The Rise of "Fake Infra"

The Unregulated Growth of Listed Infrastructure and the Dangers It Poses to the Future of Infrastructure Investing

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"Although these opinions appear to follow logically in a dialectical dicussion, yet to believe them seems next door to madness when one considers the facts. [...] It is only between what is right and what seems right from habit that some people are mad enough to see no difference."
Aristotle
On Generation and Corruption, 325^{a}

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Executive summary

In this position paper, we document the dangerous rise of the so-called listed infrastructure asset class, an ill-defined series of financial products that initially targeted retail investors and now increasingly reaches institutional investors, which now represent close to a third of the sector.

Promising to deliver the benefits of an "infrastructure investment narrative," listed infrastructure has been growing by 15% annually for a decade, reaching USD57bn of assets under management (AUM) today.

Serious research shows that listed infrastructure is failing to deliver on its many promises, and in our view, the number of false claims made about listed infrastructure products is high enough to consider a case of **mis-selling**.

We strongly recommend **stricter regulatory oversight** of these products, including the obligation to **include the word "listed" in their names** to avoid misleading investors as well as the obligation to include information in marketing documents and information kits **warning investors that listed infrastructure may not deliver the same performance** as unlisted infrastructure investments.

Listed Infrastructure Is "Fake Infra"

Our review of the marketing documentation for 144 listed infrastructure products representing 85% of the sector by AUM concludes that such products typically make near-identical claims compared to private infrastructure products.

However, our and others' research (summarised in table 1) shows repeatedly that listed infrastructure, as it is proposed to investors today, exhibits high drawdown and volatility, does not have better risk-adjusted performance than broad market stock indices, and can typically have its behaviour explained away by a series of well-known factor tilts available to investors throughout the stock market.

In this paper, we perform new tests that extend existing research and use the actual constituents of both passive and active listed infrastructure products, capturing most available listed investment products using the word "infrastructure" in their name. We find even less convincing results than previous studies, which rely on back-filled indices using data from a period when no listed infrastructure product even existed.

We also find that active listed infrastructure managers have invested in close to 1,900 different stocks over the past decade, many of which cannot possibly be considered "infrastructure" under any definition.

Fake Infra Poses a Threat to the Infrastructure Investment Sector

The growth of listed infrastructure products is problematic because of the damage that their proliferation will eventually do to proper infrastructure investing.

We believe in the potential of infrastructure debt and equity investment for asset owners. We also see no reason why – in principle – some of the products used to access the characteristics of underlying infrastructure assets could not be listed on public markets.

But today's "fake infra" will disappoint. It is comparatively expensive and will leave investors without the promised low-risk, stable inflation-

linked returns. As a result, it could **give a bad name to infrastructure investing in general**.

Fake infra could reverse years of educating investors about the potential of infrastructure assets as sources of portfolio-diversification and liability-hedging instruments.

It could undo recent progress in the prudential area to recognise the existence of a specific risk-return profile and capital-charge treatment for infrastructure debt and equity.

It may even jeopardise the involvement of institutional investors in the next generation of public-private partnerships that underpins so much of the national infrastructure plans being put forward by most OECD governments.

Transparency and Clarity Are Possible

Eventually, stock market regulators should **aim to achieve a clear definition of the listed infrastructure space**, within which better, more transparent listed infrastructure products could be created with the aim of delivering at least some of the promises of infrastructure investment to asset owners.

This definition already exists and has been developed in the context of the prudential regulation of insurers, pension plans, and banks. It can be used by stock market regulators to define underlying assets that could qualify to be included in listed equity products, as is the case for other categories or groupings of stocks.

Furthermore, asset owners should **require transparency** and that listed infrastructure asset managers publish their constituents; they should **require concrete evidence** of the delivery of infrastructure-investment narrative using listed products; and they should **benchmark listed infrastructure products against unlisted ones**.[1]

Listed infrastructure managers are not all equally responsible for the state of the sector described in this paper. Some have been involved in trying to create access to infrastructure businesses through listed products honestly and for a long time. **Genuine providers of infrastructure investment products should work together to remove the risks created by the growth of fake infra.**

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1 - Common listed infrastructure indices have a 20% tracking error with private infrastructure equity indices such as the ones published by EDHEC*infra* (BBG:EIPEE).

Table 1: Assessment of the main claims made in favour of listed infrastructure investment

The claim	Assessment	The evidence
"Equity-like returns"	Not necessarily true	Blanc-Brude et al. (2017) find returns either in line, below, or above the market. Bianchi et al. (2017) find listed infrastructure returns typically below global benchmarks.
"Reduced volatility"	Not true	Blanc-Brude et al. (2017) and Bianchi et al. (2017) find annualised return standard deviations mostly on par or higher than the market index, in line with research by Rothballer and Kaserer (2012) and others.
"Portfolio diversification"	Not true	Blanc-Brude et al. (2017) show that listed infrastructure is highly correlated with the market index.
"Downside protection"	Not true	Blanc-Brude et al. (2017) find equivalent or higher maximum drawdown and value-at-risk in listed infrastructure indices when compared to the reference market index.
"Predicable cash flows"	Not necessarily true	Blanc-Brude et al. (2016) show that the cash flows of private infrastructure firms are less volatile. However dividend payouts are *more* volatile, i.e., they vary more in size. Blanc-Brude (2013) shows that dividend payouts in listed infrastructure firms are more volatile than the market average.
"Predictable returns often linked to inflation"	Not true	Rödel and Rothballer (2012) and Bird et al. (2014) show that listed infrastructure does not offer better inflation-hedging properties than the stock market in general.
"Unique asset class"	Not true	Ammar and Eling (2015) and Bianchi et al. (2017) show that listed infrastructure indices can be replicated using simple factor tilts.

1. Introduction

In this position paper, we argue that the rapid rise of the listed infrastructure sector has led to the creation of products that do not add value to investors' portfolios; may be highly misleading; and will eventually hurt infrastructure investing in general, including damaging the public policies aiming to involve institutional investors in the financing of long-term infrastructure projects. This issue calls for more stringent regulation and better definitions and codification of the nature of assets that can qualify as "infrastructure."

For the past 15 years, infrastructure investment has been the domain of large sophisticated investors, but it is now rapidly becoming more mainstream, and asset owners of all sizes *including retail investors* have heard of the promise of the "infrastructure investment narrative" (Blanc-Brude, 2013).

The investment beliefs associated with infrastructure are rooted in strong economic hypotheses about the provision of essential services to the real economy. Moreover, the recent flurry of national infrastructure plans suggests that the infrastructure sector is poised for strong growth and supportive public policies.

However, this intuitive story is increasingly used to refer to a whole array of financial products. Originally confined to private equity or debt strategies, the label "infrastructure" can now be found attached to exchange-traded funds (ETFs); mutual funds, including open-ended funds, closed-end funds, unit trusts, OEICs, etc.; and a range of stock market indices.

This fast growing listed infrastructure sector is almost always presented as having the ability to deliver features such as stable risk-adjusted long-term returns, inflation hedging, portfolio diversification, and downside protection while being more liquid, transparent, and associated with lower transaction costs than its unlisted (private) counterpart.

But these products suffer from several problems: a lack of definition of what it means to invest in infrastructure creates much room for interpretation by managers, and – partly as a result of this – research shows that the products typically lack any distinctive investment characteristics once standard factor tilts have been taken into account.

Our review of the documentation and the performance data of 144 products reveals that listed infrastructure products are often risky and expensive without offering better value.

In other words, listed infrastructure has so far had little to offer investors, apart from new fees. Investors in listed infrastructure products who now believe that they are exposed to a new secular theme or promising infrastructure story, have in fact only been investing in age-old stock-picking strategies or a combination of betas they already had access to.

We call this phenomenon **"fake infra."**

This proliferation of listed infrastructure products is perhaps not surprising. It is easy to buy; investors who are convinced by the narrative but cannot or do not want to access private vehicles are drawn to its simplicity. It is also profitable to sell. The creation of new products around a fashionable theme means that fees can be a little higher while creating the products is much simpler than raising, operating, and distributing private infrastructure funds.

Our review of the listed infrastructure sector shows that two types of "fake infra" products have grown rapidly over the past decade:

1. "Passive" strategies proposing to isolate exposures to certain sectors through a combination of industrial-sector filters and arbitrary stock-selection and weight caps. Many listed infrastructure indices have thus been put forward by various providers and numerous ETFs now track them;
2. "Active" strategies consisting largely of mutual fund retail share classes and increasingly of institutional share classes, which offer to invest in a portfolio of hand-picked infrastructure-related stocks.

Recent peer-reviewed academic research has shown that the passive strategies are highly correlated with the market and amount of well-known factor tilts rather than any new or unique set of betas to which investors supposedly did not have access before.

Indices utilising passive strategies also fail various tests of "mean-variance spanning," that is, they do not create any diversification benefits when added to an existing portfolio of traditional asset classes. The suggestion that such products add anything new to investors' portfolios thus fails to pass basic reality checks.

Active listed infrastructure strategies have been much less studied until now. In this paper, we review the prospectuses and data for dozens of funds with the word "infrastructure" in the product name. As well as having the same failings as the passive strategies above, they suffer from another problem: they typically rely on a very broad definition of "infrastructure," including sectors that are only partially or not at all linked to infrastructure, or encompassing the revenues of firms that are arguably only partially or not at all linked to infrastructure.

The use of thematic labels in product name has been proven to affect investors' allocation decisions (Cooper et al. (2005)). The inclusion of certain sectors that are only partially linked to infrastructure in the portfolio of certain products may be regarded as misleading and should draw regulatory scrutiny. In the past, regulators have recognised the potentially misleading use of terms in products' names. For instance, in 2001, the Securities and Exchange Commission (SEC) adopted Rule 35d-1 to prevent registered investment companies from using terms in names that "*are likely to mislead an investor about a company's investment emphasis.*"

In this paper, we also extend existing research on listed infrastructure by building two sets of custom listed infrastructure proxies representing the passive and active strategies described above, using the **actual constituents** found in these products.

Our passive listed infrastructure proxy tracks 21 index-linked products, representing USD12.2bn or 72.1% of the passive listed infrastructure product universe.

Our active listed infrastructure proxy covers 79 active products, representing USD35.5bn in AUM or 88.7% of the active listed infrastructure universe.

Together, these two proxies capture USD47.7bn in AUM in 2017, or 84% of the total listed infrastructure product universe.

In line with existing research, we find that listed infrastructure is not an asset class and can be completely replicated using a standard factor model.

The growth of these listed infrastructure products is problematic because of the damage that the proliferation of this kind of product will eventually do to infrastructure investing.

We believe in the potential of infrastructure debt and equity investment for asset owners. We also see no reason why – in principle – some of the products used to access the characteristics of underlying infrastructure assets could not be listed on public markets.

But fake infra will disappoint. It will leave investors without the promised low-risk, stable inflation-linked returns, and as a result, it could give a bad name to infrastructure investing in general.

It could reverse years of educating investors about the potential of infrastructure assets as sources of portfolio-diversification and liability-hedging instruments.

It could undo recent progress in the prudential area to recognise the existence of a specific risk-return profile and capital-charge treatment for infrastructure debt and equity.

It may even jeopardise the involvement of institutional investors in the next generation of public-private partnerships that underpins so much of the national infrastructure plans being put forward by most OECD governments.

The rest of this paper is structured as follows: Section 2 documents the development of the listed infrastructure sector from a few thematic retail funds ten years ago to a fast-growing institutional share class today.

Section 3 focuses on the area which has attracted most of the research attention on this topic: passive strategies using listed infrastructure indices and the exchange-traded products (ETPs) that track them.

