and Water Resources	0.06%	-0.14%	0.00%	**-0.08%**
Environmental Services	-0.02%	0.04%	-0.04%	**-0.01%**
Network Utilities	0.07%	0.47%	0.11%	**0.65%**
Power Generation x-Renewables	-0.07%	0.03%	-0.01%	**-0.06%**
Renewable Power	-0.04%	-0.12%	0.11%	**-0.06%**
Social Infrastructure	0.01%	0.01%	0.01%	**0.03%**
Transport	-0.01%	1.23%	0.17%	**1.40%**
Total	**0.00%**	**1.53%**	**0.35%**	**1.87%**
Top Asset Owners Peer Group				
	Allocation	Selection	Interaction	Difference with benchmark
Data Infrastructure	-0.01%	-0.01%	0.01%	**-0.01%**
Energy and Water Resources	0.04%	-0.23%	-0.02%	**-0.22%**
Environmental Services	-0.02%	-0.02%	0.02%	**-0.02%**
Network Utilities	0.11%	0.36%	0.09%	**0.56%**
Power Generation x-Renewables	-0.12%	-0.12%	0.12%	**-0.12%**
Renewable Power	-0.05%	0.04%	-0.03%	**-0.04%**
Social Infrastructure	-0.02%	-0.03%	0.02%	**-0.03%**
Transport	0.03%	1.16%	0.17%	**1.36%**
Total	**-0.04%**	**1.15%**	**0.38%**	**1.49%**

Table 8: Return attribution by Corporate Governance Segment

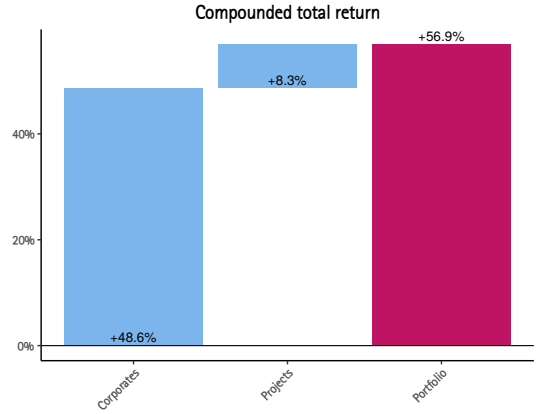
Top Asset Managers Peer Group	Allocation	Selection	Interaction	Difference with benchmark
Corporates	0.05%	1.32%	-0.01%	**1.36%**
Projects	-0.01%	0.49%	0.04%	**0.51%**
Total	**0.04%**	**1.81%**	**0.03%**	**1.87%**
Top Asset Owners Peer Group				
	Allocation	Selection	Interaction	Difference with benchmark
Corporates	0.14%	1.16%	0.13%	**1.43%**
Projects	-0.12%	0.22%	-0.04%	**0.06%**
Total	**0.02%**	**1.38%**	**0.09%**	**1.49%**

Figure 6: Return Contributions by TICCS® Corporate Governance Segment

(a) Asset Managers



(b) Asset Owners



(c) Market Benchmark

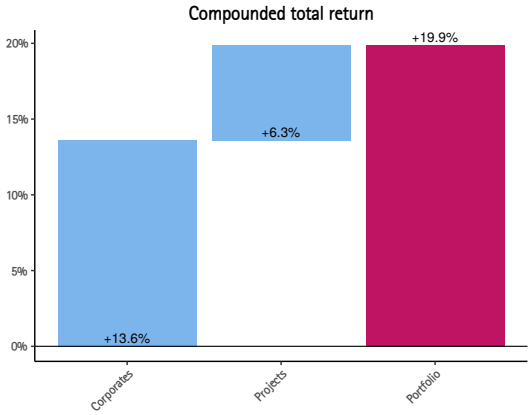
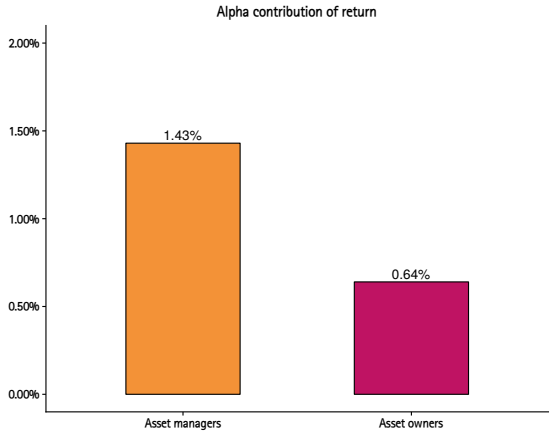


