



C A M B R I D G E A S S O C I A T E S L L C

INVESTING IN INFRASTRUCTURE

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Executive Summary

- In the aftermath of the 2008–09 sharp market declines associated with the global financial crisis, investors are increasingly seeking to diversify their portfolios away from equities, often looking toward U.S. Treasuries, gold, and hard assets such as core real estate and infrastructure. In particular, institutional investors are looking to infrastructure assets for a combination of low volatility, current yield, and some measure of inflation protection.
- To achieve these objectives, it is crucial for investors to understand the characteristics and inherent risks of infrastructure assets. Infrastructure assets are not always easy to categorize as they can exhibit bond, real estate, and equity traits, depending on the nature of the investment. This report helps to outline the borders of the infrastructure category and to decompose the layers of risk at each level (core, value-added, and opportunistic).
- In the nascent area of private infrastructure funds, the value-added category appears to have the best chances—net of all fees and costs to limited partners—of achieving the above-mentioned goals. The value-added funds will ideally focus on attractive entry pricing while acknowledging the somewhat limited effect of active management on an existing infrastructure asset.
- At the upper end of the risk/return spectrum, opportunistic strategies present the potential for strong capital growth, but at the expense of stable returns and current yield. These investments often have private equity cash flow characteristics and need to be evaluated and benchmarked as such. By contrast, the low risk “core” strategies often found in more tightly regulated environments tend to suffer from a structurally unattractive 2% management fee and 20% carried interest compensation model. Instead of importing a fee model from the private equity world, the core funds would be well served to create more LP-friendly compensation structures.
- Although the main focus of this report is on unlisted infrastructure, more developed listed infrastructure provides an important benchmark and comparison tool. Apart from allowing for more tactical valuation plays, listed infrastructure can also be used as a medium-term proxy while a private program is established. However, due to the young age of the sector—most private infrastructure funds were raised from 2005 to 2007—no industry benchmark is available on the private side.
- Existing investors in private real estate and private equity will find comfort in the fact that many basic elements of due diligence—organizational stability, alignment of LP/GP interest, track record—are equally important when judging an infrastructure fund. However, newcomers will need to assess the potential for headline risk and regulatory/political risk, as well as the longer holding periods.
- Infrastructure investors have been forced to learn some of the painful lessons from the systemic crisis of 2008–09. Among these are the obvious problems of lending long term, but borrowing on a short-term basis. The bankruptcy of Australian manager Babcock & Brown, although not caused exclusively by infrastructure investments, is perhaps the best example. An overly aggressive use of leverage and a belief in upward-only price pressures are other, all too common themes.
- As noted, the infrastructure asset class is still evolving as most managers are currently investing their first fund. However, when properly implemented and managed, infrastructure investors are rewarded with long duration assets in near-monopolistic positions and associated revenues with strong links to inflation. In these unusually uncertain times, that is an attractive value proposition. ■

Investing in Infrastructure

Once limited mainly to Australia, investor interest in infrastructure investing has picked up in recent years, with fund raising in 2007 producing the largest vintage year on record by committed capital. What is the attraction of the infrastructure asset class for institutional investors? The answer depends on the type of investor in question, but most institutions view infrastructure as a stable asset class that provides some degree of inflation protection, has low correlations to most other asset classes, and has a defensive component, with a significant portion of the returns for infrastructure assets coming from current income (yield).

Further, in light of the challenging market environment of the past few years, investors have sought out infrastructure in the hope of achieving higher risk-adjusted returns and of finding refuge from asset classes with high, but volatile, total returns. At the same time, some investors are concerned about inflationary pressures stemming from the massive fiscal stimuli introduced by governments around the world. Given investors' disappointment with the stock market, the high correlation of assets in general during the credit crisis, and their concerns about inflation, it is not surprising that some investors are finding investments in infrastructure more attractive.

This report examines infrastructure investing, including the characteristics of the asset class, the risks of investing, historical performance, and implementation considerations. We also review the current fund-raising environment for private infrastructure funds, and the outlook for the infrastructure industry. We conclude with some summary thoughts on the attractions of and considerations regarding infrastructure investments.

Characteristics of Infrastructure Assets

Infrastructure is often defined very broadly as “the essential facilities and services that the economic productivity of a community or organization depends on.”¹ Infrastructure can be split broadly along four dimensions: (1) asset type—economic or social infrastructure; (2) stage of the project's development—greenfield or brownfield projects; (3) risk level or substrategy—core, value-added, or opportunistic infrastructure; and (4) type of investment—public or private. Investments can be made through a range of implementation options including listed public infrastructure indices and private infrastructure funds.

Like private equity deals, each infrastructure asset that is privatized *will have its own deal terms*, which will be laid out in the privatization process and in the concession contract. Even as a snapshot in time, it is therefore not possible to rank countries/sectors by their attractiveness, since the terms of the privatization/concession will dictate the unique attractiveness of each asset. For example, the relative assessment of a Mexican toll road versus a Brazilian water utility will depend on “the fine print” in the concession contract and indeed on a (changing) regulatory regime over time. Therefore, each infrastructure deal should be assessed on its own terms, and generalizations about strategy risks and rewards can be misleading.

¹ Mark A. Weisdorf, “Infrastructure: A Growing Real Return Asset Class,” *CFA Institute Conference Proceedings Quarterly*, September 2007, p. 17.

Asset Type: Economic Versus Social Infrastructure

Most infrastructure projects fall into one of two broad categories: economic or social. Economic infrastructure includes transportation, telecommunications, energy, and water/wastewater utilities. Social infrastructure, by contrast, includes elderly care, hospitals, judicial facilities, prisons, and schools. The table below provides more detail on the types of projects in each category.

The major sectors of economic infrastructure vary in their ability to provide the characteristics infrastructure investors often seek (e.g., stable returns, low correlations to other asset classes, and inflation protection). Within transportation, operating toll roads are classic infrastructure investments, with tolls often linked to inflation, albeit with some GDP sensitivity. By comparison, airports should be seen as two businesses in one: revenues come from landing slot revenue as well as retail and other landside revenue streams. Retail spending is notoriously GDP-sensitive while the landing slot revenues (in effect airport “real estate”) are more fixed. Since neither revenue stream is directly linked to inflation, one would typically expect airports and seaports to provide a relatively low level of inflation protection. Telecommunication projects (often focused on cellphone towers)

do not offer a similar stability of returns nor the level of inflation protection of a toll road. Regulated utilities will provide stable inflation-adjusted returns, although exposure to this large sector can also be accessed to some degree through more liquid mutual funds and exchange-traded funds. Social infrastructure, like utilities, will generally fulfill the three investment objectives for infrastructure, but is likely to provide the lowest absolute returns.

We can also examine these same sectors for their similarity to the risk/return characteristics of more familiar assets like bonds, real estate, or private equity. Social infrastructure is often available as a public-private partnership investment, an asset that is publicly owned with lease payments going to the private sector participant for the maintenance and operation of the asset. With virtually no credit risk, the return patterns mostly resemble those of sovereign bonds, with additional returns coming from taking construction, operational, and financing risk. At the other end of the risk/return spectrum are certain telecommunication projects where—as an example—the installation, sale, or rental of cell phone towers mostly resembles a private equity risk/return profile. Toll roads and energy investments have similar characteristics to each of these asset classes, depending on the type of asset. For example, mature energy assets and

Table A. Infrastructure Sectors by Asset Type

Economic Infrastructure			Social Infrastructure
Transportation	Telecommunications	Energy and Utilities	
<ul style="list-style-type: none"> • Toll roads, bridges, tunnels • Rail, light rail, urban mass transit • Airports • Seaports 	<ul style="list-style-type: none"> • Wireless towers • Satellite systems • Telecommunications backbone 	<ul style="list-style-type: none"> • Power generation • Electricity and gas transmission • Pipelines and bulk storage • District heating and cooling • Pipes and distribution of drinking water • Collection and treatment of wastewater 	<ul style="list-style-type: none"> • Elderly care • Hospitals • Judicial facilities • Prisons • Schools

toll roads are highly predictable “bond-like” investments, whereas an expansion play acts more like real estate, with high capital expenditures up front and most of the capital gain coming at the end of the project. Finally, new toll roads or merchant power plants that are not fully contracted have shorter paybacks, higher internal rates of return (IRRs), and commensurately higher risk levels, and are thus more like private equity.

The two tables below summarize the different characteristics of infrastructure sectors.

Development Stage: Greenfield Versus Brownfield Infrastructure

A major delineation of risk occurs between greenfield and brownfield assets. Greenfield development—the process of taking a power project (for example) from the conceptual stage through land purchases; fund raising; off-take, fuel supply, and equipment negotiations; right through to financial close—is a risk-laden process often underwritten to IRRs in excess of 20%. In

contrast, a brownfield plant that has been running for several years with solid off-take agreements and an appropriate financial structure presents much reduced risk/return levels (8% to 12% gross returns) for the potential investor. Some of the most important risk factors are presented in the table on the next page.

Three of these risk factors—currency, regulatory, and real interest rate risk—will accompany the investment throughout its operational life regardless of greenfield or brownfield status. Depending on the type of asset and the predictability of cash flows, currency risk can be hedged in the short to medium term, albeit at a cost. Regulatory risk, on the other hand, is virtually impossible to hedge and can only be partly mitigated through careful monitoring. Due to the long holding periods and pronounced dependence on current income rather than terminal value, an unfavorable tariff review or even a retroactive change can have disastrous effects on the investment’s returns.