Next, section 4 looks at the performance of active strategies by examining the constituents held by listed infrastructure fund managers and developing custom indices representing the performance available to an investor exposed to this sector.

Section 5 reviews and discusses our findings and suggests recommendations for investors and regulators, and for the future development of the listed infrastructure sector.
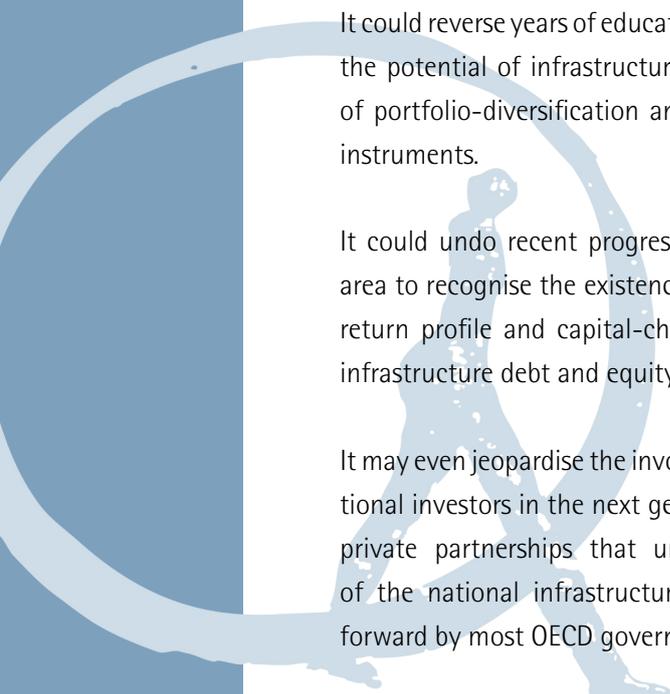
2. The Rise of "Fake Infra"

In this section, we discuss the growth of the listed infrastructure sector over the past decade. Section 2.1 reviews the reasons why investors are increasingly drawn to the infrastructure investment theme. Next, section 2.2 reviews the arguments typically made in the prospectuses of listed infrastructure products, following an in-depth review of the primary documentation. Finally, section 2.3 describes the growth of the listed infrastructure sector until today.

2.1 The Appeal of Infrastructure Investment

Investors, both institutional and retail, are increasingly interested by infrastructure investment. They are motivated by what we call the "infrastructure investment narrative" Blanc-Brude (2013). The "value proposition" of infrastructure is typically framed in the following terms:

- Infrastructure delivers *essential services* to the economy on a quasimonopolistic basis, implying stable demand and a low price elasticity of demand. This potential pricing power is often associated with *inflation hedging* characteristics;
- Also as a result of its pricing power, infrastructure is expected to exhibit "attractive" risk-adjusted returns (e.g., a risk-free monopoly rent);
- Low business risk is expected to generate *stable cash flows* and by extension *low return volatility* and limited drawdown and value-at-risk;
- Likewise, *low correlation* with the business cycle suggests the potential to improve portfolio diversification.

Figure 1: "An inflation-linked bond with rising coupons"
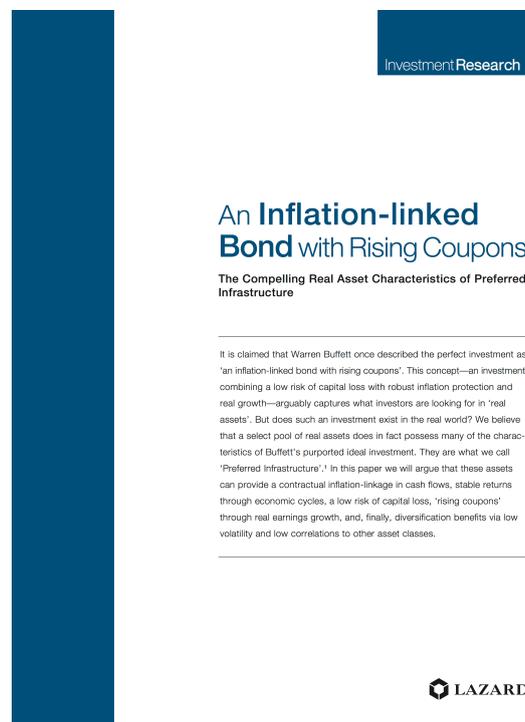
Thus, the infrastructure investment story *implies* many attractive characteristics in terms of asset and liability management.

For many years, such investments were only accessible to large institutional investors through private, illiquid vehicles and strategies.

Today, the label "infrastructure" can be found in a variety of listed products, all of which make a similar case for investing in infrastructure via public equities.

2.2 The Listed Infrastructure "Spiel"

In a 1977 *Fortune Magazine* column, Warren Buffet famously imagines the ideal long-term asset: "an inflation-linked bond with rising coupons." His point being – of course – that there is no such thing.

Still, listed infrastructure is often presented in marketing documents as if it were that very silver bullet, that is, an asset class that can do everything an investor might want, from delivering a high Sharpe ratio to hedging inflation, diversifying portfolio risk, and protecting against market downturns, all while being liquid and transparent with a documented track record, as exemplified by the cover page of one of the marketing documents we have reviewed in figure 1.

In effect, **an investor simply reading the marketing material may find listed and unlisted types of infrastructure equity products rather difficult to differentiate**: they have similar names and claim to deliver similar investment outcomes.

The only obvious differences are that listed products promises higher liquidity, lower minimum investment, relatively more transparency, and a track record.

Reviewing the primary documentation matters: previous research has shown that marketing materials matter and that the information provided does influence investors' asset allocation decisions (Jain and Wu (2000), Jordan and Kaas (2002), Huhmann and Bhattacharyya (2005)).

For this paper, we reviewed the marketing materials of 144 listed infrastructure products, the names of which are listed in 21 in the appendix. Our wide-ranging review reveals a very predictable template or pattern of argument, typically framed thus:

1. Opportunities to invest in infrastructure businesses have *increasingly* become available through public markets in recent years;
2. The infrastructure sector is characterised by huge unmet investment demand (the so-called infrastructure investment gap) and the number of future opportunities is expected

Table 2: Summary information of listed infrastructure products identified - July 2017

Product Type	Count	AUM(USDbn)	TER
Active	104	40.02	1.89
Passive	40	16.88	0.61

Sources: Bloomberg, Morningstar, ETF Database
Total expense ratio (TER) is defined as the annual fee charged by an investment company to manage and operate an investment fund.

to grow massively over the coming decades. Figures in trillions of dollars are not rare;
3. Governments are short of funds, need private investors in infrastructure, and are committed to privatising public infrastructure or granting investors long-term concessions to own and operate monopoly businesses that provide essential services to the economy;
4. Infrastructure investment is typically a net contributor to economic growth and as such creates social benefits as well.

In this context, in keeping with the investment narrative highlighted in the previous section, listed infrastructure products typically promise to seek the following investment objectives:

1. achieve attractive risk-adjusted returns over a medium-to-long-term investment horizon;
2. provide total return, that is, capital appreciation and income generation;
3. provide portfolio diversification benefits;
4. provide inflation protection;
5. provide less exposure to economic cycles;
6. provide downside protection, limiting permanent capital loss;
7. provide stable and predictable yield;
8. lower overall portfolio volatility.

This appealing product offering has led to the significant growth of the listed infrastructure sector, which we review next.

2.3   Sector Growth

The growth of listed infrastructure has been very fast over the past decade. The validity of the arguments mentioned above deserves to be investigated given the significant growth of these products, especially in the retail space, where

Table 3: Top 10 largest listed infrastructure Products - July 2017

Product Name	Nature	AUM(USDbn)	Weight	Cumulative
Alerian MLP ETF	Passive	9.52	0.17	0.17
Lazard Global Listed Infrastructure Portfolio	Active	5.13	0.09	0.26
Deutsche Global Infrastructure Fund	Active	3.52	0.06	0.32
ICVC First State Global Listed Infrastructure Fund	Active	3.31	0.06	0.38
GS MLP Energy Infrastructure Fund	Active	2.43	0.04	0.42
ETRACS Alerian MLP Infrastructure Index ETN	Passive	2.24	0.04	0.46
First Trust North American Energy Infrastructure Fund	Active	1.71	0.03	0.49
iShares Global Infrastructure ETF	Passive	1.70	0.03	0.52
Renaissance Global Infrastructure Fund	Active	1.41	0.02	0.54
Northern Multi-Manager Global Listed Infrastructure Fund	Active	1.24	0.02	0.57

Sources: Bloomberg, Morningstar

Figure 2: Number of listed infrastructure products and indices since 2000
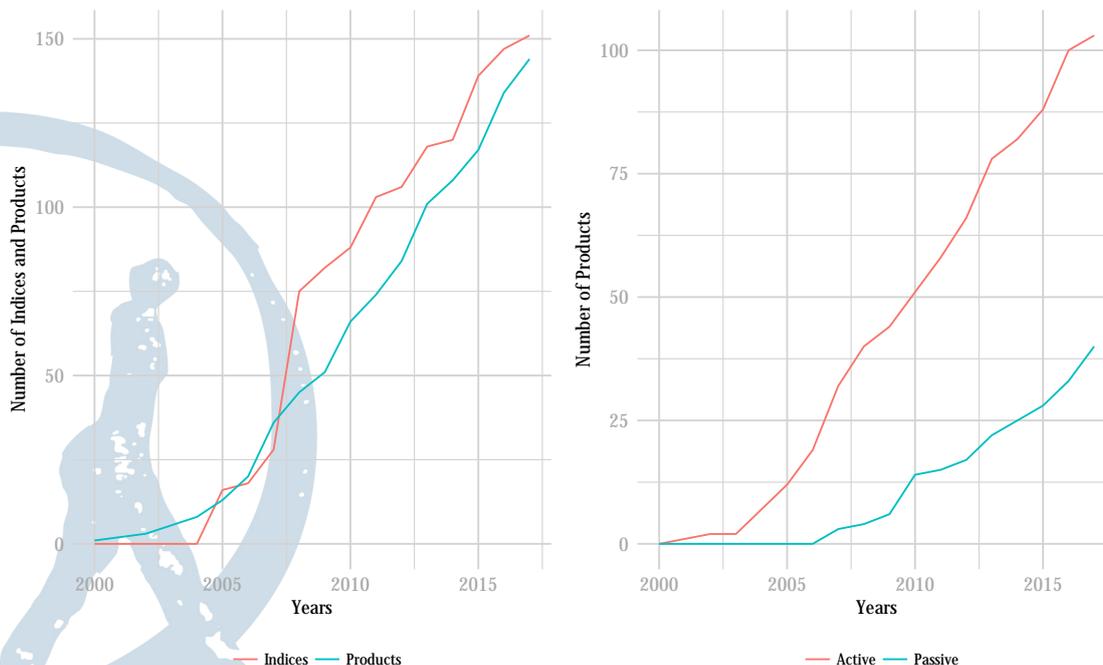
Sources: Bloomberg, Morningstar, ETF Database

investors are not necessarily well-equipped to assess the validity of the claims made, as in the passive investment space, due to the broader success of exchange-traded funds among retail and institutional investors alike.

Today there are more than 100 active listed equity infrastructure funds and 40 index tracking listed infrastructure funds (table 2). The listed infrastructure sector is also becoming more well-known, with its own Morningstar category and industrial lobby group (the Global Listed Infrastructure Organisation).

Combining all listed products referring to listed infrastructure, mutual funds, and exchange-traded funds, we tallied about USD57bn of assets under management allocated to these strategies in July of 2017.

Table 3 shows that the sector is dominated by a few larger products, with the first five largest funds accounting for 20% of AUMs allocated to these strategies. A myriad of smaller products has followed steadily over the past decade, as figure 2 attests.