Table 9: Decomposition of Historical Volatility

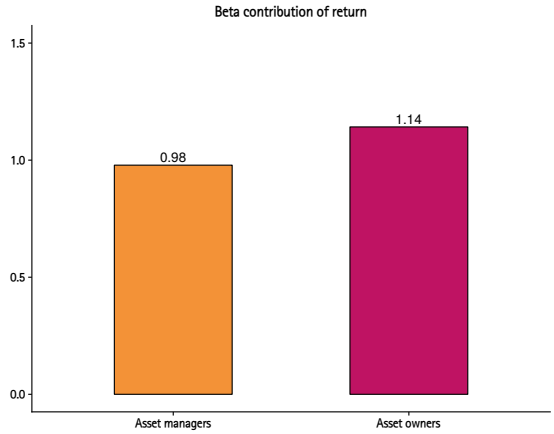
Top Asset Manager Peer Group	Historical volatility	Systematic	Idiosyncratic
3 years	14.59%	12.3%	7.91%
5 years	17.08%	13.7%	10.21%
10 years	15.83%	13.7%	7.86%
Top Asset Manager Peer Group			
	Historical volatility	Systematic	Idiosyncratic
3 years	15.13%	14.3%	4.92%
5 years	17.45%	16.0%	7.02%
10 years	17.06%	16.0%	5.83%

Figure 7: Portfolio Alpha and Beta of the Top Asset Managers and Asset Owners Peer Groups - 2010-2020

(a) Asset Managers



(b) Asset Owners



Using these results, portfolio volatility can be also decomposed into systematic and idiosyncratic components.

Table 9 shows that:

- The higher portfolio volatility of top AO is driven by its systematic component, as a result of their higher beta against the benchmark.
- Top AM have higher idiosyncratic volatility which is congruent with their higher alpha.

3.4 Risk Factor Analysis

The EDHECinfra asset pricing methodology hinges around estimating each company's equity risk premium at the end of every quarter. This premium is used to generate marked-to-market valuations for each company. The index or portfolio level risk premia is reported as the weighted average of each constituent's risk premia.

Figure 18 shows this weighted average risk premia for the two peer group portfolios and the benchmark over the past five years. We find that:

- Both peer group portfolios exhibit higher equity risk premia than the market, i.e., they are both exposed to more risk than the market, which is also why their returns are higher than the market.
- On average, top AM have been harvesting a higher equity risk premium than the top AO.

What is the exposure of these portfolios to different risk factors?

The risk premium harvested by each peer group is the combination of their exposures to several risk factors times the price of each one of these risk factors.

Figures 9a to 9d highlight the risk exposures to the four key risk factors used in the EDHECinfra methodology: Leverage (senior liabilities / total assets), Size (total assets), Profit (return-on-assets) and Investment (Capex / total assets).[2]

- The top AM peer portfolio includes the greatest exposition to the leverage factor, almost 85% on an average. Top AO, on the other hand are a little less exposed (~80%) but still have higher exposure than the market.
- Top AO tend to invest in larger companies with average size of USD 4-5bn, in comparison, top AM have relatively smaller assets on average, but still larger than the market average.
- Exposures to the profit and investment factors, while increasingly higher than the market, are also more in line with market averages.

Marginal contribution of risk factors to the equity premia

Next, we compute the marginal impact of each of the risk factors to the risk premium of a portfolio (Figures 10a to 10d).

2 - Other factors in the expected return model are Term Spread and control variables. These 4 factors explain most of the variance of expected returns between these portfolios.