Table B-1. Infrastructure Sectors: Ability to Deliver Stable Returns, Low Correlations and Inflation Protection

	Economic Infrastructure				Social Infrastructure
	Toll Roads	Air/Seaports	Energy/Utilities	Telecoms	
Stable Income-Based Returns	Operating toll roads	Landing slot revenue	Regulated utilities		Typically all asset types
Low Correlation with Other Assets/GDP			Typically all asset types	Depending on asset type	Typically all asset types
Inflation Protection	Roads with tariff adjustments		Regulated assets		Assets with tariff adjustments

Note: In terms of intra-sector correlations, based on UBS data, communications shows low correlations (0.2 to 0.3) to other sectors, while toll roads, ports, seaports, and various utilities are more highly correlated with each other (typically 0.6 to 0.7).

Table B-2. Infrastructure Sectors: Similarity to Bonds, Real Estate and Private Equity

	Economic Infrastructure				Social Infrastructure
	Toll Roads	Air/Seaports	Energy/Utilities	Telecoms	
Bonds	Mature toll roads		Regulated utilities		Public-private partnerships
Real Estate	Expansion of toll road	Typically all asset types	Expansion of regulated asset		
Private Equity	New toll road		Merchant power plant	Depending on asset type	

Depending on the availability of long-dated debt, interest rate risk could also be an issue. Since project revenues are often tied to inflation, infrastructure profits are partially immunized from the effects of rising nominal yields as any increase in debt service costs may be offset by an increase in revenues. However, to the degree that debt costs increase due to a rise in real interest rates, infrastructure investments remain vulnerable to interest rate risk.

The early stages of greenfield projects represent the most risky periods in the life of an infrastructure investment. These investments are subject to model/forecasting risk in the form of over-optimistic forecasts of revenues; construction risk due to cost overruns or project delays, which will have an immediate impact on IRRs; and contract risk, meaning the legal documentation risk that involves private sector counterparties. Also present in the initial stages are risks related to the leverage levels and structuring/matching of the debt. For example, the appropriate structure of a debt package for a greenfield toll road will depend on the traffic patterns observed during the initial months and years of the toll road. For brownfield assets, the owners will generally look

for long-term, fixed (or swapped) rate financing, thereby locking in a fixed interest rate and matching the life of the asset with the tenor of the loans.

By comparison, brownfield investments have fewer risk factors than greenfield investments, with funds that invest mainly in brownfield assets exposed to operational risk and the business climate at the time of a potential exit, in addition to the currency, regulatory, and real interest rate risk discussed earlier.

In general, infrastructure investments decrease in risk as they transition from pure greenfield projects with return targets over 20% per year through the commissioning/start-up phase to stable brownfield assets yielding low-double-digit returns, depending on sector, geography, competition, leverage levels, and the contractual arrangements agreed upon. Attractive risk-adjusted returns are achievable in both greenfield and brownfield phases; the key is to be comfortable with the inherent risks at each stage and the expected risk premium received in return.

Table C. Key Risk Factors by Development Stage

Risk Factor	Greenfield			Brownfield	
	Structuring	Construction	Operations		Asset Mgmt/Exit
Currency	Throughout				
Regulatory/Legal	Throughout				
Real Interest Rate	Throughout				
Model/Forecasting	X				
Construction/Contract		X			
Business/Operations			Start-up	Ongoing	
Illiquidity/Exit					X
Leverage Levels	Initial Stages				
Structuring/Debt Matching	Early Stages				

Substrategies: Core, Value-Added and Opportunistic Investments

Due to infrastructure’s similarity to real estate, investments are often referred to along the core, value-added, and opportunistic spectrum familiar to real estate investors. At the lower end of the risk/return spectrum, operating brownfield assets with appropriate debt structures can be characterized as *core* infrastructure. Utilities, brownfield toll roads, and social infrastructure are investments that would typically fall into this category. Assets like railways, airports, electricity/gas networks, and seaports that have a greenfield component, higher leverage, and/or a higher degree of necessary asset management are *value-added* investments. Pure greenfield investments and deals that involve operating businesses are termed *opportunistic* infrastructure or “private equity infrastructure.” Telecommunication projects, unregulated waste collection companies, and pure greenfield projects would generally meet this definition.

The recent financial crisis has exposed the layers of risk that were added to the traditional definitions of core, value-added, and opportunistic investments. Even core brownfield assets can become highly risky when overleveraged and value-added strategies pose the additional risk of operational complexity. As an overlay to the risks posed by leverage and asset management, the incursion by opportunistic infrastructure funds into emerging markets introduces a number of uncertainties, such as increased currency and regulatory risk. In summary, investors need to be careful that the definition and scope of the proposed infrastructure investments are not unduly expanded, thereby derailing the original reasons for investing. The complexities from value-added and opportunistic strategies are *additive*, as increasing layers of risk are added at each level (as shown in the figure below).

Figure A-1. Key Risk Factors by Substrategy

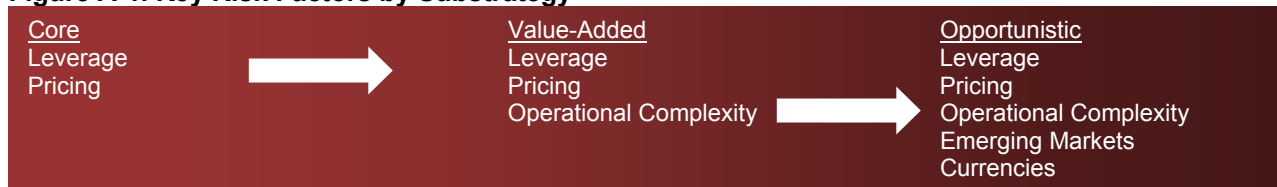
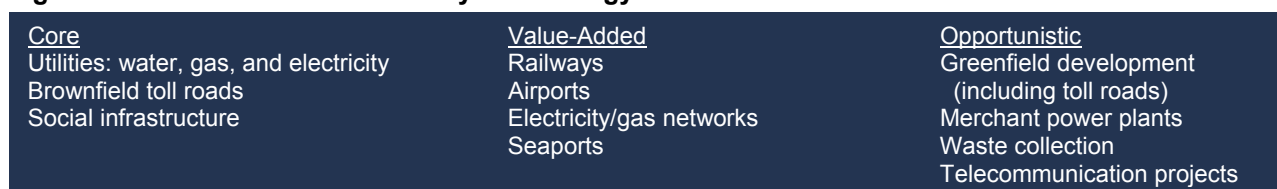


Figure A-2. Infrastructure Sectors by Substrategy



Additional Risks Inherent in Infrastructure Investing

Infrastructure investments involve a number of risks, many of which are unique to this asset class. As a broad asset class, investors must consider the following characteristics of infrastructure in addition to those discussed in the previous sections:

- **Limitations of Active Management.** Particularly with investments in plants that have been running for several years (brown-field investments), returns are much less sensitive to active asset management due to their regulated nature. A value-added infrastructure fund might expect gross, leveraged returns of 14% to 16%, of which 12% to 15% will accrue from the initial, regulated return and only 0% to 2% additional returns will come from economies of scope (asset management), economies of scale (add-on acquisitions), and financial management.²
- **Government/Regulatory Risk.** The governments of more mature infrastructure markets (like Australia, Canada, and the United Kingdom) have been tested over the years with respect to the exact interpretation of key documents, such as privatization documents and public-private partnership agreements. For long-term strategies such as infrastructure, a well-established legal regime is crucial to the viability of the sector. Yet even in countries with well-established legal regimes, risk remains. In 2008, the British government ordered U.K. airport operator British Airports Authority (BAA), owned by Spanish construction company Ferrovial, to sell three of its airports to break what it saw as a monopoly. BAA sold Gatwick Airport to Global Infrastructure Partners (GIP)

² This is a stylized example, but should be fairly representative of the value-added segment. Core funds will target gross returns in the low teens, while opportunistic funds aim for returns in the high teens.

in 2009,³ and, unless it can reach a settlement with the commission, will likely have to sell the other two airports as well after losing its court case to stop the sale. Except in outright privatizations into competitive markets (e.g., the telecom deregulation wave of the 1990s), regulatory risk remains crucial to infrastructure investors due to the potentially crippling effects on returns and the lack of recourse against a government regulator.

- **Headline Risk.** Infrastructure investments generally carry more headline/reputation risk than private equity portfolio companies operating in the business-to-business segment or early-stage venture capital firms. However, investors in private or public infrastructure funds will generally remain anonymous from the public and will thus be shielded from most headline risk. Direct investors in infrastructure have much greater exposure to headline risk. Even with smaller investments or minority stakes, limited partners still run the risk of being associated with a public service that affects millions of end users (and potential voters).

Historical Performance Characteristics

As noted earlier, investors look to infrastructure with the hope of finding a high, stable yield over a long concession period, with some degree of inflation protection and little to no correlation with other asset classes. We review the historical performance of infrastructure along these lines. Due to the dearth of data on private infrastructure, particularly historical data, we use data from the listed market to evaluate infrastructure against

³ GIP, which was founded by ex-employees of General Electric and Credit Suisse, announced in November 2010 that it had syndicated part of the Gatwick deal to the South Korean National Pension Service, CalPERS, and the Abu Dhabi Investment Authority.

these characteristics. Although there are differences between the public and private markets, examining the data on the listed market can at least provide some context for the private market. (See the Appendix for additional detail on the characteristics of selected listed infrastructure indices.)

Infrastructure for Low Volatility

Although we do not have data for the private infrastructure market, the risk/return characteristics of the listed market can provide some parameters for thinking about the private market. Over the past 20 years, the annualized standard deviation of listed infrastructure returns has been lower than that of emerging markets equities, public real estate, venture capital, and commodities, but higher than that of other major asset classes, including developed markets equities (Exhibit 1). Listed infrastructure has provided high returns—only emerging markets equities and the unlisted asset classes of private equity, venture capital, and hedge funds returned more during the period. During the financial crisis, defined here as the seven quarters ending with second quarter 2009, broad bond indices provided the best “safe haven” and unlisted assets (private equity, venture capital, hedge funds, and private U.S. real estate) provided less volatility as these assets are not marked-to-market on a daily basis (Exhibit 2). However, during the crisis, listed infrastructure was the least volatile of the listed options.