The same figure also shows that passive (index-tracking) products have been launched more recently (only after the global financial crisis of 2008) and still represent only a quarter of the number of products and of all assets allocated to listed infrastructure, as shown in figure 3.

From a geographical perspective, most of these products are global, as shown on figure 8 in the appendix. Regional products also exist for Asia-Pacific (i.e., Australia and India) and the United States corresponding to a specific demand from investors, while the rest of the world, including Europe where most investable infrastructure can be found today, is only very marginally the object of specific regional products.

Finally, about a quarter of listed infrastructure AUMs today are under the control of what one might call "top asset managers" with three quarters of products being managed by other intermediaries, either smaller asset-management firms, banks, standalone ETF providers, or even joint ventures between local banks and life insurers or asset managers. In figure 4, we split asset managers into two broad categories, standalone or captive.[1]

Among these products, 104 can be considered as active (including both mutual funds and so-called active ETPs) and 40 can be considered as passive products. Active listed infrastructure products came on the market first, followed by passive products delivered through exchange-traded funds (ETFs) and exchange-traded notes (ETNs) (together known as "ETPs").

Passive listed infrastructure products

ETPs or more generally index-tracking funds have attracted a lot of attention from investors who have been switching from expensive active products to lower-cost passive products.

The main advantage of ETPs over other types of mutual fund vehicles comes from their low cost and their transparency. ETPs may also offer an additional source of liquidity for the underlying markets in which they trade. ETPs trade like a stock in the sense that they are listed on equity

exchanges and thus are tradable using standard equity-trading tools.

In 2006, there were no index tracking listed infrastructure products. Today, we identify 40 of them representing USD16.9bn in AUM (July 2017), with the first two ETFs launched in 2007 (iShares Global Infrastructure ETF and SPDR S&P Global Infrastructure ETF).[2]

Listed infrastructure indices

The substantial increase in the number of ETPs reflects the equivalent growth of listed infrastructure indices over the same period of study.

Index providers tend to launch indices in series, for example, Macquarie in 2005 (16), UBS in 2006 (2), MSCI in 2008 (12), Dow Jones/Brookfield in 2008 (32), FTSE in 2011 (9). The first listed infrastructure indices were launched in 2005 and 2006 by Macquarie and UBS respectively. However, these series of indices are now mostly inactive. A couple of years later, other index providers such as S&P and MSCI launched similar indices. Figure 2 shows the increase in number of indices and products over time.

Today, 16 distinct index providers that have launched 147 indices altogether, with various geographical, currency, and sector focuses. Some of these indices are tracked by ETPs for replication purposes or by active mutual funds for performance benchmarking. The two indices most used for replication purposes in constructing ETPs are the Alerian MLP Infrastructure Index and the S&P Global Infrastructure Index.

Active listed infrastructure products

There was only one active listed infrastructure fund in 2000; there were 20 in 2006, and we identify 104 such products today, representing USD40bn in AUM.

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1 - We define captive asset managers as asset management units within broader global financial services firms such as banks. In contrast, standalone asset managers are financial services firms that are primarily focusing on managing assets on behalf of investors.

2 - Total net assets of ETPs have been reported to have reached USD3.6 trillion globally at the end of 2016 (Morningstar Research, 2017).

Figure 3: Listed infrastructure by provider and product type

Listed & Unlisted : 39.29 %

Universe
product provider type by size

Listed : 60.71 %

Passive : 29.66 %

Universe
product type by size

Active : 70.34 %
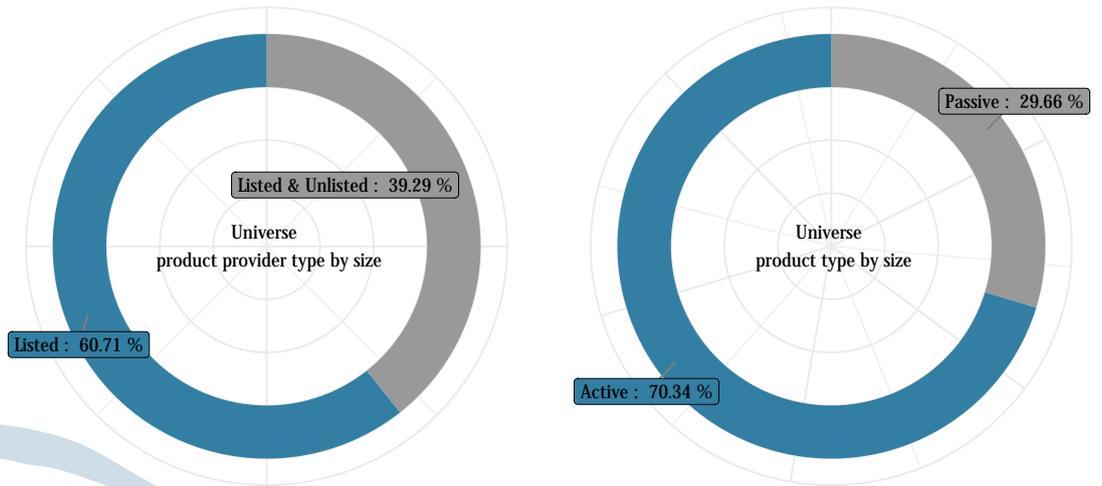
Figure 4: Listed infrastructure product providers and clients, by volume

Joint Venture : 0.64 %

Bank : 4.13 %

Standalone ETF Provider : 19.29 %

Captive Asset Manager : 44.77 %

Universe
product provider by size

Standalone Asset Manager : 31.17 %

Institutional : 30.41 %

Active products
current investor allocation by size

Retail : 69.59 %

Thus, the listed infrastructure sector is growing fast and beyond a few large funds is still dominated by a myriad of small product offerings targeting retail investors. We note however that institutional share classes have now started to grow very fast as well.

Is the listed infrastructure sector delivering the promises of the infrastructure investment narrative?

In the following two sections, we review existing academic research and the performance data available for both passive (section 3) and active (section 4) listed investment products referring to "infrastructure" in their name, explicitly targeting the investment narrative, and using the marketing arguments described above.

Active listed infrastructure products predictably charge rather high fees with an average total expense ratio (TER) of 1.9%, to be compared with 0.61% on average for the passive products described above. These fees are high when comparing them with the results of the latest annual fund-fee study performed by Morningstar (2017) on US mutual funds and ETFs. Morningstar reported an average TER of 0.75% and 0.17% for active and passive products respectively.

Finally, we can look at the share classes of active listed infrastructure funds and see what type of investors tend to be buying such products: 70% of assets invested in active listed infrastructure today correspond to retail share classes, while 30% are more recently launched institutional share classes. The rapid growth of listed infrastructure products has been driven primarily by retail investors, but institutional investors are catching up. Institutional share classes are now growing rapidly, as shown in figure 5, from two in 2004 to more than 40 share classes in 2017, with half of existing share classes launched over the last five years.

3. The Evidence: Passive Products Fail to Exhibit Unique Characteristics

In section 3.1, we review existing research on passive listed infrastructure investment: listed infrastructure indices and the ETFs that track them. The serious and more robust literature is not kind with passive listed infrastructure and typically concludes that it has no claim to being an asset class.

In section 3.2, we extend this research by building a proxy of existing products in this space using the "effective" constituents of actual passive products since their launch, rather than the backfilled indices used in previous research.

Focusing on the characteristics of actual products rather than hypothetical investment opportunities, we find even less convincing evidence of a listed infrastructure asset class.

3.1   Existing Research

3.1.1   The Search for a New Asset Class

The most frequent contention about "listed infrastructure" is that it is an "asset class" in its own right, thus justifying a specific focus on the part of investors alongside other asset classes. This question has attracted some attention in academic and industry literature.

Although there is not a concise and genuine definition of an "asset class," the academic and industry literature shares the common understanding that an asset class has similar fundamental factors, cannot be replicated using other traditional asset classes, and reports low or negative correlation with other asset classes, thus contributing to portfolio diversification.

Employing correlation analysis, a study by Oberhofer (2001) raises six characteristics that an asset class must have, namely (i) similar securities in the class, (ii) highly correlated returns with others in the class; (iii) representation of a material fraction of the investment opportunity set; (iv) readily available price and composition data; (v) the potential for investing useful amounts in the asset class passively; and, (vi) summing to an approximation of the entire investment-opportunity set.

Mongars et al. (2006) provides three characteristics of an asset class which are (i) exhibiting the ability to outperform the risk-free rate; (ii) reporting low or negative correlation with other asset classes; and (iii) not being able to be replicated with a simple linear combination of assets.

In its search for a listed infrastructure asset class, existing research thus focuses on "passive" approaches embodied by listed infrastructure indices to try and identify the presence of some or all of the asset class characteristics described above. This literature can be divided into four groups that we discuss next.

3.1.2   Descriptive Approaches

A first group of studies proposes descriptive analyses of listed infrastructure indices. These papers, often written by industry participants, use infrastructure indices described in section 2 to examine the performance of listed infrastructure and, to some extent, promote listed infrastructure products.

In a series of studies looking at listed infrastructure portfolios in various countries, Peng and Newell (2007), Newell and Peng (2008), and

Table 4: Assessment of the main claims made in favour of listed infrastructure investment

The claim	Assessment	The evidence
"Equity-like returns"	Not necessarily true	Blanc-Brude et al. (2017) find price and total returns either in line, below, or above the market. Bianchi et al. (2017) find listed infrastructure returns typically below global benchmarks.
"Reduced volatility"	Not true	Blanc-Brude et al. (2017) and Bianchi et al. (2017) find annualised return standard deviations mostly on par or higher than the market index, in line with previous research by Rothballer and Kaserer (2012) and most other papers.
"Portfolio diversification"	Not true	Blanc-Brude et al. (2017) show that listed infrastructure is highly correlated with the market index.
"Downside protection"	Not true	Blanc-Brude et al. (2017) find equivalent or higher maximum drawdown and value-at-risk in listed infrastructure indices when compared to the reference market index.
"Predicable cash flows"	Not necessarily true	Blanc-Brude et al. (2016) show that the cash flows of private infrastructure firms are less volatile than in the rest of the economy. However dividend payouts are *more* volatile, i.e., they vary more in size. Blanc-Brude (2013) shows that dividend payouts in listed infrastructure firms are more volatile than the market average.
"Predictable returns often linked to inflation"	Not true	Rödel and Rothballer (2012) and Bird et al. (2014) show that listed infrastructure does not offer better inflation-hedging properties than the stock market in general.
"Unique asset class"	Not true	Ammar and Eling (2015) and Bianchi et al. (2017) show that listed infrastructure indices can be replicated using simple factor tilts.

Newell et al. (2009) find that listed infrastructure yields higher returns than broad market stock indices but also higher volatility. These authors also report medium to high correlations between listed infrastructure and equities. More recent but similar studies, like Finkenzeller et al. (2010), report similar results.

Other studies such as Dechant and Finkenzeller (2013), Oyedele et al. (2013), Oyedele et al. (2014), and Panayiotou and Medda (2016) typically report higher Sharpe ratios and sometimes suggest that listed infrastructure can create diversification benefits.

Numerous industry studies describe the characteristics of listed infrastructure. Colonial First State Asset Management (2009) and RREEF (2007) both suggest infrastructure indices

volatility is on par with equities and real estate but that market correlation is relatively low. Armann and Weisdorf (2008) and Martin (2010) argue that listed infrastructure in both the United States and Australia offers inflation hedging.

Such descriptive studies can be considered rather weak. They lack rigorous statistical tests of their findings, that is, they may report higher Sharpe ratios but never show that these are different from that of broad market indices at a statistically significant level. Overall, they **fail to give a consistent and robust view of the characteristics of listed infrastructure.**

3.1.3 Regression Analyses

The next group of studies takes the matter more seriously and conducts regression analyses of

indices of infrastructure stocks defined by sector and revenue source.