Figure 8: Weighted average equity risk premia: top asset managers and asset owners peer group portfolios and market benchmark

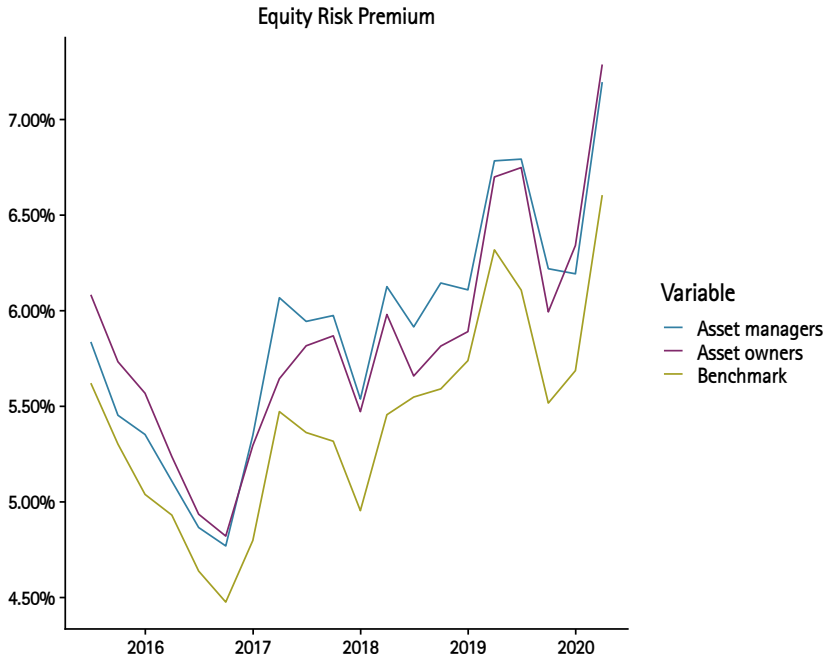
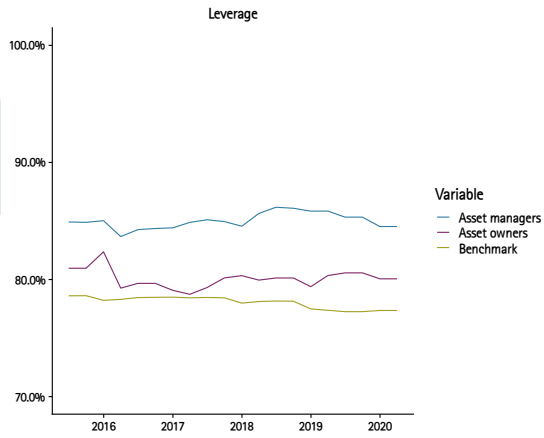
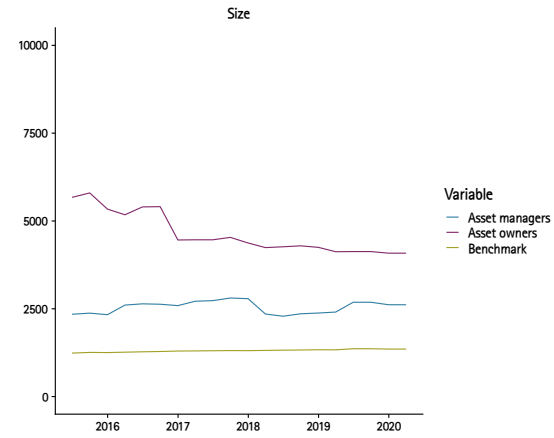


Figure 9: Average Exposure to the Key Risk Factors

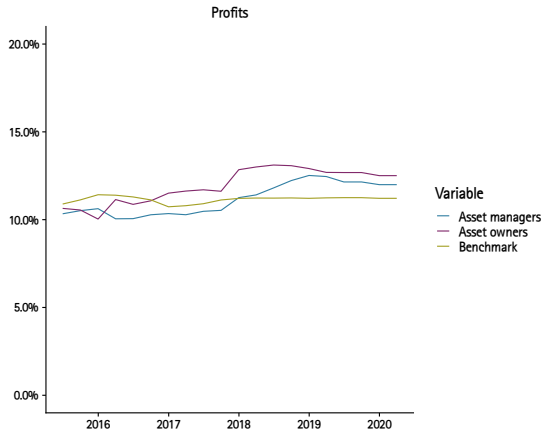
(a) Leverage Factor Exposure (senior liabilities)



(b) Size Factor Exposure (total assets)



(c) Profit Factor Exposure (return on assets)