While it is difficult to draw conclusions from a period even as long as 20 years, we would expect standard deviations for an asset such as infrastructure to fall between those of bonds and real estate. For long-term planning purposes, we assume that bonds have a standard deviation in the high single digits and real estate in the high teens. Returns for infrastructure are even more difficult to predict as it is a relatively nascent investment strategy. For the unlisted market, given the illiquidity and value-added potential, we would expect the returns to be somewhat higher than

those of listed infrastructure, and the standard deviation somewhat lower. For the 20-year period ending in 2010, the closest asset class to listed infrastructure in terms of risk/return was developed markets REITs (as represented by the FTSE® EPRA/NAREIT Developed Real Estate Index).

Risk/Return Characteristics. The Sharpe ratio measures the excess return over a risk-free rate compared to the risk taken. Compared to other liquid, investable strategies, listed infrastructure has performed better on this measure over ten- and 20-year timeframes than developed markets equities, commodities, and developed markets REITs. The more illiquid strategies performed the best over these time periods, with U.S. property the best in the ten-year period, and U.S. private equity the best in the 20-year period (Exhibit 3). Because these strategies are marked to market less frequently and are in some cases reported on a quarterly basis, their volatility may be understated (Exhibit 4 shows rolling three-year Sharpe ratios).

No comparable dataset exists for private infrastructure funds, but in general, the results in Exhibit 3 should be good proxies for large, core infrastructure assets held by private infrastructure funds. The performance of listed infrastructure is less relevant for opportunistic private infrastructure investments or assets that have additional layers of risk (as detailed earlier).

Infrastructure is unlikely to provide the stability and “safe haven” aspects that a bond allocation can provide. However, when compared with other equity-based investments, a compelling argument can be made for infrastructure on a risk-adjusted basis. Investors should also take note that both listed and unlisted infrastructure investments represent new asset classes, making it impossible to draw a firm conclusion regarding the correlation between the two.

Infrastructure for Inflation Protection

Assuming that regulatory risk, such as renegotiation of concession or operating contracts, is not an issue, infrastructure investments will give investors solid inflation protection whenever the revenues are derived from regulated, inflation-linked tariffs—investments like toll roads, social infrastructure, and regulated utilities. Seaports, airports, and telecommunication investments are less likely to provide this form of inflation protection as their revenue models are not directly linked to inflation indices.

Infrastructure also provides indirect inflation protection through the replacement cost of the assets. Similar to real estate, the replacement cost includes all labor, construction, and financing necessary to build an asset. In practice, the replacement cost is often approximated by the regulatory asset base, which is usually indexed to inflation. Thus, inflation protection can appear through the income statement (inflation-linked tariffs) or through the balance sheet (inflation-linked regulatory asset base).

Again using listed infrastructure as a proxy, when analyzing the simple correlations between various asset classes (Exhibit 5) for the past 20 years, the UBS Developed Infrastructure Index has exhibited only a 0.07 correlation with U.S. CPI and a 0.09 correlation with G7 CPI. This should be expected given the low level and stability of inflation over the period. A more relevant test of infrastructure investments' inflation-protection abilities would be correlations during a high or sharply rising inflationary period, which we have not experienced over the period for which we have infrastructure return data.

Infrastructure for Diversification

Over the past 20 years, infrastructure's correlation with bonds and commodities has been low, higher with broad equity indices, and mixed with hard

assets (Exhibit 5). For example, for the 1991–2010 period, the correlation of listed infrastructure with the Barclays Capital Global Aggregate Bond Index was 0.33; with the S&P GSCI™ commodity index, 0.18; and with oil (based on the end of quarter West Texas Intermediate price), 0.04. Correlations with broad equity indices were higher, at 0.65 for MSCI World and 0.47 for MSCI Emerging Markets. On the hard assets side, listed infrastructure was highly correlated with REITs, at 0.71 for the FTSE® EPRA/NAREIT Developed Markets Index, but more moderately correlated with real estate (0.45 with U.K. real estate and 0.17 with U.S. real estate). Correlations for the past ten years are quite similar, though correlations with equities (developed and emerging), oil, private equity, and venture capital moved significantly (more than 20 points) higher from their values in the 20-year period. These results would indicate that listed infrastructure behaves much like listed equities and REITs, but can provide some diversification benefits to a bond or commodity allocation.

Similar studies on the Australian markets with a track record stretching back to the mid-1990s show that private infrastructure investments had very low correlations with other assets. One report from 2007 found that private infrastructure in Australia had a correlation of 0.04 with Australian bonds, 0.16 with listed property, and 0.32 with local equities from 1995 to 2006.⁴ These low correlations undoubtedly contributed to the popularity and early adoption of infrastructure investments among institutional Australian investors. The higher correlations in other regions over the 2001–10 period seen in Exhibit 5 suggest that Australian investors likely benefitted from “first mover” advantages in an era of less global interdependency or possibly from a less connected Australian economy.

⁴ Mark A. Weisdorf, “Infrastructure: A Growing Real Return Asset Class,” *CFA Institute Conference Proceedings Quarterly*, September 2007, pp. 17–27.

Current Trends

During the 2009 vintage year, private infrastructure fund raising slowed to a trickle as 17 funds raised \$7.7 billion, compared to 38 funds that raised \$34.9 billion during 2008, according to Preqin (Exhibit 6). Fund-raising levels picked back up in 2010 (jumping 255% in dollars raised), but still remain significantly below 2007–08 levels. More funds are targeting Asia and other regions outside Europe and the United States, though fund-raising targets are still larger for the latter two regions. Although unlisted infrastructure fund raising improved in 2010, the effects of the global crisis can still be felt, with some managers postponing fund closing dates.

Recent manager meetings have demonstrated the changing post-crisis landscape and an increased risk aversion among fund managers. Some of these current trends are summarized below.

- **Brownfield is the new greenfield.** Very few funds have pipelines with significant greenfield projects. Brownfield and secondary stage deals accounted for 63% of the total deal volume in 2010. Most funds are now looking for brownfield assets, often from distressed corporate or government sellers, due to their lower risk profile. Managers tend to favor developed markets over developing markets as high, unleveraged returns can currently be achieved in more stable OECD countries.
- **Investment landscape bifurcated.** As several large investment banks/financial institutions have either failed or continue to struggle (AIG, Babcock & Brown, Lehman Brothers, etc.), the relative weight of smaller, independent funds is increasing. The current fund-raising landscape is therefore dominated by the survivors of the recent turmoil (often raising their second fund) as well as smaller newcomers
- and spin-outs from the failed banking giants (Exhibit 7).
- **Fees sticky, but coming down in select cases.** Pressure from limited partners is sending fees down for certain funds. Many older infrastructure funds have a private equity–like fee structure—2% management fee and 20% carried interest. Given that infrastructure is not expected to earn the high returns seen in private equity funds, but rather generate stable, long-term yields, limited partners have started to balk at paying private equity–like fees. For vintage year 2009 and 2010 funds, management fees have come down a bit, with about half of these funds operating with a management fee of less than 2%. Many of these funds also have a mechanism for reducing management fees after the end of the investment period. We have even seen a few funds offering a 1% management fee and 10% carried interest fee format. Investors should make sure to study the details around these apparently attractive charges.
- **Private infrastructure too early to call.** The performance of the recent, very large vintages is still too early to call. However, anecdotally, the higher risk/return funds that relied more on leverage and profitable exits have, not surprisingly, been hit quite hard. Furthermore, the private equity groups that have added an infrastructure product seem to have struggled compared to independent firms.
- **Near-term shake-out likely.** Although there are still a substantial number of funds on the road—122 funds targeting \$85.8 billion in commitments as of January 2011, according to Preqin—a return to the record-breaking fund-raising levels of recent years seems highly unlikely. For many funds that started fund raising in 2008–09, the most likely outcome

is a significantly diminished final fund size or abandonment of the strategy altogether.

We view these changes as overwhelmingly positive, since they imply a smaller field of competitors with terms (potentially) more friendly to limited partners. Managers' preference for brownfield over greenfield funds is also positive for investors looking for the core characteristics of infrastructure (stable returns, inflation protection), provided the fees and terms are commensurate with the limited ability for such managers to add value.

The Future of Private Infrastructure Investing

The infrastructure investment management industry today stands at a crossroads. Some funds have experienced problems at the holding company level as the systemic bank crisis impacted many bank-sponsored funds. At the underlying asset level, managers added more geographic/sector risk, overleveraged assets, and/or occasionally underestimated the operational effort needed to preserve the value of the assets. On the listed infrastructure side, correlations with equities were uncomfortably high, and within private infrastructure, the lack of a broad, representative performance benchmark made it more challenging for investors to evaluate fund performance.

Nonetheless, the need for additional infrastructure is clear. One recent report estimated need in developing countries at \$18.1 trillion over the next 20 years.⁵ China is the largest component of this, with infrastructure investment needs of more than \$6.0 trillion. In comparison, the existing stock of all European infrastructure has been estimated at between €4 trillion and €5 trillion (US\$6.0 trillion

to US\$7.5 trillion).⁶ The infrastructure needs for the OECD countries are also expanding after years of underinvestment; the investment needed for the next 20 years in the developed world has been estimated at over \$20 trillion.⁷ With the large debt burdens in many of these countries, privatization of public assets would represent one way to raise funds, and could be a source of investment for private or public infrastructure funds. It remains to be seen how politically palatable privatization would be; some proposals have been put forward recently in the United States for the creation of a National Infrastructure Bank to encourage greater private sector co-investment in infrastructure projects, though this does not necessarily indicate full privatization is on the way.