Using a more systematic definition of listed infrastructure than the previous studies as well as proper statistical methods, these papers look for some of the specific aspects of the infrastructure investment narrative (e.g., low volatility, inflation hedging) and typically fail to find any.

Rothballer and Kaserer (2012) select 1,458 publicly listed infrastructure firms from 71 countries. They find that infrastructure stocks exhibit low market risk but high idiosyncratic volatility. They also report significant hetero-geneity in the risk profiles of different listed infrastructure subsectors.

In a separate study, Rödel and Rothballer (2012) examine the listed infrastructure firms universe created by Rothballer and Kaserer to test whether listed infrastructure provides a better hedge against inflation than equities at large, and they find no such property. In a separate study, Bird et al. (2014) concurs that listed infrastructure does not particularly help hedging inflation.

3.1.4   Mean-Variance Spanning

A more holistic approach to identifying a listed infrastructure asset class is taken in a more recent paper by Blanc-Brude et al. (2017), testing the "mean-variance spanning" (MVS) properties of more than 20 listed infrastructure indices.

In this paper, the authors begin by considering a reference universe of standard asset classes to which investors typically have access (stocks, bonds, commodities, hedge funds, private equity, etc.) and test whether adding a listed infras-tructure bucket to this list has any effect on the total portfolio diversification.

Blanc-Brude et al. (2017) find that:

1. Twenty-one different indices of listed infras-tructure stocks have equivalent or higher risk than the market index, with which they are all highly correlated;

2. Adding any of these 21 proxies to an investor's asset mix has no discernible effect on their mean-variance efficient frontier[1] in global and US equity markets over the past 15 years. In very concrete terms, this means that listed infrastructure is of no interest in terms of diversifying an asset allocation;

3. Listed infrastructure is fully spanned by existing asset classes or risk factors, that is, it is 100% replicable using assets that investors already have.

Here, the claim that listed infrastructure is a well-identified class of public stocks that expands the investment universe of a typical investor fails to pass 189 tests of statistical significance.[2]

3.1.5   Factor Decomposition

As well as testing the role of listed infrastructure in a total portfolio, another strand of literature has been applying the well-established risk-factor literature to try and explain the performance of listed infrastructure indices in terms of standard factor tilts as opposed to a unique and new "infrastructure beta."

Bird et al. (2014) produces the first factor model analysis of listed infrastructure and finds excess returns for the 1995-2006 period using a three-factor Fama-French model and Australian and US data.

However, these findings are overturned by several more recent studies benefiting from longer data series and more advanced models.

A paper by Ammar and Eling (2015) develops a nine-factor model of listed infrastructure returns based on specific risks of infrastructure investment. Likewise, they show that a multi-

1 - Using the mean-variance spanning (MVS) test of (Huberman and Kandel, 1987; Kan and Zhou, 2012).

2 - For 21 listed infrastructure indices, the authors conduct three MVS tests over three time periods (2000-2015, 2000-2008, and 2008-2015).

factor model can explain the return variation of listed infrastructure products and indices. They document positive loadings for a market factor, past returns, leverage, term structure, and a default. Ammar and Eling (2015) also show that low market betas in listed infrastructure are mostly caused by utility stocks.

More recently, Bianchi et al. (2017) employ the Carhart four-factor model and also test the effect of a supplementary "utility tilt" using the MSCI World Utility Index return as a fifth factor.

They conclude that standard factor tilts can explain close to 100% of the variance of returns in listed infrastructure indices, that is, it is only a subsector of the broader equity market, and investments in listed infrastructure do not offer superior risk-adjusted returns compared to established asset classes.

Importantly, Bianchi et al. (2017) find that once standard Fama-French factors have been controlled for any residual alpha (excess returns) is explained away, that is, the regression intercept is always equal to zero.

3.1.6   Conclusion

Despite the claims found in listed infrastructure marketing materials and in some descriptive studies identified above, a series of academic papers using different approaches and types of tests (regression and cointegration analysis, mean-variance spanning, multifactor modeling) all **concur to conclude that there is no such thing as a listed infrastructure asset class**.

The various proxies used in this literature all correspond to what we have called "passive" listed infrastructure in this paper: listed infrastructure indices and the ETPs that track them.

Table 4 summarises the most robust findings of this literature.

We conclude that **using investable equity market factors that have been robustly documented in the academic literature, it is possible to completely replicate the performance of listed infrastructure indices.** Moreover, it would be pointless to do so since they are shown to offer exposures to risk factors that are available throughout the broader stock market to begin with.

3.2   A New Proxy of Passive Listed Infrastructure Products

Next, we built a custom index that has not been used in previous research papers and represents the actual performance of passive listed infrastructure strategies available to investors since their launch by aggregating the constituents of the exchange-traded funds that track the most common listed infrastructure indices.

To represent the performance of passive listed infrastructure products, we build a custom index using annual portfolio holdings across products. While the literature described above has made extensive use of listed infrastructure indices, which go back to the mid-90s when listed infrastructure ETPs did not exist, we look at the performance that has effectively been available to investors by focusing on the constituents of the listed infrastructure passive products identified.

Each year, we account for new product launch as well as liquidation when defining the index universe. At the index-constituents level, this means that our index-rebalancing methodology adjusts each year for new equity security inclusion and exclusion based on the aggregate positioning of passive listed infrastructure products.

Hence, we conduct the following experiment:

● We collect the constituent and weight information for 21 passive listed infrastructure products, representing USD12.2bn in AUM

or 72.1% of the passive listed infrastructure universe. The list of products used is shown in table 18 in the appendix;

- We compute the performance of this portfolio using the relevant constituents in the relevant year and using weights corresponding to actual weights in each fund. Thus, the index corresponds to the performance received by an investor who would be exposed to the aggregate stock selection and weights found in passive listed infrastructure products;
- We compare the performance of this proxy with broad market and sector indices as well as well-known equity factors.

Thus, we build a global passive listed infrastructure proxy using annual-portfolio-holdings information such as constituents, weights, market capitalisation, and annual total return sourced from Bloomberg. The period of reference is 2010-17, two years after the launch of the first listed infrastructure ETFs.

Comparative broad equity benchmarks used are MSCI World (MSCIWRLD), MSCI World Utilities (MSCIWRLDUTIL), MSCI World Energy (MSCIWRLDENGY), MSCI World Industrials (MSCIWLDIND), and MSCI Emerging Markets (MSCIEM), all sourced from Datastream.

We note that **the list of constituents selected by passive listed infrastructure managers has grown considerably: from 167 assets in 2000 to more than 400 stocks in 2017**.

In total, 626 unique stocks have been included in the passive listed infrastructure index since 2000. These stocks are spread across 10 Global Industry Classification Standard (GICS) sectors or 34 Industry Classification Benchmark (ICB) sectors. Tables 15 and 14 in the appendix show the number of products exposed to each sector (product count and percentage of universe of products).

GICS classification reveals stocks that are not related to infrastructure by any stretch of the imagination, including those in sectors such as consumer discretionary, real estate, and financials. Similarly, when using the ICB classification, we find noninfrastructure related sectors such as media and travel & leisure, among others.

Next, table 5 and figure 6 illustrate the performance metrics for our passive listed infrastructure proxy.

We find that passive exposure to the stocks found in listed infrastructure indices does not deliver a better performance or a better risk/reward trade-off than the broad equity market. Moreover, maximum drawdown is twice as high as the broad market over the period and more in line with that of the energy benchmark (44%).

The passive listed infrastructure proxy is also highly correlated with market indices as shown in the correlation matrix in table 20 in the appendix. Correlation is in the 50-80% range and is highly statistically significant.

Finally, we look at the factors that could explain the returns of passive listed infrastructure products. We follow the literature and control for the classic Fama-French factors and potential sector biases.

Table 6 shows the regression results of the Fama-French global four-factor models, along with the VIF, or variance inflation factor, [3] and adjusted R-squared, that is, the proportion of returns' variance explained by the model.

As expected given the correlation level reported above, the factor regression reveals that a large portion of return variance can be explained by the market factor. When performing the Fama-French four-factor model regression on our three custom

3 - VIF shows potential potential correlation between factors, aka. multi-collinearity. It has a lower bound of 1 and no upper bound. VIFs below 2 typically indicate reasonable independence between factors.

Table 5: Passive listed infrastructure proxy & reference benchmarks performance table (2010-2017)

Metrics	PLIVW	MSCIWRLD	MSCIWRLDUTIL	MSCIWRLDEGY	MSCIWRLDIND	MSCIEM
Mean	0.04	0.10	0.06	0.02	0.12	0.09
Volatility	0.17	0.13	0.12	0.20	0.15	0.22
Sharpe Ratio	0.21	0.74	0.48	0.10	0.77	0.41
MDD	0.44	0.19	0.13	0.41	0.25	0.61

Mean is monthly average total return annualised. Volatility is the monthly standard deviation of total returns annualised. The Sharpe ratio is equal to excess returns divided by return volatility. Maximum drawdown (MDD) refers to the index maximum loss from a peak to trough.
Custom listed infrastructure index is the passive listed infrastructure proxy, product value weights (PLIVW). Reference benchmarks are MSCI World (MSCIWRLD), MSCI World Utilities (MSCIWRLDUTIL), MSCI World Energy (MSCIWRLDENGY), MSCI World Industrials (MSCIWRLDIND), MSCI Emerging Markets (MSCIEM).

Table 6: Fama-French four-factor model - global passive listed infrastructure value-weighted index

Term	Estimate	Std. error	Statistic	P. value	VIF	Adj. R2
(Intercept)	-0.00	0.00	-0.10	0.92		0.6763
Mkt-RF	0.89***	0.08	10.93	0.00	1.09253	
SMB	-0.04	0.23	-0.18	0.86	1.040396	
HML	0.09	0.21	0.44	0.66	1.354315	
WML	-0.07	0.14	-0.48	0.63	1.249255	
Emerging mkt(1)	0.30***	0.12	2.60	0.01	1.217539	
Energy(2)	0.31***	0.11	2.84	0.01	1.38623	

(1)EM-Mkt-RF (2)ENGY-Mkt-RF *** statistically significant at the 1% confidence level

Figure 6: Passive listed infrastructure proxy, product value weights, total return performance comparison with broad market indices

— MSCI WORLD
— MSCI WORLD Energy
— MSCI WORLD Industrials
— MSCI WORLD Utilities
— Passive Listed Infrastructure Proxy
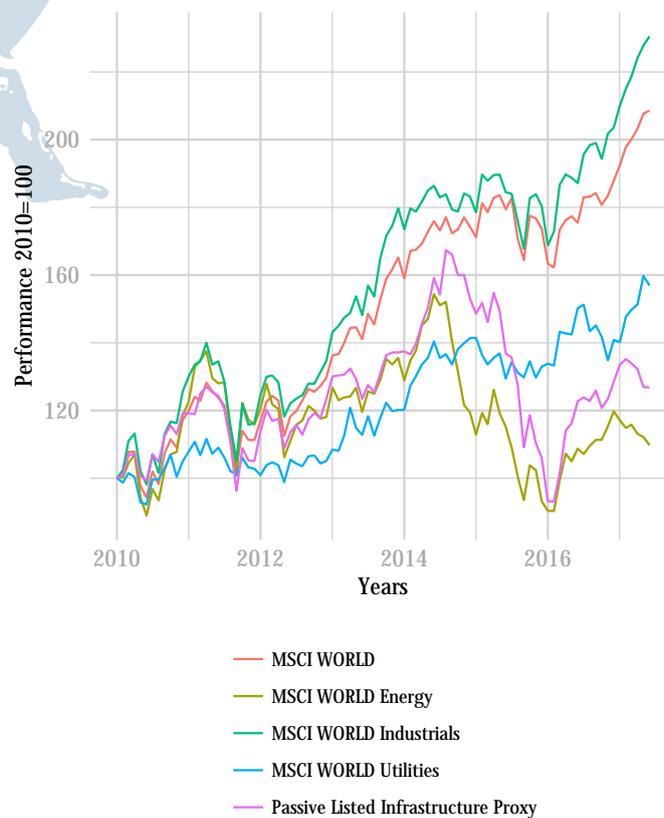
indices, we also find that none of the style factors (SMB, HML, and WML)[4] are significant, meaning that these indices do not even create exposure to standard risk factors, but only exposure to energy and emerging markets.