(d) Investment Factor Exposure (capex)

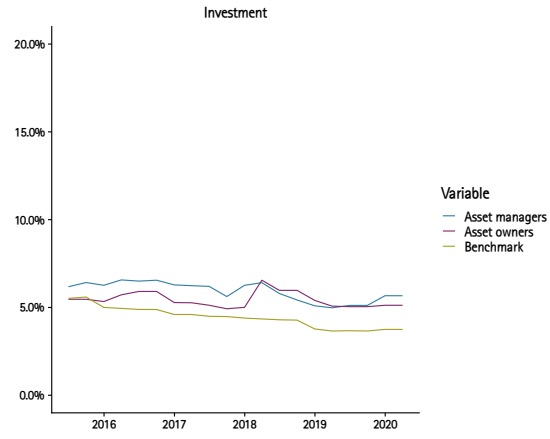
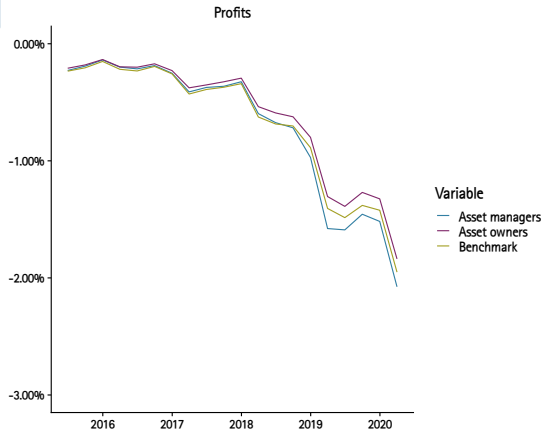


Figure 10: Key Risk Factors Marginal Contributions to the Equity Risk Premia

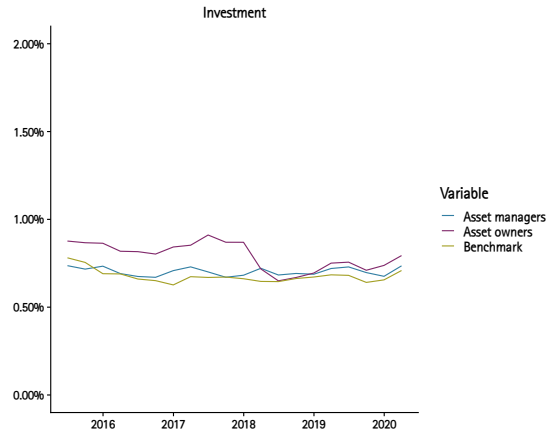
(a) Leverage Factor Marginal Contribution

(b) Size Factor Conrtribution

(c) Profit Factor Contribution



(d) Investment Factor Contribution



- The leverage factor has the strongest impact and, recently, has been responsible for more than 750 basis points of the equity premia for all the three portfolios. Top AM, as a result, are most impacted by their greater exposure to leverage and earn the highest equity premium. Top AO, as well, derive larger equity premium from leverage factor as compared to the market.
- The size factor is the second biggest contributor to the equity premia and, in this category, top AO are able to harvest higher premium driven by their greater exposure to large assets.
- More profitable companies require a lower equity risk premium, as indicated by figure 19. However, owing to their similar exposures to profit factor, there is little difference in the marginal impact of the profit factor in the peer groups relative to the market.
- Similarly, the effect of the investment factor makes a relatively small difference between the two peer group portfolios and the market benchmark.

3.5 Choosing the Right Benchmark – the case of contracted project investors

The analysis presented above used the broad market index as the benchmark for the top AO and top AM peer groups because the global market for unlisted infrastructure investment is the relevant market for these two peer groups.

However, not all infrastructure investors have this outlook. If an investor focused only on a specific segment of the unlisted infrastructure market, the choice of benchmark to conduct this analysis will be very important. As is the case in other asset classes, by picking the wrong benchmark,

investors risk underestimating beta and overestimating the alpha of their portfolio.

Next, we consider the case of an infrastructure investor that specialises in contracted projects. Using the same information collected for the Top AM peer group, we build a portfolio that includes only contracted (TICCS®-BR1) project finance vehicles (TICCS®-CG1).