To put this infrastructure demand in perspective, we can compare the above numbers with the private capital available for infrastructure investing (so-called dry powder). As of December 2010, the dry powder from the recent, very successful fundraising vintages was approximately \$30 billion for North America, \$16 billion for Europe, and \$12 billion for Asian and other regional private infrastructure funds, according to Preqin. Naturally, private funds will not meet all infrastructure demand and additional capital will no doubt be raised over the coming years. Nevertheless, it is clear that private infrastructure funds will be able to finance only a tiny fraction of the investments needed.

Crucially, investors should be careful not to confuse this massive need for infrastructure with automatic, outsized returns. Previous surges in infrastructure investment, such as the U.S. railways of the nineteenth century and the global airline

⁵ Marco Airoidi, Lamberto Biscarini, and Vito Saracino, "The Global Infrastructure Challenge: Top Priorities for the Public and Private Sectors," The Boston Consulting Group, July 2010.

⁶ RREEF Research: European Infrastructure Market, June 2006.

⁷ Marco Airoidi, Lamberto Biscarini, and Vito Saracino, "The Global Infrastructure Challenge: Top Priorities for the Public and Private Sectors," The Boston Consulting Group, July 2010.

industry of the twentieth century, often left investors disappointed. In addition, academic research has found no correlation between GDP growth and real returns on equities over the long term.⁸ In a similar vein, investors should therefore be appropriately cautious about managers that explicitly or implicitly attempt to link economic growth (GDP) with infrastructure returns.

Implementation

Given that a potential investor understands the main characteristics of infrastructure, its role in the portfolio, and the risks, the focus shifts to implementation, including choice of vehicle, selection of relevant benchmarks, and criteria for evaluating managers.

Choice of Investment Vehicle

Investors have several vehicle options for an infrastructure allocation including listed funds, evergreen funds, funds-of-funds, primary funds, and direct investments. The amount of in-house resources, the size of the infrastructure program, and the available capacity for illiquid investments will largely determine the preferred vehicle for infrastructure investments.

With a short time horizon or high liquidity needs, listed infrastructure funds are often the only option available. Further, for those investors with limited resources for building a diversified private portfolio of infrastructure investments, listed infrastructure and/or unlisted funds-of-funds are often the only options available. Given the relative immaturity of the primary fund space, it is no surprise that the fund-of-funds segment is even less developed. Only 11 fund-of-funds managers were successful in raising funds between 2006 and 2010, although six general partners are

⁸ Elroy Dimson, Paul Marsh, and Mike Staunton, *Credit Suisse Global Investment Returns Yearbook 2010*.

currently fund raising, according to Preqin. The pros and cons of these funds-of-funds are similar to their siblings in other asset classes, and it is much too early to speculate about the ultimate performance of these funds.

The issue of matching fund life with the life of *core* infrastructure assets is occasionally addressed by the use of an evergreen fund.⁹ Evergreen funds do not have a final close, but instead rely on long-term investors that are comfortable with the buy-and-hold strategies of these funds. Despite their name, very few such funds are truly evergreen and instead offer the investor liquidity events at certain, pre-determined dates (every five years, for example) and on a “best efforts” basis.¹⁰ The assets of these evergreen funds are typically core assets that are held to the end of long-dated concession contracts. Recurring dividends—as opposed to sales proceeds from exits—are therefore a major source of returns for evergreen investors.

Within the infrastructure landscape, evergreen funds are quite rare as most investors with private equity/real estate investment experience seem more comfortable with a ten- to 15-year fund life. However, evergreen funds are a viable alternative for investors that on one hand are either unwilling or unable to accept the stock market volatility associated with listed infrastructure and on the other hand want more liquidity than the typical, closed-ended fund with a 15+ year term.

Given a higher allocation to infrastructure, the investor can develop a more diversified portfolio of primary funds that will benefit from lower fees

⁹ Australian managers such as AMP Capital Investors and CP2 are examples of evergreen fund managers (see Exhibit 7).

¹⁰ When comparing the illiquidity of funds-of-funds versus evergreen funds, funds-of-funds imply a longer, inflexible lock-up period (10+ years), while evergreen funds are designed for very long-term investors, but offer earlier redemption options.

than the fund-of-funds option. The primary fund landscape is discussed in more detail below.

Finally, the largest investors in infrastructure—mostly pension plans and other investors in Australia, Canada, the United Kingdom, and the United States—engage in co-investments or direct infrastructure investments. Most limited partners will, however, not have sufficient in-house expertise or asset base to take significant direct stakes in infrastructure assets.

Primary Infrastructure Funds. Increasingly, institutional investors access infrastructure via private fund structures. These funds are typically organized in a private equity fund format with ten- to 15-year fund lives and an incentive structure as a mix of management fees and carried interest. The history of these private infrastructure funds reflects the increasing institutionalization of this asset class. Macquarie, an Australian bank, pioneered the bundling and securitization of infrastructure projects into a fund format and grew rapidly from its local Australian origins in 1969 to a global player with several infrastructure funds and assets worth more than a \$100 billion. Infrastructure investing was uncommon outside of Australia until the early to mid-2000s, when a number of smaller, boutique infrastructure firms successfully raised their first funds. They were also joined by mostly European/international financial institutions, such as AIG, Barclays, and HSBC. Almost simultaneously during the 2007–08 period, a number of new entrants appeared in the infrastructure sector. These players included large investment banks, such as Citigroup, Goldman Sachs, Morgan Stanley, and UBS, and companies such as Axa, Carlyle, EQT, and Hg Capital, which had heretofore mainly been associated with private equity investing. Even funds traditionally investing in real estate (RREEF, Starwood) and

large regional asset managers¹¹ were successful in their fund-raising efforts. The average fund size increased substantially in 2007–08 and most investor commitments were captured by these investment banks, private equity firms, and real estate firms. In other words, institutional investment in infrastructure expanded rapidly in the years before the crisis, with much of the investment in managers that had limited experience in this area. Clearly, under such conditions, historical performance provides a limited guide for future expectations.

Infrastructure debt funds, which typically specialize in either senior debt or junior (mezzanine) debt, are a developing niche within the private infrastructure fund-raising landscape. During the recent fund-raising boom, debt levels were as high as 70% to 90% of enterprise value, although levels of 70% are now more common.¹² Infrastructure debt funds are relatively rare, but typically promise returns based on spreads above Euribor.

Relevant Benchmarks

Benchmarks exist for public infrastructure (see the Appendix), but the ability to benchmark private infrastructure is severely handicapped by the fact that very few funds have made it through a full ten- to 15-year cycle. Indeed, many of the funds recently raised are still in their investment period. Consequently, there is as of yet not enough performance data to construct a robust infrastructure benchmark, similar to Cambridge Associates Private Equity Index®, U.S. Venture Capital Index®, and Real Estate Index. Lacking a reliable benchmark, as private real estate investors did in the 1970s, infrastructure investors must develop alternative benchmark approaches, three of which are discussed below.

¹¹ Abraaj, a large asset manager headquartered in Dubai, raised its first global infrastructure fund at roughly \$2 billion in 2007.

¹² Barbara Weber and Hans Wilhelm Alfen, *Infrastructure as an Asset Class* (West Sussex: John Wiley & Sons, Inc., 2010).

First, an existing investor in private infrastructure assets could create a private benchmark by adding to a listed infrastructure index an illiquidity premium and other premiums as they relate to differences in geographic, leverage, or sector exposure, expressed as an additional return over or as a multiple of listed market index returns. As with other private vehicles, the investment returns should be evaluated over the medium/long term (at least five years) to allow for the investments to exit the J-curve effect.

Another approach to benchmarking would involve weights according to the underlying asset exposure. As an example, a portfolio with targeted allocations of 50% value-added funds and 50% higher risk “private equity–like” funds would have a benchmark with equal weights to Cambridge Associates’ Real Estate and Private Equity benchmarks.

A third and final approach would be to use the historical returns accumulated by Australian private infrastructure investors. While such benchmarks have the advantage of being a more direct comparison, the Australian data have the disadvantage of being tied to a specific geography and the risk/return profile may therefore not be applicable to other geographies. Clearly, there is not yet an industry standard for private infrastructure benchmarks and investors will have to use an approximation, possibly customized further for specific needs.

Manager Evaluation

When evaluating private infrastructure funds, many of the criteria used in conducting due diligence on private equity and real estate managers can also be used for infrastructure investments. For example, a careful investor will assess the fund’s detailed track record (if available), the investment strategy, and the appropriateness of the team size/composition given such an investment strategy. The alignment of interests (obtained through management fees or carried interest) and the safeguarding of these interests through key-man clauses and other

corporate governance terms apply as much to infrastructure investments as they do to other alternative asset classes.

However, in the case of infrastructure, a number of additional criteria need to be taken into consideration:

- **Holding Periods.** The most obvious is the longer holding periods that stem from correspondingly long concession periods, often spanning over 30 years. More opportunistic infrastructure funds that target private equity–like operating companies will likely be comfortable with a ten- to 12-year fund life. However, funds that are pursuing yield and/or inflation protection are much less inclined to sell a well-performing asset after five to six years. Such core/value-added strategies should therefore be matched by longer fund lives (at least 15 years including extensions) or an evergreen structure.
- **Terminal Value.** Investors need to carefully evaluate any reliance on the terminal (exit) value of the investments. Funds investing in more volatile investments, such as telecom projects and GDP-sensitive assets such as airports/seaports, will run the risk of being unable to divest profitably at the end of a fund’s life. Generous fund life extension periods can only partially offset this risk.
- **Strategy Drift.** A well-known risk from the private equity/venture capital world, strategy drift takes different forms in infrastructure. Funds can stray from their previously announced risk profile by taking on more greenfield exposure or by increasing overall levels of leverage. Note that while stabilized brownfield assets can support higher levels of debt due to the predictability of cash flows, strategies taking more operational risk or more tied to economic growth cannot; this

was often overlooked in the recent years prior to 2008 when cheap financing was applied to *all* project types.