This result is in contrast with the findings of the literature described above, which uses listed infrastructure indices and finds significant Fama-French factor exposures. That is because, while they were launched in the mid-2000s, these indices have also been back-filled to the mid-1990s. With longer time series, the performance of listed infrastructure indices is primarily explained as a combination of well-known risk factors.

Here, however we only look at the exchange-traded products that have actually been available to investors since 2007-10. Over this shorter time frame and, perhaps as a results of the aftermath of the global financial crisis, passive listed infrastructure products have not even delivered clear factor exposures, only a combination of the broad market and emerging- and energy-market effects.

The "alpha," or intercept, of the model is not statistically different from zero, that is, there are no excess returns.

Thus, if the literature typically fails to find a listed infrastructure asset class using passive listed infrastructure indices, we also **fail to find any evidence of the infrastructure investment narrative when looking at the performance of the actual exchange-traded products that track these indices.**

4 - Small-minus-big or size factor, high-minus-low or value factor, and winner-minus-loser or momentum factor

4. The Evidence: Active Listed Infrastructure Products Fail to Deliver

The passive listed infrastructure products described in section 2 and analysed above have been the focus of existing academic and industry research in search of a listed infrastructure asset class.

This quest has failed: we cannot find any evidence of such an asset class.

However, we know from our review of the market that most listed infrastructure products are actively managed. The providers of these products argue that their knowledge of infrastructure firms allows them to go beyond blindly selecting stock based on GICS code and instead to "carefully select pure play infrastructure firms."

Today, there is no research on the returns of active listed infrastructure products. In this section, we go several steps further in the analysis of listed infrastructure products and conduct empirical tests that have not yet been done in the research literature.

In what follows, we conduct a detailed analysis of the performance of **active** listed infrastructure products using the actual constituent and portfolio weight choices of actual listed infrastructure fund managers over the past 15 years.

In view of the usual risk-adjusted performance metrics and statistical tests, we have to conclude that active infrastructure products, despite higher fees than other active mutual funds, offer no unique characteristics or alpha.

4.1 Active infrastructure constituent and weight selection

As we highlighted in section 2, the majority of listed infrastructure finds are *active* products. Here, managers do not simply track a sector-based index but instead make two types of decisions with respect to the investments made: stock selection and weighting.

Hence, the current findings of the research literature on listed infrastructure do not necessarily mean that active listed infrastructure managers do not deliver on the value proposition identified earlier.

In what follows, we conduct the following experiment:

- We collect the constituent and weight information for 79 active listed infrastructure products, representing USD35.5bn in AUM or 88.7% of the active listed infrastructure universe;
- We compute the performance of a portfolio using the relevant constituents in the relevant year and a weighting scheme corresponding to the actual value weights held by each active fund manager;
- Because we identify allocations to noninfrastructure sectors by a number of active listed infrastructure managers, we also compute these same portfolios without the "noise" created by the noninfrastructure stocks found in these products. We call the result a "pure" active listed infrastructure proxy;

We use the same data sources and methodology described in section 3.

The list of constituents selected by active listed infrastructure managers has grown considerably and even more than that of passive infrastructure strategies described in section 3: starting from only 69 assets in 2000, more than 700 stocks are included in the constituents of the 76 products identified in 2017.

In total, 1,869 unique stocks have been included in the portfolio since 2000. These stocks are spread across 11 GICS sectors or 41 ICB Sectors.

Tables 16 and 17 in the appendix show the number of products exposed to each sector (product count and percentage of universe of products).

Looking at GICS classification, we still find noninfrastructure related sectors such as consumer discretionary, consumer staples, real estate, and financials.

Similarly, the ICB classification of the constituents reveals noninfrastructure related sectors such as media, travel & leisure, forestry & paper, banks, personal goods, and food producers among others.

A look at the list of constituents shows numerous noninfrastructure names, including the highly unlikely stocks shown in table 7, which include Amazon.com, Microsoft, and Nintendo.

Table 7: Example of 10 noninfrastructure names

Names
AMAZON.COM INC
CARREFOUR SA
NINTENDO CO LTD
PEPSICO INC
TESCO PLC
WAL-MART STORES INC
SAMSUNG ELECTRONICS CO LTD
QANTAS AIRWAYS LTD
HYUNDAI MOTOR CO
MICROSOFT CORP

This proliferation of names including numerous noninfrastructure names is problematic. It creates significant noise when trying to measure the performance of listed infrastructure.

Some active listed infrastructure managers argue that they are able to select "pure play" infrastructure stocks from a short list of companies expected to have characteristics in line with the infrastructure investment narrative.

To account for this issue, we differentiate between the "effective" constituents of the active listed infrastructure universe and what would amount to "pure" (or almost pure) infrastructure sectors.[1] We compute a "pure" active portfolio of listed infrastructure, selecting only those sectors in the list of constituents identified earlier that belong to a standard definition of "infrastructure," that is, the following eight ICB sectors shown in table 8.

Table 8: List of ICB sectors considered as "pure infrastructure"

Names
Gas, Water & Multi-utilities
Oil Equipment, Services & Distribution
Industrial Transportation
Electricity
Construction & Materials
Oil & Gas Producers
Mobile Telecommunications
Alternative Energy

Building this "pure play" portfolio using the constituents of active listed infrastructure products leads to removing 50% of the constituents by number of stocks and 13% by total value of the portfolio.

Next, we look at the performance of this active listed infrastructure proxy, using either its effective or "pure" constituents.

4.2   A Proxy of Active Listed Infrastructure Products

Tables 9 and 10 as well as figure 7 show the performance of our active listed infrastructure proxy using either the effective list of constituents found in these products or the "pure

Table 9: Performance metrics of the active listed infrastructure proxy and broad market comparators

Metrics	ALIVW	MSCIWRLD	MSCIWRLDUTIL	MSCIWRLDEGY	MSCIWRLDIND	MSCIEM
Mean	0.06	0.05	0.07	0.08	0.08	0.09
Volatility	0.16	0.15	0.14	0.21	0.18	0.22
Sharpe Ratio	0.33	0.33	0.51	0.37	0.44	0.41
MDD	0.58	0.54	0.42	0.53	0.58	0.61

Mean is monthly average total return annualised. Volatility is the monthly standard deviation of total returns annualised. The Sharpe ratio is equal to excess returns divided by return volatility. Maximum drawdown (MDD) refers to the index maximum loss from a peak to trough.
Custom listed infrastructure index is the active listed infrastructure proxy, product value weights (ALIVW). Reference benchmarks are MSCI World (MSCIWRLD), MSCI World Utilities (MSCIWRLDUTIL), MSCI World Energy (MSCIWRLDENGY), MSCI World Industrials (MSCIWRLDIND), MSCI Emerging Markets (MSCIEM).

Table 10: Performance metrics of the "pure" active listed infrastructure proxy and broad market comparators

Metrics	ALPIVW	MSCIWRLD	MSCIWRLDUTIL	MSCIWRLDEGY	MSCIWRLDIND	MSCIEM
Mean	0.08	0.05	0.07	0.08	0.08	0.09
Volatility	0.15	0.15	0.14	0.21	0.18	0.22
Sharpe Ratio	0.47	0.33	0.51	0.37	0.44	0.41
MDD	0.49	0.54	0.42	0.53	0.58	0.61

Mean is monthly average total return annualised. Volatility is the monthly standard deviation of total returns annualised. The Sharpe ratio is equal to excess returns divided by return volatility. Maximum drawdown (MDD) refers to the index maximum loss from a peak to trough.
Custom listed infrastructure index is the active listed "pure" infrastructure proxy, product value weights (ALPIVW). Reference benchmarks are MSCI World (MSCIWRLD), MSCI World Utilities (MSCIWRLDUTIL), MSCI World Energy (MSCIWRLDENGY), MSCI World Industrials (MSCIWRLDIND), MSCI Emerging Markets (MSCIEM).

play" list, filtering out any obviously noninfrastructure sectors.

Looking at the performance of actual active listed infrastructure in comparison with broad market benchmarks makes for dismal reading: these products deliver a risk-adjusted return (Sharpe ratio) on par with the world equity index and below that of utilities, industrial, or energy stocks. Its maximum drawdown is also high, barely better than the maximum drawdown of emerging-market stocks. Given the exposure of active listed infrastructure products to emerging markets, this is in fact unsurprising.

If the same products were not invested in noninfrastructure stocks, a typical investor would receive the performance of the "pure play" proxy that we computed by removing all the constituents that do not belong to clear infrastructure sectors. This "pure" listed infrastructure proxy performs better than its "actual" counterpart. On a risk-adjusted basis it offers better performance than the broad equity market, between utilities and energy. Still neither its Sharpe ratio nor its maximum drawdown signal a unique behaviour compared with broad market and sector indices.

As before, we also look at the factors that explain the returns of each active listed infrastructure

portfolio described above. The following tables present the regression results using the Fama-French global four-factor model, controlling for sector effects, VIFs, and R-squared.

As expected, the regressions reveal that a large portion of return variance can be explained by movements in the market, value (in the case of the "pure" proxy only), and momentum factors as well as some utilities- and energy-market effects.

As before, the model constant or "alpha" which represents potential excess returns is not statistically different from zero, that is, *active* listed infrastructure products **do not create any "alpha."**

4.3 A Disappointment

Overall, our test of the active listed infrastructure space is disappointing. Despite the opportunity to select specific stocks geared to deliver the infrastructure investment narrative, active products exhibit two major problems:

1. They can include numerous noninfrastrcture stocks, making the potential exposure to any infrastructure effect less obvious;
2. They fail to clearly outperform broad market or standard industrial sector indices or deliver a different risk/return or drawdown profile