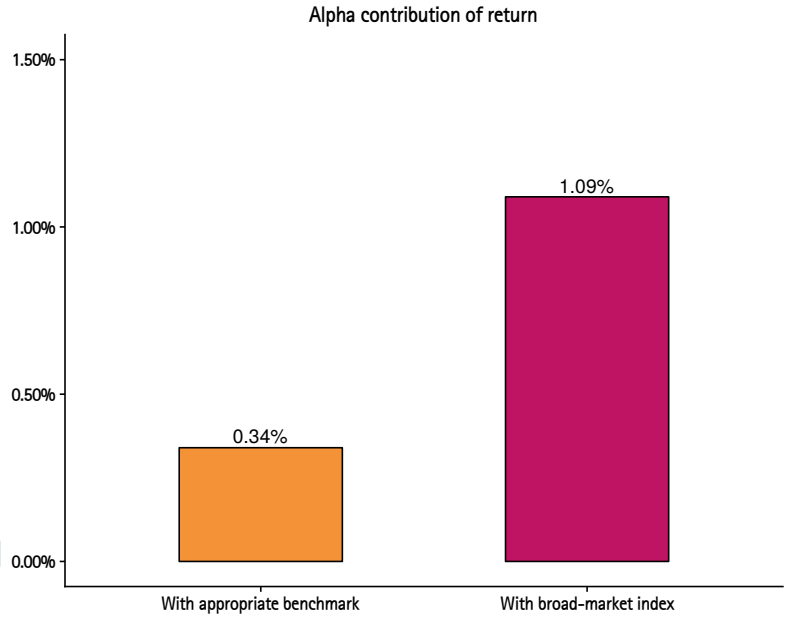
This yield a peer portfolio of 60 assets invested over 10 years with 18 still present in the portfolio today after 42 exits. As of Q1 2020, this contracted project (top AM) peer portfolio represent USD2bn of market value and 700m USD of actual investment by Top AM during that time.

As shown on figure 11, if this portfolio was benchmarked against the same broad market index used for the two peer groups presented earlier, an investor would find a beta of 0.70 and an alpha of 109bp.

However, with the more adequate contracted project benchmark, we get a beta of 1.03 and a much lower alpha of 34bp.

This illustrates how having access to a granular set of benchmarks that accurately represent the assets in the portfolio or the infrastructure segments defined in the investment strategy matter to be able to understand the sources of performance. Note that a clear and objective asset classification scheme like TICCS® is also essential to be able to implement such granular benchmarking.

Figure 11: Alpha and Beta Decomposition of the Contracted Project Peer Portfolio using the wrong (broad market) benchmark and the adequate



4. Conclusions

4.1 Findings

In this case study, we have examined the risk and performance of two important peer groups of investors in the unlisted infrastructure sector: large infrastructure asset managers and large asset owners (by infrastructure AUM).

Key findings about the two peer groups are:

1. These two peer groups perform well relative to the market primarily because they manage to invest in the best assets;
2. However, they are not able to use asset allocation to different sectors or business risk segments to improve their performance. Instead they often underperform the benchmark because of their implicit or *de facto* asset allocation choices;
3. They are quite concentrated in a few firms, which is in line with the first finding;
4. They are exposed to more risk than the market average, in particular:
   a. Higher exposure to leverage in the case of top AM
   b. Higher exposure to larger assets in the case of top AO
5. Top AM are also exposed to higher idiosyncratic risk than the top AO peer group which exhibit a higher market beta;
6. Overall, top AM are the best performers on a risk-adjusted basis;
7. Because AM exit their investments regularly, they can also benefit from market timing effects which are not necessarily available to the Top AO.

This analysis also gives us some insights into infrastructure investing

- Using Asset allocation at the asset class level is tough (rebalancing cannot be done once a quarter).
- If selection skills are rare and different across segments, then there can be a trade-off between diversifying across more segments and using your skills to pick the best deals in only a few segments.
- With lumpy assets and under-diversified portfolios, security selection makes all the difference, and hence, unlisted infrastructure remains a very active investment strategy.
- The beta vs alpha decomposition of a fund manager is often used to measure 'added value' assuming that the beta of the portfolio is available to investors at a low cost through an index fund or equivalent. In the case of infrastructure, building an infrastructure portfolio can take a decade and is conditioned by each investor's ability to access a very illiquid and segmented market. Thus, delivering a well-defined beta (corresponding to a well-documented benchmark) may well add more value to the final investor than beating the same benchmark by a few basis points.
- This last point suggests that infrastructure managers or teams could also be evaluated in terms of tracking error relative to a benchmark which represents the target risk exposures that a given investor wants to achieve by investing in infrastructure.