- **Type of Acquisition.** As with private equity funds, investors should analyze the sector split and the type of acquisition (auction, negotiated deal, etc.). For infrastructure investments, the distinction between full privatization versus a public-private partnership agreement becomes crucial as the general partner has much more discretion under the full privatization scenario. The existing portfolio and pipeline of new investments also need to be assessed to determine whether pricing is availability- or volume-based. Generally, availability-based pricing is preferred, since volume-based pricing is often closely related to overall economic activity.
- **Fund Terms.** The fund terms offered should reflect the lower potential for active managers to add value in infrastructure investments (see the section on additional risks). Standard private equity terms of 2% management fees and 20% carried interest do *not* seem justified for lower risk/return infrastructure funds. This argument is analogous to the need for core/core-plus real estate funds to adopt a limited partner-friendly structure that reflects the amount of alpha added. Hard hurdles (i.e., no catch-up clause) would be a welcome start, but lower (10% to 15%) carried interest rates are also preferred.

In summary, the investor needs to evaluate whether the general partner has the necessary *financial skills* to mitigate interest rate, structuring, modeling/forecasting, and currency risks as well as the right *asset management skills* to overcome construction, business, operational, and illiquidity/exit risks. A potential infrastructure investor also needs to evaluate the terms (fees, fund life) in light of the characteristics of the asset class.

Conclusion

In the past, Cambridge Associates regarded infrastructure investments as unattractive for investors looking for high risk-adjusted returns as it seemed to us that the expected levels of return did not compensate investors adequately for the risks (e.g., political risk and illiquidity). The maturing of the market and the repricing of risk and liquidity have no doubt made this area more interesting for long-term investors.

Infrastructure investments should not be expected to achieve rates of returns similar to top-quartile venture capital or private equity funds. However, these investments have some unique characteristics that make them worth considering for investors seeking stable returns and diversification benefits. Within the wider opportunity set, the substrategies of core, value-added, and opportunistic infrastructure have different investment attractions and considerations.

Core Infrastructure: Attractions and Considerations

- For investors with an objective of protecting their portfolios against inflation, core infrastructure funds with inflation-linked revenues represent one of the most direct avenues to fulfilling that objective.
- Despite the benefits of such core strategies, private infrastructure funds within this segment need to offer incentive structures that are more friendly to limited partners in order to reflect the limited ability of general partners to influence returns from brownfield projects.
- As an alternative, investors with limited allocations or with liquidity concerns have the option to invest in listed infrastructure, although they will have to accept market volatility. It should be noted that listed infra-

structure has not been found to have a high correlation with inflation, but that would not be expected when inflation is low and stable. An inflationary period is needed to properly test this assumption.

- Listed infrastructure provides diversification benefits through less than perfect correlations with certain asset classes; private infrastructure presumably will perform even better on this measure.

Value-Added Infrastructure: Attractions and Considerations

- Value-added funds that are disciplined on entry valuations represent an attractive mid-point on the risk/return scale as they benefit from some inflation protection and stability of returns while at the same time giving limited partners a degree of return upside.
- If a particular value-added investment opportunity claims to deliver inflation-adjusted returns, investors should make particularly sure that investment returns (through dividends or capital gains) are truly linked to inflation.

Opportunistic Infrastructure: Attractions and Considerations

- The track record of private infrastructure investing remains thin. Instead, our analysis has relied mainly on the performance, risk, and correlations of listed infrastructure. In smaller or more opportunistic deals, comparisons to the public market are less appropriate, so it is difficult to say what investors can expect from investments in this substrategy.
- More adventurous investors can potentially push the risk/return profile out even further. When adding leverage, sovereign, or green-field risk, the return profile will, however, cross into private equity territory and thus cease to

have the infrastructure benefits outlined in this report. Such investment opportunities need to be evaluated on a case-by-case basis, as is the case with private equity in general. Such evaluations are complicated in infrastructure by the lack of historical track records to inform decision making.

The options within public and private infrastructure investing have widened substantially over the last decade. Going one step further, Cambridge Associates believes that private infrastructure will follow in the steps of private equity and real estate and develop a fuller set of investment options, including more sector and regional funds and eventually a market for secondary interests. Nonetheless, potential investors need to recognize that infrastructure is in many ways an emerging asset class—the quality of its asset managers and fund vehicles is still in flux and improving. Like many other asset classes, the most recent past has been characterized by unusually large (and still unproven) fund-raising vintages. The asset class is not without risk, and in the current environment regulatory and headline risks are particular concerns. However, when properly implemented and managed, infrastructure investors are rewarded with long duration assets in near-monopolistic positions and associated revenues with strong links to inflation. In these unusually uncertain times, that is an attractive value proposition. ■

Appendix: Infrastructure Indices

As infrastructure is still a developing area of investment, few indices exist. All of the indices of which we are aware have an inception date within the past five years, and all have backfilled history. The UBS Developed Infrastructure and Utilities Index has the longest history of the indices for which we have data; the UBS Developed Infrastructure Index, a subindex, is the index we have used throughout our exhibits. For comparison, this Appendix includes some details on the three main UBS infrastructure indices and an infrastructure index provided by Standard & Poor's. Both the UBS index and the S&P index are calculated by Standard & Poor's.

UBS Developed Infrastructure and Utilities Index

A free float-adjusted, market cap-weighted index with two main subindices. The index and its subindices were created in 2006 and have history backfilled to 1990.

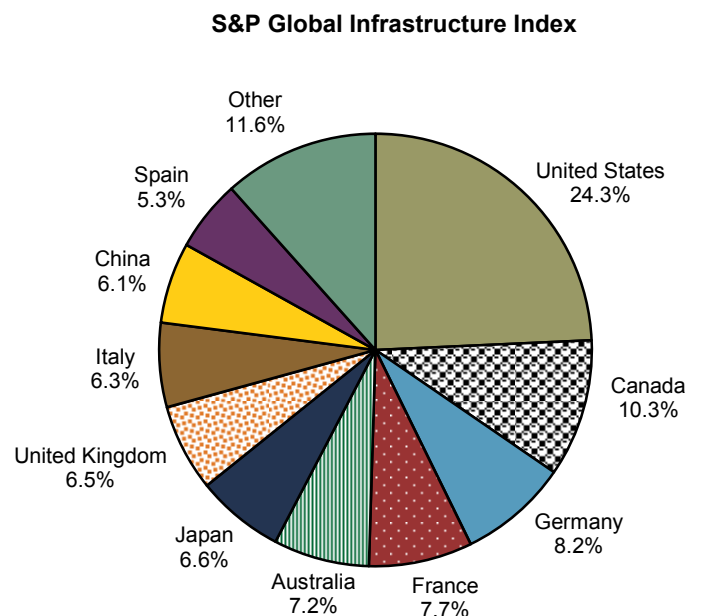
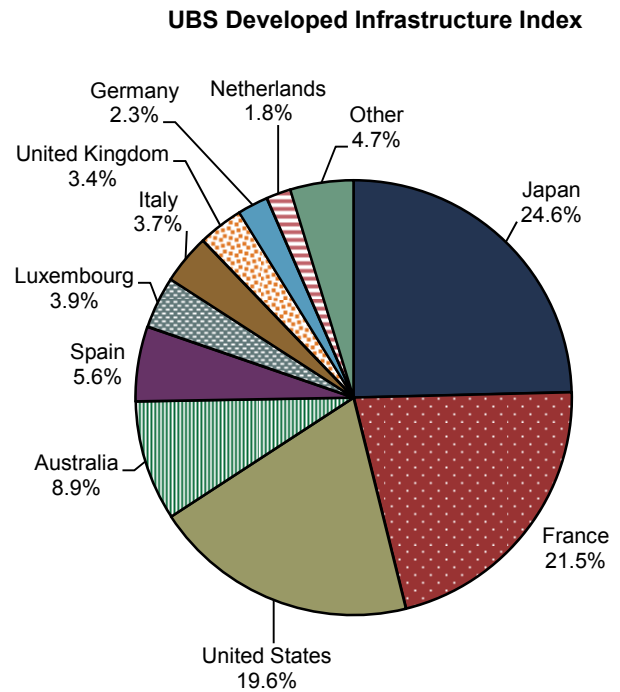
UBS Developed Infrastructure Index

Includes constituents in the following areas of infrastructure: airports, communications, ports, rail, toll roads, and diversified infrastructure. Total market cap for the 31 securities in the index as of December 31, 2010, was \$173.0 billion. The top ten securities equaled 74.1% of the index as of December 31, 2010. Figure A shows the country weights of the index as of December 31, 2010, and Figure B shows the sector weights as of the same date.

UBS Developed Utilities Index

Includes constituents focused on utilities: integrated, integrated regulated, transmission & distribution,

Figure A. Index Country Weights
As of December 31, 2010



Sources: Standard & Poor's and UBS Global Asset Management.