Figure 7: Active listed infrastructure proxy (product weights), total return performance comparison with broad market indices, effective constituents (LHS) and pure constituents (RHS)
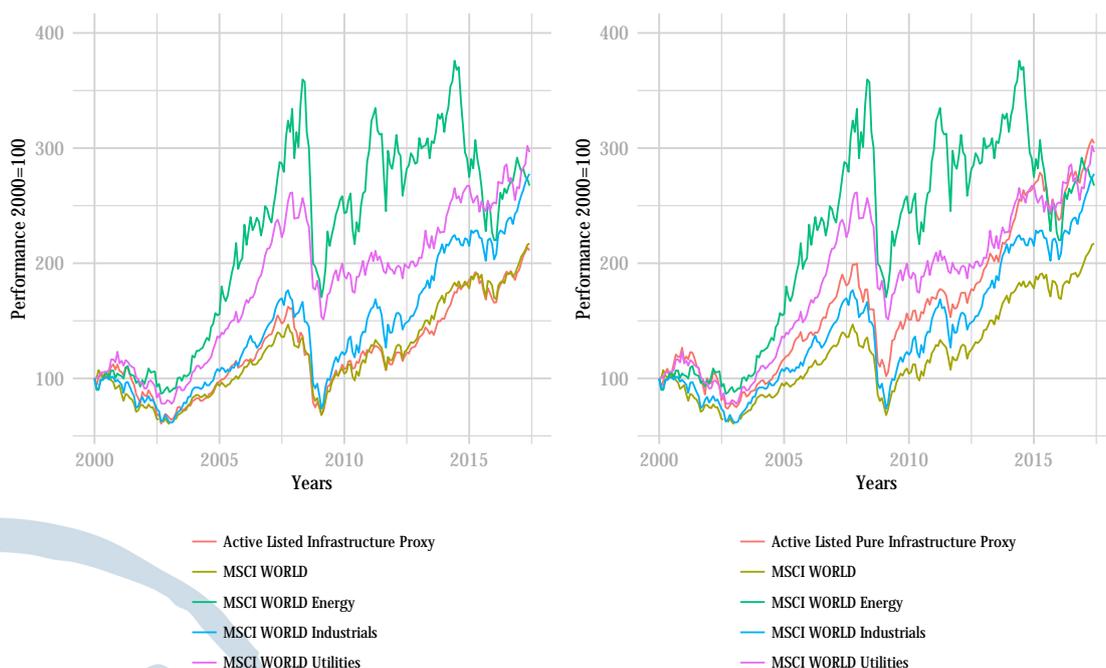
Table 11: Fama-French four-factor model - global active listed infrastructure value weighted index

Term	Estimate	Std. error	Statistic	P. value	VIF	Adj. R2
(Intercept)	-0.00	0.00	-0.57	0.57		0.7763
Mkt-RF	0.98***	0.04	23.96	0.00	1.5139	
SMB	-0.12	0.08	-1.56	0.12	1.185493	
HML	-0.01	0.07	-0.21	0.83	1.26839	
WML	-0.16***	0.04	-3.93	0.00	1.375505	
Utilties (1)	0.49***	0.06	8.77	0.00	1.705691	
Energy (2)	0.10***	0.04	2.62	0.01	1.187039	

(1)UTIL-Mkt-RF (2)ENGY-Mkt-RF *** statistically significant at the 1% confidence level

Table 12: Fama-French four-factor model - global active pure listed infrastructure value weighted index

Term	Estimate	Std. error	Statistic	P. value	VIF	Adj. R2
(Intercept)	-0.00	0.00	-0.22	0.83		0.7209
Mkt-RF	0.92***	0.04	20.81	0.00	1.565728	
SMB	-0.04	0.09	-0.46	0.65	1.30774	
HML	0.13*	0.07	1.75	0.08	1.195265	
WML	-0.14***	0.04	-3.14	0.00	1.384423	
Utilities (1)	0.63***	0.06	10.42	0.00	1.600098	
Energy (2)	0.12***	0.04	3.05	0.00	1.22411	

(1)UTIL-Mkt-RF (2)ENGY-Mkt-RF *** statistically significant at the 1% confidence level * statistically significant at the 10% confidence level

from them. Moreover, most of their performance can be explained using standard factor models that typically correspond to cheaper strategies and can be implemented across the total equity portfolio instead of within ill-defined themes.

5. Discussion & Recommendations

In this section, we summarise and discuss our findings and make a number of recommendations to investors and regulators about the treatment of listed infrastructure product offerings.

5.1 Discussion of the Results

In this paper, we distinguished between passive and active listed infrastructure products. The former consists of indices of stocks selected on the basis of their industrial categorisation or investment funds that track such indices (exchange-traded products). The latter corresponds to various types of mutual funds for which an asset manager decides which stocks to select, at which weight, in the portfolio.

Using the various intuitions found in the infrastructure investment narrative, passive and active listed infrastructure products promise a mix of *betas* and *alpha*: diversification, stability, and inflation hedging, as well as higher returns for limited risk taking, that is, higher Sharpe ratios.

But we now know that the data disagrees strongly with the arguments put forward by listed infrastructure managers, which, as we noted earlier, are often impossible to distinguish from that of unlisted infrastructure funds.

In line with previous academic research on the subject, we found that passive listed infrastructure does not exhibit the characteristics of a unique or specific asset class, that is, a group of assets exhibiting low correlation with other assets and that cannot be replicated using other more widespread financial assets.

We also found that a portfolio of the constituents of active listed infrastructure products exhibits a similar lack of unique properties. Instead, we show that the choices of stocks and weights made by listed infrastructure managers *do not deliver* the infrastructure investment narrative in the form of better Sharpe ratios, lower correlations, or better drawdown and can be replicated using well-known factor (passive) exposures.

Hence, the argument for listed infrastructure is typically fallacious.

The fallacy arises thus: first an argument is made about some aspects of infrastructure businesses (e.g., "people always pay their water bills, so water companies have stable income"), next investment characteristics are inferred about infrastructure firms in general (e.g., "companies in the water sector have stable returns").

In aggregate, this is a fallacy of composition, that is, inferring something about the whole which is only true about some of its parts. Private infrastructure investments may well have some of the characteristics implied by the infrastructure investment narrative, but that does not necessarily mean that collections of stocks that share an SIC code with these firms also do.

This is why listed infrastructure is fake infra.

Ultimately, investors who choose to invest in listed infrastructure must consider that listed infrastructure is not representative of a new asset class that would provide a gain in diversification in a global portfolio allocation.

Nor should they consider that listed infrastructure is a source of better long-term risk-adjusted returns like the universally accepted long-term rewarded factors in the equity asset class. These factors, that is, value, momentum, low volatility, mid-cap, and (more recently) profitability and investment, have been

documented in academic literature that justifies their usefulness from a theoretical and empirical point of view.

From the studies that we and others have conducted, listed infrastructure should be considered to be a sector bet that is part of a tactical choice or an opportunity to access alpha with all the limitations that academic research and empirical studies have raised in terms of persistence of alpha.

In view of research results and of the large number of false arguments used by the promoters of listed infrastructure, we consider that we are unfortunately in a situation of **mis-selling to the detriment of investors**.

5.1.1 The Promise of the Infrastructure Narrative Still Stands

These findings may be surprising to many investors. Assuming that an infrastructure project or firm has a very specific business model, as highlighted by the infrastructure narrative, why would these characteristics disappear as soon as the firm's equity is traded on an exchange?

In theory they should not. Instead, daily trading should lead to more effective and efficient price discovery, reflecting these business characteristics more accurately than before. Hence, if it is the case that infrastructure firms have long-term, stable, perhaps even inflation-linked businesses, they should be valuable to many long-term investors and have comparatively higher value and lower returns/betas.

In fact, **the conclusions of the current literature on listed infrastructure should not lead investors to conclude that there is no distinct infrastructure asset class or that it is not possible to create a distinct one that is listed.**

Instead, the issue is one of both definition and access.

First, we have shown in previous research that the cash flows of well-defined private infrastructure firms are indeed less volatile than those of matched control groups of noninfrastructure firms (see Blanc-Brude et al., 2016, for a detailed study using 15 years of cash flows data).

However, because infrastructure is ill-defined as a category of businesses, many different types of businesses can be conflated under this label. This creates a gray area for the emergence of products which have little to do with infrastructure in the first place.

This also creates a confusion among businesses, on the one hand, that may well be considered to belong to one or another "infrastructure sector," but are neither stable nor long-term nor inflation-linked and, on the other hand, those that do have these characteristics.

A key distinction is the one we have made repeatedly in previous publications about the difference between "infrastructure projects" and "infrastructure corporates" (see for example Blanc-Brude, 2014). While infrastructure projects are designed and indeed financed to create businesses that are fundamentally what the infrastructure investment narrative is about, infrastructure corporates may or may not be thus characterised.

Infrastructure corporates are "just corporates." They may have a stable, cash-flow driven business delivering essential services at one point in time, and later change strategy, leverage up, embark on overseas investment adventures, or simply decide to use all their water mains to become a multimedia provider and thus completely change business models.

This point has now been confirmed by EDHEC research on the behaviour of private infrastructure firms. Two series of private infrastructure indices released by EDHEC*infra* in June 2017 describe the behaviour of private infrastructure

equity (BBG:EIPEE) and debt (BBG:EIPDE) investments in 14 European countries since 2000.

When these broad market indices are split between infrastructure projects (BBG:EIPEEPF, EIPDEPF) and infrastructure corporates (BBG: EIPEEC, EIPDEC), they exhibit very different behaviours. Infrastructure corporate debt for instance is hard to distinguish from an investment-grade corporate debt index (more details about the different behaviour of projects and corporates in EDHEC*infra* indices can be obtained in Blanc-Brude et al. (2017b) and Blanc-Brude et al. (2017a)).

This debate is not new. Investors who are regulated by the European Insurance and Occupational Pension Authority (EIOPA) have been involved in discussing how to define infrastructure for the purpose of calibrating Solvency-II risk modules. The recommendations made by EIOPA to the European Commission (EIOPA, 2016) put forward a notion similar to the one we defended above: "infrastructure" means certain business-model characteristics, not GICS codes.

Encouragingly, the understanding of what constitutes an infrastructure asset under Solvency-II is now spilling over into other prudential areas, most notably banking (see, for example, the draft EU regulation on CRR2).

Hence the issue of access: in effect, few of the businesses that qualify as having a pure "infrastructure" business model under these definitions are available on the stock market today.

The vast majority of private infrastructure projects are simply not listed.

There are in fact a few exceptions that we have documented before in contributions to EIOPA and in peer-reviewed publications: most notably a handful of REIT-like baskets of private infrastructure equity listed on the London stock exchange, which we have called "the PFI portfolio."

These products have, we have shown, the ability to deliver unique investment characteristics (see Blanc-Brude et al., 2017, for detailed analysis). They are, however, a rarity.

We note that the active infrastructure managers that we analysed in the previous section seem mostly unaware of the existence of these stocks, even though they occasionally appear in their portfolios.

Thus, **a different listed infrastructure sector is possible**, and it could have unique and attractive characteristics. Today, however, it mostly does not exist.

5.2 Recommendations

We make the following recommendations to stock market regulators, asset owners, and asset managers.

5.2.1 Recommendations to Regulators

Defining and categorising infrastructure investment products is at the heart of investors' ability to understand and access infrastructure without being exposed to multiple unidentified risks.

Stock market regulators have been interested in potentially misleading uses of terms in products' names before.

For instance, in 2001, the Securities and Exchange Commission (SEC) adopted Rule 35d-1 to prevent registered investment companies from using terms in names that "are likely to mislead an investor about a company's investment emphasis."[1]

1 - see Investment Company Act of 1940 [AS AMENDED THROUGH P.L. 112-90, APPROVED JANUARY 3, 2012]. In particular, the SEC made the following statement: Rule 35d-1 applies to "all registered investment companies, including mutual funds, closed-end investment companies, and unit investment trusts (⊠UITs⊠)" and requires all registered investment companies to invest at least 80%

In Europe, such regulations on the names of investment products do not exist. However, the final guidelines issued in June 2017 by the European Securities and Markets Authority (ESMA) may indirectly request a better definition of listed infrastructure as part of the introduction of "product governance requirements to ensure that firms which manufacture and distribute financial instruments act in the clients☐ best interests during all the stages of the life-cycle of products or services[2]."

The Key Investor Information Document (KIID) under the UCITS directive has been introduced to provide prospective retail investors with a more transparent overview of products in a standard format. Such a document shall include key information such as the investment objective and investment policy, the risk and reward profile of the product that will ensure investors will make an informed decision when investing in a specific product. As such, this regulation intends to improve the protection of retail investors by standardising disclosure requirements, hence increasing transparency in UCITS products.[3]

Our survey of the listed infrastructure industry has shown that a multitude of new products are continuously being launched claiming to deliver the same investment profile of private infrastructure investments, while the list of assets actually invested in keeps expanding to include hundreds of stocks, many of which cannot seriously be considered to belong to the "infrastructure" sector.