4.2 Develop this use case for your own portfolio

Asset managers, asset owners and consultants can do this analysis on their own portfolio using the data available in the EDHECinfra platform.

1. Classification: First, categorise your unlisted infrastructure equity investments using TICCS®.
2. Benchmark selection: Use your asset values to determine the business risk, industrial activity and corporate governance weights of your portfolio or target portfolio. Use this profile to

select the best market index or sub-index for your benchmark amongst 120+ options on the EDHEC*infra* platform.

3. Performance contributions: Using your infrastructure portfolio's valuations (prices or NAVs) and cashflows, you can compute quarterly total returns. Use the relevant TICCS® sub-indices in the EDHEC*infra* platform to get the returns of each segments of your portfolio. Use your portfolio weights to derive the contributions of each segment to your portfolio returns
4. Performance attribution: Use your portfolio weights and returns for each TICCS® segment relative to the EDHEC*infra* sub-indices weights and returns, to attribute the performance difference by allocation, selection and interaction effects.
5. Market Beta/Alpha Assessment: Regress your portfolio returns against the benchmark returns to determine alpha/beta (you need a few years of data)

This approach works for portfolios of infrastructure debt as well. The EDHEC*infra* platform includes several hundred indices of private infrastructure debt including project finance and corporate infrastructure debt, CPI-linked and all the different TICCS® classes.

EDHEC*infra* Publications (2016-2020)

EDHECinfra Methdologies & Standards

- The Infrastructure Company Classification Standard (TICCS) - Updated March 2020
- Credit Risk Methodology - April 2020
- Infrastrcuture Index Methdology Standard - Updated March 2020
- Global Infrastructure Investment Data Standard - Updated March 2020
- Unlisted Infrastructure Valuation Methodology - A Moderm Approach to Measuring Fair Value in Illiquid Infrastructure Investments - Updated March 2020

Selected EDHEC Publications

- Amenc, N., F. Blanc-Brude, A. Gupta, J-Y. Lim. "2019 Global Infrastructure Investor Survey - Benchmarking Trends and Best Practices" (April 2019)
- Whittaker, T., S. Garcia. "ESG Reporting and Financial Performance: The case of infrastructure." (March 2019)
- Blanc-Brude, F, J-L. Yim. "The Pricing of Private Infrastructure Debt - A dynamic Approach" (February 2019)
- Blanc-Brude, F., C. Tran. "Which Factors Explain Unlisted Infrastructure Asset Prices?" (January 2019)
- S. Garcia, F. Blanc-Brude, T. Whittaker. "Tome La Siguiente Salida (Take the Next Exit) - A Case Study of Road Investments Gone Wrong, Spain, 1998-2018" (March 2018)
- Amenc, N., F. Blanc-Brude "Selecting Reference Indices for the Infrastructure Asset Class" (February 2018)
- Blanc-Brude, F., A. Chreng, M. Hasan, Q. Wang, and T. Whittaker. "Private Infrastructure Equity Indices: Benchmarking European Private Infrastructure Equity 2000-2016" (June 2017).
- Blanc-Brude, F., A. Chreng, M. Hasan, Q. Wang, and T. Whittaker. "Private Infrastructure Debt Indices: Benchmarking European Private Infrastructure Debt 2000-2016" (June 2017).
- Blanc-Brude, F., G. Chen, and T. Whittaker. "Towards Better Infrastructure Investment Products: A Survey of Investors' Perceptions and Expectations from Investing in Infrastructure" (July 2016).
- Blanc-Brude, F., T. Whittaker, and S. Wilde. "Searching for a Listed Infrastructure Asset Class: Mean-Variance Spanning Tests of 22 Listed Infrastructure Proxies" (June 2016).
- Blanc-Brude, F., T. Whittaker, and M. Hasan. "Cash Flow Dynamics of Private Infrastructure Debt" (March 2016).

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