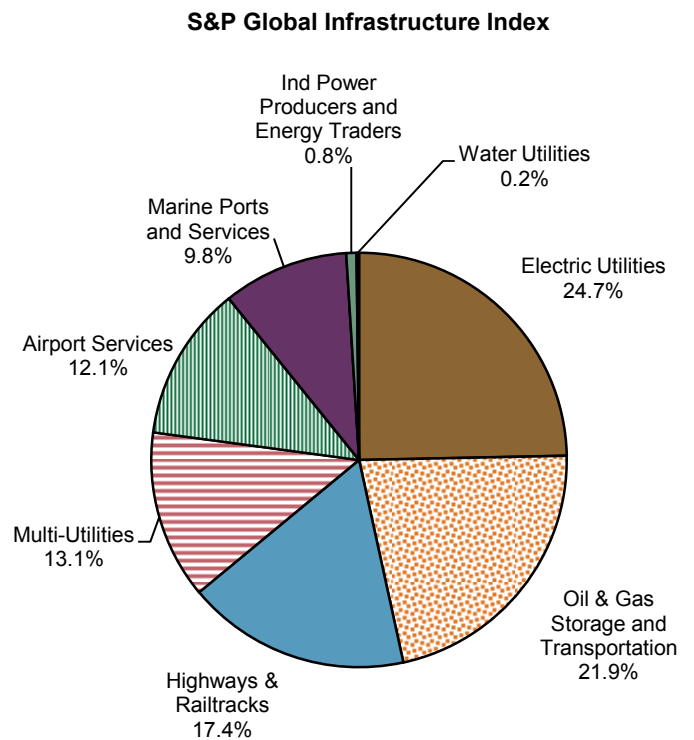
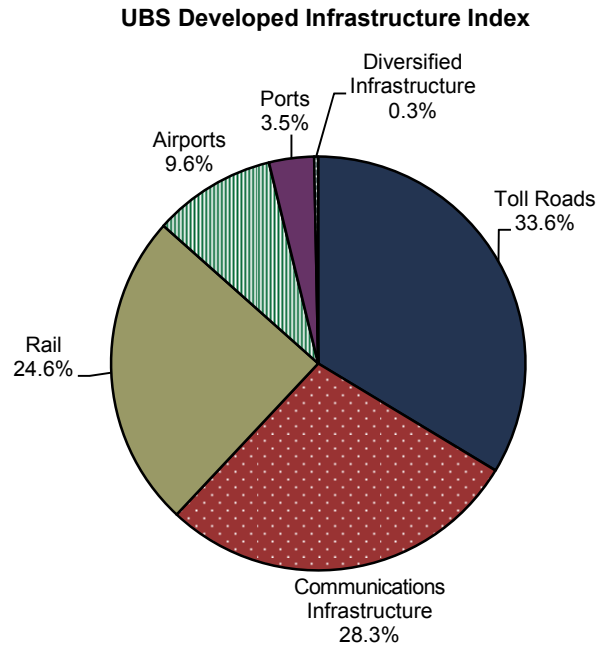
generation, water, and diversified utilities. Total market cap for the 166 securities in the index as of December 31, 2010, was \$1.2 trillion. The top ten securities equaled 28.8% of the index as of December 31, 2010.

S&P Global Infrastructure Index

A free float-adjusted index using a modified cap-weighting scheme that reduces single-stock concentration and balances exposure across two clusters. The index was created in 2007 and has history back to 2001.

Constituents are selected from the following sectors: energy, transportation, and utilities. The index is designed to include 75 constituents, with 15 distributed to emerging markets and 60 to developed markets. The emerging markets companies are chosen by market cap, with no more than two-thirds in any one of the three sectors. Developed markets companies are then selected by market cap in such a way as to lead to the total index having 30 transportation, 30 utilities, and 15 energy infrastructure companies. The index had a market cap of \$749.5 billion as of December 31, 2010; the top ten holdings made up 37.3% of the index weight. Figure A shows the country weights of the index as of December 31, 2010, and Figure B shows the sector weights as of the same date.

Figure B. Index Sector Weights
As of December 31, 2010



Sources: Standard & Poor's and UBS Global Asset Management.

Notes on the Data

In the exhibits that follow, asset classes are represented by the following indices:

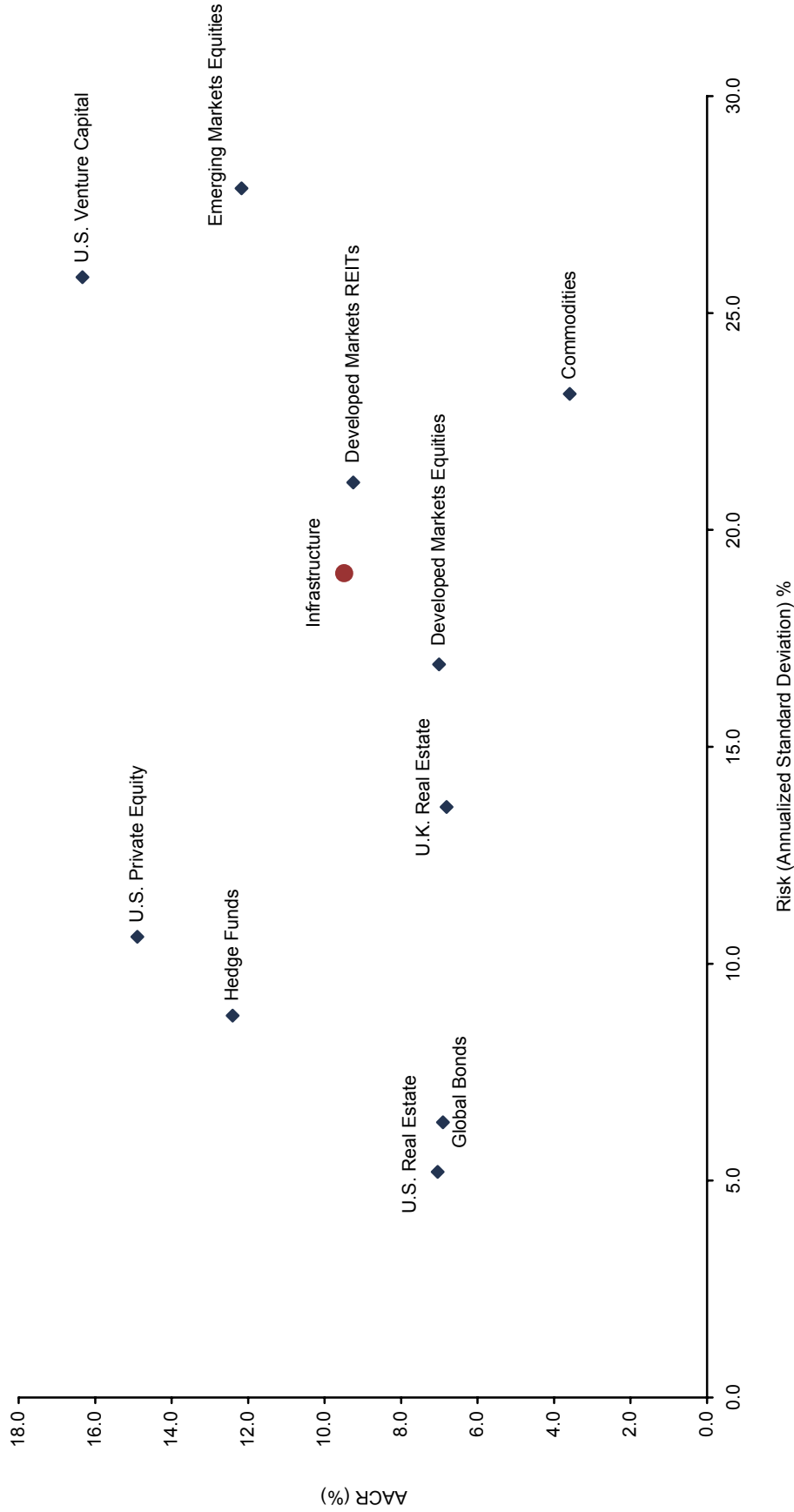
<u>Asset Class</u>	<u>Representative Index</u>
Developed Markets Equities	MSCI World Index
Emerging Markets Equities	MSCI Emerging Markets Index
Commodities	S&P GSCI™
U.S. Energy	S&P 500 Energy Index
Oil	West Texas Intermediate Closing Spot Price
Global Bonds	Barclays Capital Global Aggregate Bond Index
U.S. CPI-U	Consumer Price Index - All Urban Consumers
G7 CPI	Consumer Price Index - G7
Developed REITs	FTSE®/EPRA NAREIT Developed Real Estate
U.K. Real Estate	IPD U.K. Index
U.S. Real Estate	NCREIF Property Index
Private Equity	Cambridge Associates U.S. Private Equity Index®
Venture Capital	Cambridge Associates U.S. Venture Capital Index®
Infrastructure	UBS Developed Infrastructure Index