There is thus a serious risk of mis-selling when most clients are retail investors who are less well equipped to assess the investments made. As more and more institutional investors are attracted to these products, mis-selling concerns become intertwined with prudential and fiduciary questions.

In the absence of a clear definition of what "infrastructure" means in the public equity space, we recommend that stock market regulators require of listed infrastructure product providers that:

1. All such products should be **clearly labeled as "<u>listed</u> infrastructure" investment products** to avoid misleading investors, especially retail investors, by suggesting that such products are equivalent to private infrastructure investments;
2. Listed infrastructure product providers should be required to **add a warning** in the marketing documents of listed infrastructure products highlighting that these investments **cannot guarantee to deliver the performance and risk profile of unlisted infrastructure assets**.

Moreover, stock market regulators should **aim to achieve a clear definition of the listed infrastructure space**, within which better, more transparent listed infrastructure products could be created with the aim of delivering at least some of the promises of infrastructure investment to asset owners.

Unlike terms such as *small-*, *mid-*, or *large-capitalisation* or *high-yield*, "infrastructure" is not defined in the financial regulatory framework governing mutual and index-traded funds.

Such a definition exists and has been developed in the context of the prudential regulation of insurers, pension plans, and banks.[4].

Today, it can be used by stock market regulators to define listed infrastructure equity products, especially in the retail space, where investors can be much less aware of the meaning of certain

of its assets in the type of investment suggested by its name in order to "provide an investor greater assurance that the company's investments will be consistent with its name." In 2003, the SEC also warned mutual funds against using terms that may suggest protection from loss in their name. Given the repeated claim that infrastructure investments are made of "stable, long-term assets," the name "infrastructure" could be thought to correspond to an inherently low-risk strategy.

2 - see ESMA 2017/36-43-620.
3 - see ESMA/2016/569.

4 - see for example EIOPA (2016).

terminologies used to promote investment products.

5.2.2 Recommendations to Asset Owners

Today, most investors in listed infrastructure products are retail investors who need to be protected by a more rigorous regulatory framework (see next point).

But the growing involvement of institutional investors in the listed infrastructure space puts some of the onus on them to help improve current practices and require sufficient quality and transparency from asset managers.

Asset owners involved in listed infrastructure products should:

- **Require transparency**: listed infrastructure asset managers should publish their "carefully selected" list of stocks. Today, too few of the non-US based listed infrastructure funds agree to reveal what they invest in. The argument that this constitutes some kind of commercial secret is bizarre at best. If one is to believe their claim that they invest in a distinct, persistent asset class, it should not be expected to lose its properties by virtue of becoming public knowledge;
- **Require concrete evidence** of the delivery of the infrastructure investment narrative using listed products. A battery of statistical tests can be used to determine whether portfolio diversification, inflation hedging, or return volatility are improved by listed infrastructure products. They should be used;
- **Benchmark listed infrastructure products against unlisted ones**: broad market private infrastructure benchmarks now exist that can be directly compared with public markets[5]. Today, listed infrastructure indices typically have a 20% tracking error with these indices.

5 - EDHEC*infra* private infrastructure indices effectively address the classic issues of stale pricing and volatility smoothing so that broad market measures can be used in relation to other asset classes.

Investors should require listed products to better track the private infrastructure sector.

5.2.3 Recommendations to Asset Managers

Ultimately, the proliferation of fake infra puts most of infrastructure investment sector at risk. Because fake infra products will not deliver, they will disappoint, and this could reverse years of efforts in educating investors, discussing regulations, and promoting public policy plans to support long-term private investment in the infrastructure of major economies.

Genuine providers of infrastructure investment products should work together to remove the risks created by the growth of fake infra.

Listed infrastructure managers are not all equally responsible for the state of the sector described in this paper. Some, such as the ones described in our "PFI portfolio" (Blanc-Brude et al., 2017) have been involved in trying to create access to infrastructure businesses through listed products honestly and for a long time.

Whether or not their investment beliefs are validated by the data, they have an interest in helping listed infrastructure better define its value proposition and demonstrate its commitment to creating value for its customers by:

1. Helping regulators to create a credible framework and boundaries defining what listed infrastructure investing means;
2. Publishing its choice of constituents and justifying it *ex ante* in terms of the above framework and *ex post* by agreeing to test its ability to deliver the infrastructure investment narrative.

6. Appendix

Universe Identification and Data Collection

This section describes the data sources of our extensive review of listed infrastructure products as well as the datasets used to build the two sets of custom listed infrastructure proxies representing passive and active strategies.

Index-Level Analysis

Our identification process relied on one rule: the index name must include the label "infrastructure." Following this simple rule-based filtering exercise, we were able to identify 147 indices launched by 16 distinct providers, among which 17 indices are now inactive.

Product-Level Analysis

Our identification process of listed infrastructure products relied on one rule: either the fund's name or the underlying index used for replication purposes (in case of ETPs) must include the label "infrastructure." Following this simple rule-based filtering exercise, we were able to identify 144 listed infrastructure products globally, among which 7 appeared to have been liquidated prior to July 2017.

Data Collection

Constituent information, returns, and market capitalisation have been collected using Bloomberg. Reference indices have been obtained using Thomson Reuters Datastream.

Products general information has been collected using a variety of data sources, including but not limited to Morningstar, Bloomberg, the SEC, SEDAR, Financial Times Market Data, specific

Figure 8: Geographical focus of products
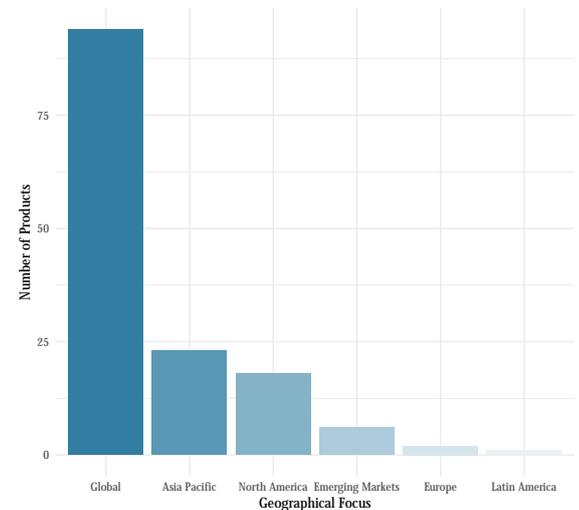
product disclosure statements, and prospectuses. Information collected is summarised as follows:

- Fund's name;
- Investment management firm;
- Vehicle used;
- Fund launch date;
- Fund's AUM (as of July 2017);
- Share classes (number and types) and size (as of July 2017);
- Reference benchmark;
- Active/passive nature of the product;
- Type of replication (for ETPs);
- Performance in total return space;
- Total expense ratio;
- Constituent information, including weights, GICS/ICB sector classification, total return, and market capitalisation;
- Geographical focus;
- Investment objective;
- Product description;
- Fund managers.

Table 13: List of indices replicated by passive listed infrastructure products

Index Names
Alerian Energy Infrastructure Index
Alerian MLP Infrastructure Index
DJ Brookfield Global Infrastructure Composite Index
DJ Brookfield Global Infrastructure North American Listed Index
FTSE Brazil Infrastructure Extended Index
FTSE Developed Core Infra. 50/50 Hedged Index
FTSE Developed Core Infrastructure 50-50 Index
FTSE Developed Core Infrastructure Index
FTSE Developed Europe Core Infrastructure Capped Net Tax Index
FTSE Global Core Infrastructure Index
FTSE USA Core Infrastructure Capped Net Tax Index
INDXX China Infrastructure Index
INDXX India Infrastructure Index
INDXX U.S. Infrastructure Development Index
Morningstar Global Multi-Asset Infrastructure Index
MSCI Europe Infrastructure Index
MSCI Japan Infrastructure Index
NASDAQ OMX Clean Edge Smart Grid Infra. Index
NMX30 Infrastructure Global Index
RARE Global Infrastructure Index
S-Network Emerging Infrastructure Builders Index
Solactive Global Infra. Low Earnings Volatility Index
Solactive High Income Infrastructure MLP Index
Solactive MLP & Energy Infrastructure Index
Solactive MLP Infrastructure Index
Solactive US Energy Infrastructure MLP Index
S&P Emerging Markets Infrastructure Index
S&P Global Infrastructure Index
S&P High Income Infrastructure Index
STOXX Global Broad Infrastructure Index
Summit Zacks Global Water Index

Sources: Bloomberg, ETF Database

Table 14: Passive products - Historical ICB sector exposure

ICB Sector	Count	Prop.
Gas, Water & Multi-utilities	18	0.86
Oil Equipment, Services & Distribution	17	0.81
Electricity	14	0.67
Oil & Gas Producers	13	0.62
Industrial Transportation	13	0.62
Construction & Materials	9	0.43
Technology Hardware & Equipment	9	0.43
General Industrials	8	0.38
Media	7	0.33
Mining	6	0.29
Nonequity Investment Instruments	6	0.29
Support Services	6	0.29
Travel & Leisure	6	0.29
Mobile Telecommunications	6	0.29
General Retailers	5	0.24
Alternative Energy	5	0.24
Real Estate Investment Trusts	5	0.24
Industrial Engineering	5	0.24
Electronic & Electrical Equipment	5	0.24
Industrial Metals & Mining	4	0.19
Chemicals	4	0.19
Software & Computer Services	4	0.19
Fixed Line Telecommunications	4	0.19
Household Goods & Home Construction	3	0.14
Health Care Equipment & Services	3	0.14
Automobiles & Parts	3	0.14
Equity Investment Instruments	3	0.14
Forestry & Paper	2	0.10
Real Estate Investment & Services	2	0.10
Leisure Goods	1	0.05
Personal Goods	1	0.05
Financial Services	1	0.05
Life Insurance	1	0.05
Aerospace & Defense	1	0.05

Table 15: Passive products - Historical GICS sector exposure

GICS Sector	Count	Proportion
Energy	18	0.86
Utilities	17	0.81
Industrials	16	0.76
Consumer Discretionary	11	0.52
Real Estate	7	0.33
Telecommunication Services	7	0.33
Information Technology	5	0.24
Materials	4	0.19
Health Care	3	0.14
Financials	3	0.14

Table 16: Active Products Historical GICS Sectors Exposure

GICS Sector	Count	Proportion
Energy	77	0.97
Utilities	76	0.96
Industrials	75	0.95
Real Estate	67	0.85
Telecommunication Services	66	0.84
Consumer Discretionary	64	0.81
Financials	36	0.46
Materials	35	0.44
Information Technology	33	0.42
Health Care	20	0.25
Consumer Staples	18	0.23

Table 17: Active Products Historical ICB Sectors Exposure

ICB Sector	Count	Prop.
Oil Equipment, Services & Distribution	78	0.99
Gas, Water & Multi-utilities	78	0.99
Industrial Transportation	76	0.96
Electricity	75	0.95
Construction & Materials	70	0.89
Mobile Telecommunications	64	0.81
Oil & Gas Producers	63	0.80
Media	54	0.68
Travel & Leisure	53	0.67
Real Estate Investment Trusts	53	0.67
Alternative Energy	47	0.59
Support Services	43	0.54
Financial Services	42	0.53
General Industrials	39	0.49
Industrial Engineering	36	0.46
Technology Hardware & Equipment	33	0.42
Electronic & Electrical Equipment	33	0.42
Fixed Line Telecommunications	32	0.41
Nonequity Investment Instruments	32	0.41
Mining	30	0.38
Industrial Metals & Mining	28	0.35
Software & Computer Services	27	0.34
Real Estate Investment & Services	26	0.33
Automobiles & Parts	24	0.30
Chemicals	23	0.29
General Retailers	23	0.29
Aerospace & Defense	22	0.28
Forestry & Paper	22	0.28
Banks	21	0.27
Personal Goods	17	0.22
Equity Investment Instruments	15	0.19
Food Producers	15	0.19
Household Goods & Home Construction	14	0.18
Pharmaceuticals & Biotechnology	12	0.15
Health Care Equipment & Services	12	0.15
Life Insurance	11	0.14
Nonlife Insurance	8	0.10
Leisure Goods	8	0.10
Tobacco	6	0.08
Food & Drug Retailers	5	0.06
Beverages	3	0.04