EXHIBITS

Exhibit 1

Risk Versus Return for Various Asset Classes

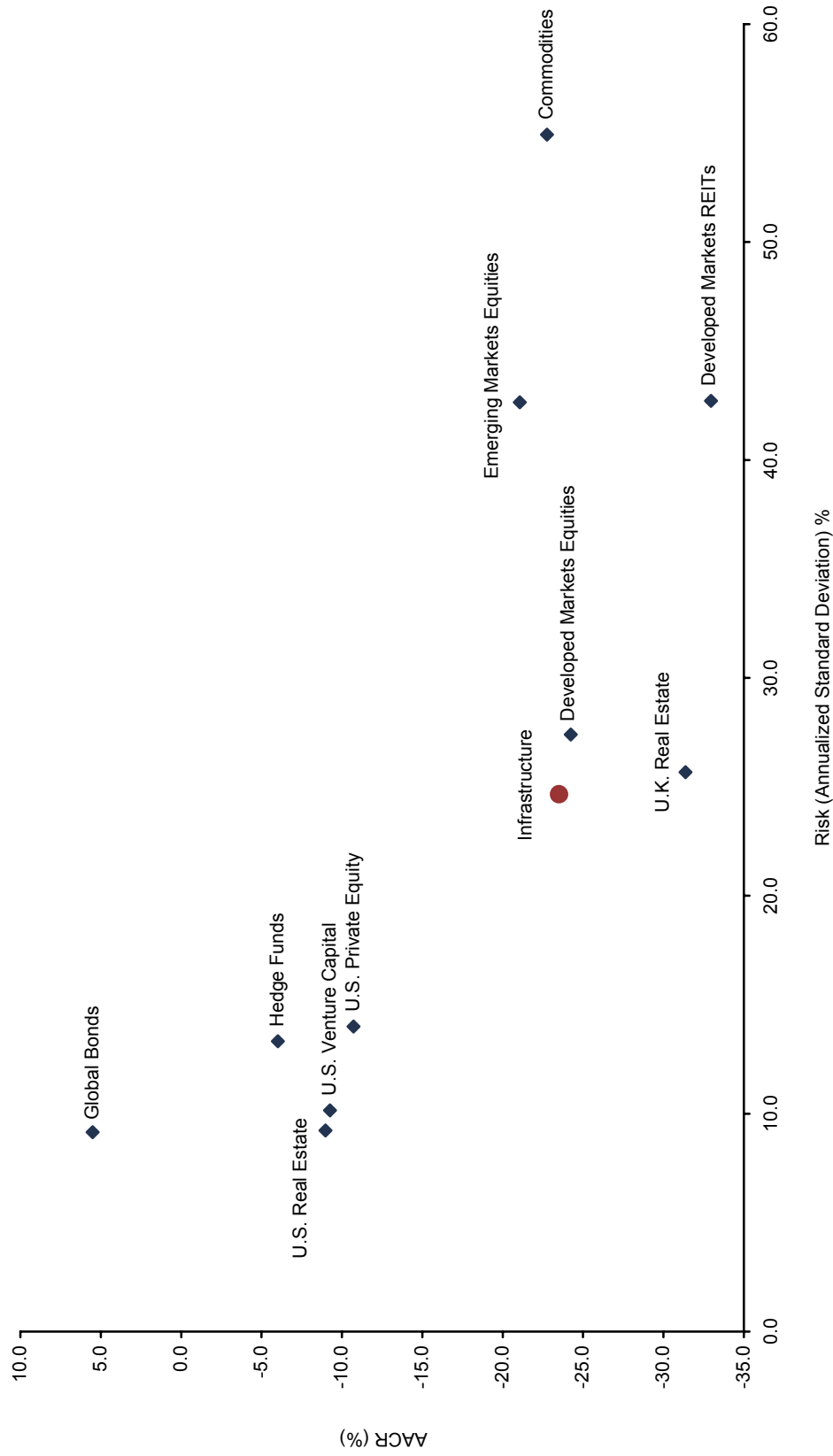
First Quarter 1991 – Fourth Quarter 2010



Sources: Barclays Capital, Bloomberg L.P., Cambridge Associates LLC, FTSE International Limited, Hedge Fund Research, Inc., Investment Property Databank Ltd, MSCI Inc., National Council of Real Estate Investment Fiduciaries, Standard & Poor's, Thomson Datastream, and UBS Global Asset Management. MSCI data provided "as is" without any express or implied warranties.

Notes: Please see Appendix for the indices used to represent each asset class. Data are quarterly. Total returns for emerging markets equities are gross of dividend taxes. Total returns for developed markets equities are net of dividend taxes. Hedge fund data are preliminary for the preceding two quarters.

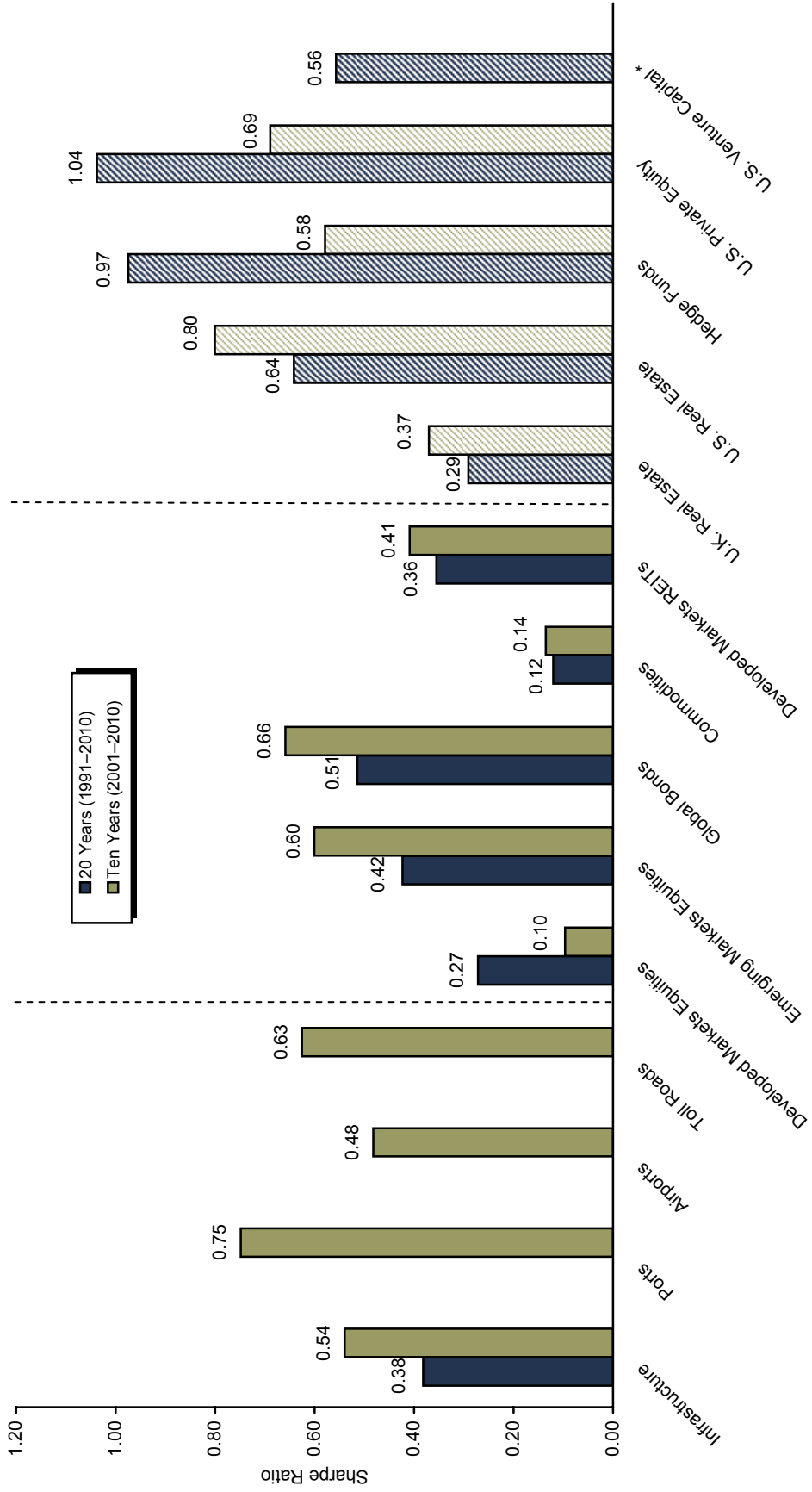
Exhibit 2
Risk Versus Return for Various Asset Classes During Recent Crisis Period
 Fourth Quarter 2007 – Second Quarter 2009



Sources: Barclays Capital, Bloomberg L.P., Cambridge Associates LLC, FTSE International Limited, Hedge Fund Research, Inc., Investment Property Databank Ltd, MSCI Inc., National Council of Real Estate Investment Fiduciaries, Standard & Poor's, Thomson Datastream, and UBS Global Asset Management. MSCI data provided "as is" without any express or implied warranties.

Notes: Please see Appendix for the indices used to represent each asset class. Data are quarterly. Total returns for emerging markets equities are gross of dividend taxes. Total returns for developed markets equities are net of dividend taxes. Hedge fund data are preliminary for the preceding two quarters.

**Exhibit 3
Sharpe Ratios: Infrastructure Versus Other Asset Classes**



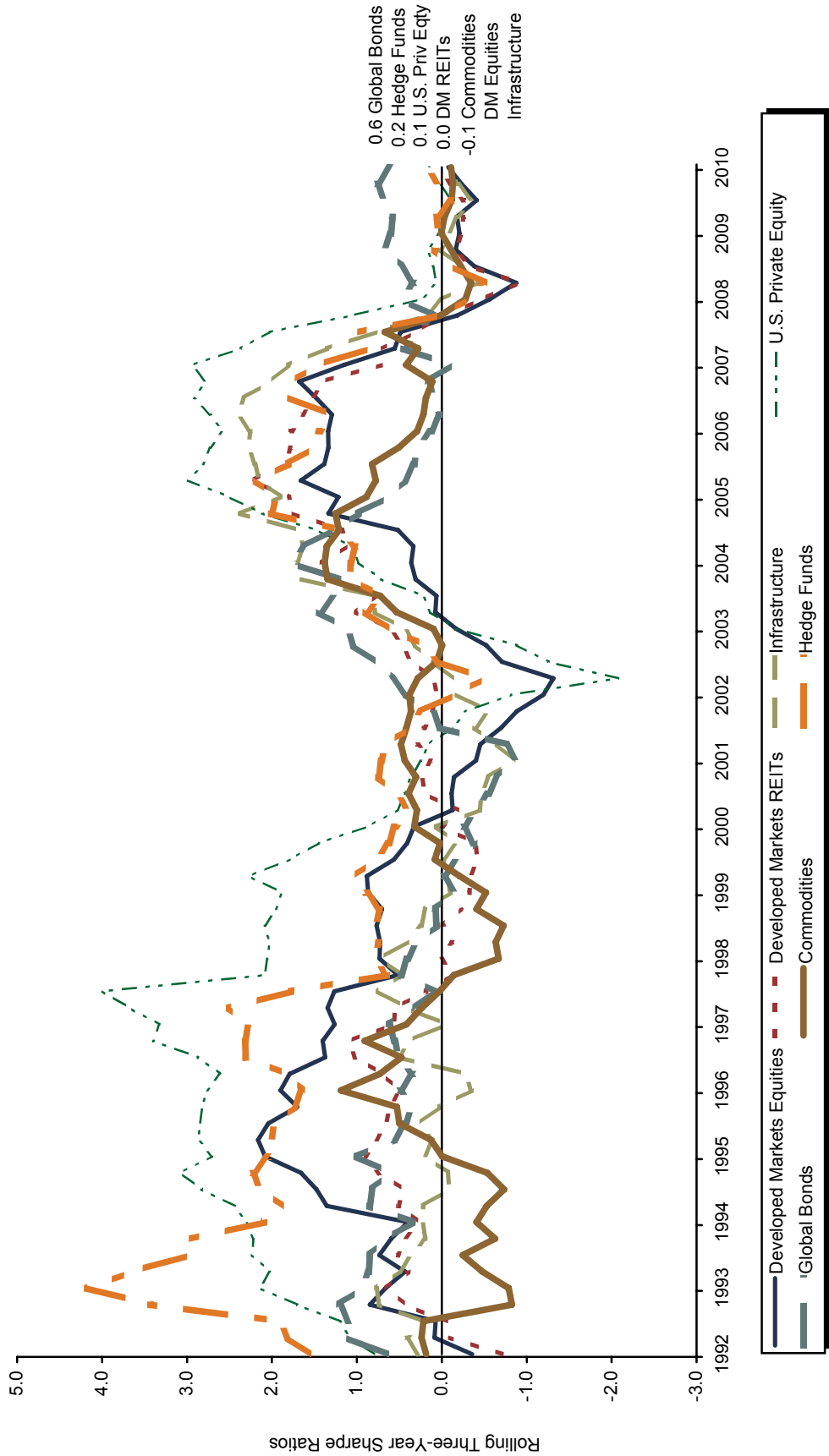
Sources: Barclays Capital, Bloomberg L.P., BofA Merrill Lynch, Cambridge Associates LLC, Federal Reserve, FTSE International Limited, Hedge Fund Research, Inc., Investment Property Databank Ltd, MSCI Inc., National Council of Real Estate Investment Fiduciaries, Standard & Poor's, Thomson Datastream, and UBS Global Asset Management. MSCI data provided "as is" without any express or implied warranties.