Table 18: Passive listed infrastructure index – list of products

Name	Index Tracked
Alerian MLP ETF	Alerian MLP Infrastructure Index
iShares Emerging Markets Infrastructure ETF	S&P Emerging Markets Infrastructure Index
Alerian Energy Infrastructure ETF	Alerian Energy Infrastructure Index
Guggenheim S&P High Income Infrastructure ETF	S&P High Income Infrastructure Index
SPDR S&P Global Infrastructure ETF	S&P Global Infrastructure Index
Amundi Global Infrastructure UCITS ETF	Solactive Global Infra. Low Earnings Vol Net Total Return Index
First Trust NASDAQ Clean Edge Smart Grid Infrastructure Index Fund	NASDAQ OMX Clean Edge Smart Grid Infra. Index
Legg Mason Global Infrastructure ETF	S&P Global Infrastructure Index
Columbia India Infrastructure ETF	Indxx India Infrastructure Index
Global X MLP ETF	Solactive MLP Infrastructure Index
Global X MLP & Energy Infrastructure ETF	Solactive MLP & Energy Infrastructure Index
FlexShares STOXX Global Broad Infrastructure Index Fund	STOXX Global Broad Infrastructure Index
Summit Water Infrastructure Multifactor ETF	Zacks Global Water Index
Vanguard Global Infrastructure Fund	FTSE Developed Core Infrastructure Index
ProShares DJ Brookfield Global Infracstructure ETF	DJ Brookfield Global Infrascructure Composite Index
VanEck Vectors High Income Infrastructure MLP ETF	Solactive High Infra. MLP Index
PowerShares Emerging Markets Infrastructure Portfolio	S-Network Emerging Infrastructure Builders Index
Global X U.S. Infrastructure Development ETF	Indxx U.S. Infrastructure Development Index
Lyxor FTSE USA Core Infrastructure Capped UCITS ETF	FTSE USA Core Infrastructure Capped Net Tax Index
Lyxor FTSE Developed Europe Core Infrastructure Capped UCITS ETF	FTSE Developed Europe Core Infra. Capped Net Tax Index
ETFS US Energy Infrastructure MLP GO UCITS ETF	Solactive US Energy Infrastructure MLP Index

Sources: Bloomberg

Table 19: Correlation matrix - global passive listed infrastructure value-weighted index

	PLIVW	MSCIWRLD	MSCIWRLDUTIL	MSCIWRLDEGY	MSCIWRLDIND
PLIVW					
MSCIWORLD	0.77***				
MSCIWRLDUTIL	0.49***	0.65***			
MSCIWORLDEGY	0.79***	0.83***	0.50***		
MSCIWRLDIND	0.76***	0.95***	0.54***	0.83***	

Custom listed infrastructure index is the Passive listed infrastructure proxy, product value weights (PLIVW). Reference benchmarks are MSCI World (MSCIWRLD), MSCI WORLD Utilities (MSCIWRLDUTIL), MSCI World Energy (MSCIWRLDEGY), MSCI World Industrials (MSCIWRLDIND).

Table 20: Correlation matrix - global active listed infrastructure value-weighted index

	ALIVW	MSCIWRLD	MSCIWRLDUTIL	MSCIWRLDEGY	MSCIWRLDIND
ALIVW					
MSCIWRLD	0.81***				
MSCIWRLDUTIL	0.78***	0.67***			
MSCIWORLDEGY	0.69***	0.70***	0.63***		
MSCIWRLDIND	0.78***	0.88***	0.64***	0.73***	

Custom listed infrastructure index is the Active listed infrastructure proxy, product value weights (ALIVW). Reference benchmarks are MSCI World (MSCIWRLD), MSCI WORLD Utilities (MSCIWRLDUTIL), MSCI World Energy (MSCIWRLDENGY), MSCI World Industrials (MSCIWRLDIND).

Table 21: List of all identified listed infrastructure products

ProductName	
Alerian MLP ETF	Macquarie Global Listed Infrastructure Fund
Lazard Global Listed Infrastructure Portfolio	iShares Emerging Markets Infrastructure ETF
Deutsche Global Infrastructure Fund	Reaves Utilities and Energy Infrastructure Fund
ICVC First State Global Listed Infrastructure Fund	Kotak Infrastructure & Economic Reform Fund
GS MLP Energy Infrastructure Fund	Amundi Funds - Equity India Infrastructure
ETRACS Alerian MLP Infrastructure Index ETN	CF Macquarie Global Infra. Securities Fund
First Trust North American Energy Infrastructure Fund	ETRACS 2xMthly Lev. Long Alerian MLP Infra. Index ETN
iShares Global Infrastructure ETF	Cathay Global Infrastructure Fund
Renaissance Global Infrastructure Fund	ETRACS 2xMonthly Leveraged Alerian MLP Infra. Index ETN
Northern Multi-Manager Global Listed Infrastructure Fund	VanEck Vectors FTSE Global Infrastructure (Hedged) ETF
Russell Investments Global Infrastructure Pool Fund	ProShares DJ Brookfield Global Infrastructure ETF
Morgan Stanley Investment Funds Global Infra. Fund	Salient EM Infrastructure Fund
Russell Global Infrastructure Fund	Alerian Energy Infrastructure ETF
Dynamic Global Infrastructure Fund	BMO Global Infrastructure Fund
Magellan Infrastructure Fund	Voya CBRE Global Infrastructure Fund
Deutsche Invest I Global Infrastructure FC	ETFS US Energy Infrastructure MLP GO UCITS ETF
Partners Group Invest - Listed Infrastructure	CBRE Clarion Global Infrastructure Value Fund
Partners Group Global Infrastructure SICAV	Guggenheim S&P High Income Infrastructure ETF
FlexShares STOXX Global Broad Infrastructure ETF	VanEck Vectors High Income Infrastructure MLP ETF
Colonial First State Wholesale Global Listed Infra. Sec. Fund	Ve-RI Listed Infrastructure Fund
Brookfield Global Listed Infra. Long/Short UCITS Fund	Sun Life Sentry Infrastructure Fund
Nuveen Global Infrastructure Fund	Legg Mason Global Infrastructure ETF
Maple-Brown Abbott Global Listed Infrastructure Fund	Blackrock Global Listed Infrastructure Fund
Magellan Infrastructure Fund (Unhedged)	CF Canlife Global Infrastructure Fund
Global X MLP ETF	Dreyfus Global Infrastructure Fund
Frontier MFG Core Infrastructure Fund	BNP Paribas Easy NMX 30 Infrastructure Global UCITS ETF
Invesco Asia Infrastructure Fund	Lyxor FTSE USA Core Infrastructure Capped UCITS ETF
InfraCap MLP ETF	Middlefield Global Infrastructure Fund
Legg Mason IF RARE Global Infrastructure Income Fund	Lyxor FTSE Developed Europe Core Infra. Capped ETF
Brookfield Global Listed Infrastructure UCITS Fund	First Trust NASDAQ Clean Edge Smart Grid Infra. Index Fund
Morgan Stanley Global Infrastructure Portfolio	Canara Robeco Infrastructure Fund
Russell Investments Global Listed Infrastructure	HSBC Infrastructure Equity Fund
Sentry Global Infrastructure Fund	Oak Ridge Global Resources & Infrastructure Fund
Legg Mason RARE Infrastructure Value Fund	Oppenheimer Macquarie Global Infrastructure Fund
Macquarie Global Infrastructure Total Return Fund Inc	Prudential Global Infrastructure Fund
AMP Capital Funds - Global Listed Infrastructure Fund	RBC Quant Global Infrastructure Leaders ETF
Global X MLP & Energy Infrastructure ETF	Invesco Global Infrastructure Fund
Desjardins Global Infrastructure Fund	PowerShares Emerging Markets Infrastructure Portfolio
Vanguard Global Infrastructure Fund	Meeder Infrastructure Fund
ICICI Prudential Infrastructure Fund	AMP Capital Global Infra. Securities Fund
UTI Infrastructure Fund	Brookfield Global Listed Infrastructure Fund
Sundaram Infrastructure Advantage Fund	First Asset Active Utility & Infrastructure ETF
BMO Global Infrastructure ETF	Alpha Infrastructure Fund
Mercer Passive Global Listed Infrastructure Fund	Sprott Global Infrastructure Fund
Cohen & Steers Global Infrastructure Fund	Macquarie Global Infrastructure Income Fund
Manulife Global Infrastructure Fund	IKC Global Infrastructure Fund
Columbia Global Infrastructure Fund	United Asia Pacific Infrastructure Fund
Brookfield Global Listed Infrastructure Income Fund	Amundi Global Infrastructure UCITS ETF
Aberdeen Global Emerging Markets Infra. Equity Fund	Global X U.S. Infrastructure Development ETF
SPDR S&P Global Infrastructure ETF	LIC NOMURA MF Infrastructure Fund
Franklin Build India Fund	Samsung KODEX S&P Global Infrastructure ETF
Catalyst MLP & Infrastructure Fund	Mirae Asset TIGER Synth-S&P Global Infrastructure ETF
Alpine Global Infrastructure Fund	4D Global Infrastructure Fund
Duff & Phelps Global Infrastructure Fund	Hanwha ARIRANG S&P Global Infra ETF
Sun GIF Solutions Sun Life Sentry Infrastructure Estate	Invesco India Infrastructure Fund
Macquarie/First Trust Global Infra/Utilities Dividend & Income Fund	Summit Water Infrastructure Multifactor ETF
Maple-Brown Abbott Global Infrastructure Fund	Magellan Wholesale Plus Infrastructure Fund
L&T Infrastructure Fund	Deutsche MLP & Energy Infrastructure Fund
Credit Suisse (Lux) Infrastructure Equity Fund	Tata Indian Infrastructure Fund
Birla Sun Life Infrastructure Fund	ETRACS 1XMonthly Short Alerian MLP Infra. TR Index ETN
SBI Infrastructure Fund	Deutsche X-trackers S&P Hedged Global Infrastructure ETF
SPDR Morningstar Multi-Asset Global Infra. UCITS ETF	Goldman Sachs Global Infrastructure Equity Portfolio
Investors Global Infrastructure Fund	Legg Mason RARE Emerging Markets Infrastructure Fund
Magellan Infrastructure Fund	Amundi Opportunities - Amundi India Infrastructure Fund
Franklin Global Listed Infrastructure Fund	BOI AXA Focused Infrastructure Fund
Prudential Jennison Global Infrastructure Fund	MFG Infrastructure Fund
Mercer Listed Infrastructure Fund	Taurus Infrastructure Fund
IDFC Infrastructure Fund	EGShares Brazil Infrastructure ETF
EdR Fund Infrasphere	EGShares China Infrastructure ETF
Whitehelm Capital Listed Core Infrastructure Fund	Macquarie Emerging Markets Infrastructure Income Fund
Columbia India Infrastructure ETF	UBS ETF-MSCI Europe Infrastructure 20/35 UCITS ETF
Vanguard Global Infrastructure Index Fund	UBS ETF-MSCI Japan Infrastructure 20/35 UCITS ETF

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