Notes: Data for ports, airports, and toll roads begin in January 31, 2000, and are represented by the corresponding UBS Developed Infrastructure & Utilities Index. Please see Appendix for the indices used to represent other asset classes. Shaded bars are either not fully liquid strategies (private equity, venture capital, and hedge funds) or not directly investible (U.K. and U.S. real estate). Total returns for emerging markets equities are gross of dividend taxes. Total returns for developed markets equities are net of dividend taxes. Hedge fund data are preliminary for the preceding two quarters.

* The Sharpe ratio for U.S. venture capital for the ten-year period is -0.47.

Exhibit 4
Rolling Three-Year Sharpe Ratios for Various Asset Classes

October 1, 1992 – December 31, 2010



Sources: Barclays Capital, Bloomberg L.P., BofA Merrill Lynch, Cambridge Associates LLC, Federal Reserve, FTSE International Limited, Hedge Fund Research, Inc., MSCI Inc., Standard & Poor's, Thomson Datastream, and UBS Global Asset Management. MSCI data provided "as is" without any express or implied warranties.
 Notes: Please see Appendix for the indices used to represent each asset class. Data are quarterly. Total returns for emerging markets equities are gross of dividend taxes. Total returns for developed markets equities are net of dividend taxes. Hedge fund data are preliminary for the preceding two quarters.

Exhibit 5

Correlation Matrix of Various Asset Classes and Infrastructure

Ten-Year Correlations

First Quarter 2001 – Fourth Quarter 2010

	Developed Markets	Emerging Markets	Comm	U.S. Energy	Oil	Global Bonds	U.S. CPI-U	G7 CPI	Developed Markets REITs	U.K. Real Estate	U.S. Real Estate	U.S. Private Equity	U.S. Venture Capital	Infra-structure
Developed Markets	1.00													
Emerging Markets	0.91	1.00												
Commodities	0.39	0.42	1.00											
U.S. Energy	0.77	0.73	0.70	1.00										
Oil	0.33	0.42	0.93	0.63	1.00									
Global Bonds	0.12	0.07	0.01	-0.05	-0.10	1.00								
U.S. CPI-U	0.10	0.11	0.67	0.36	0.68	-0.26	1.00							
G7 CPI	0.14	0.13	0.70	0.40	0.70	-0.26	0.98	1.00						
Dvlpd Mirkts REITs	0.85	0.79	0.36	0.55	0.33	0.28	0.16	0.18	1.00					
U.K. Real Estate	0.57	0.53	0.51	0.47	0.44	0.23	0.35	0.35	0.69	1.00				
U.S. Real Estate	0.23	0.16	0.32	0.37	0.17	-0.06	0.29	0.35	0.26	0.47	1.00			
U.S. Private Equity	0.80	0.72	0.39	0.67	0.33	-0.03	0.22	0.27	0.69	0.63	0.54	1.00		
U.S. Venture Capital	0.60	0.53	0.34	0.57	0.31	-0.12	0.17	0.23	0.45	0.30	0.38	0.81	1.00	
Infrastructure	0.89	0.78	0.34	0.67	0.27	0.33	0.07	0.10	0.86	0.61	0.27	0.75	0.53	1.00

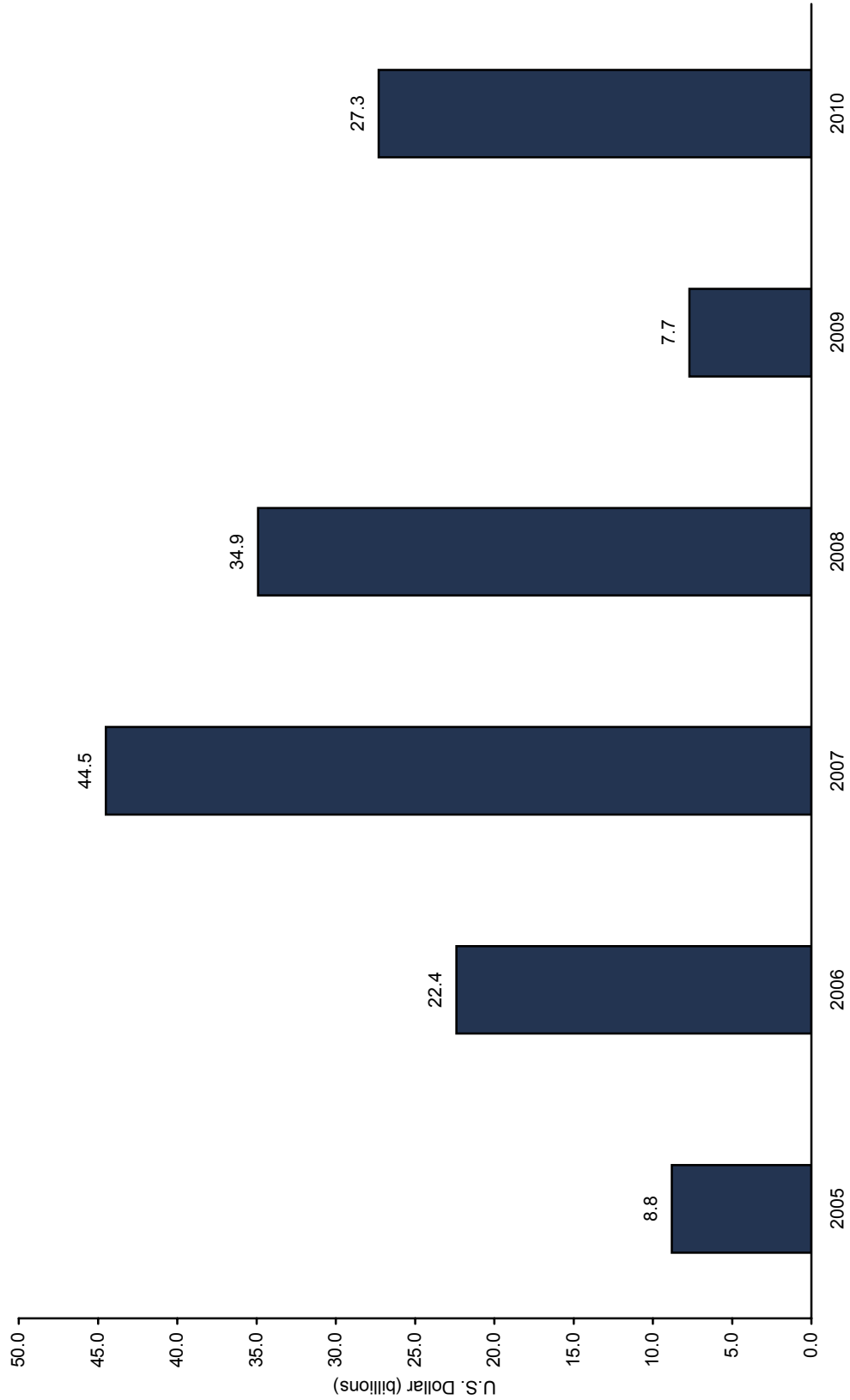
20-Year Correlations

First Quarter 1991 – Fourth Quarter 2010

	Developed Markets	Emerging Markets	Comm	U.S. Energy	Oil	Global Bonds	U.S. CPI-U	G7 CPI	Developed Markets REITs	U.K. Real Estate	U.S. Real Estate	U.S. Private Equity	U.S. Venture Capital	Infra-structure
Developed Markets	1.00													
Emerging Markets	0.71	1.00												
Commodities	0.22	0.18	1.00											
U.S. Energy	0.68	0.44	0.62	1.00										
Oil	0.12	0.11	0.84	0.48	1.00									
Global Bonds	0.09	-0.13	-0.02	0.03	-0.06	1.00								
U.S. CPI-U	0.06	0.10	0.60	0.32	0.53	-0.20	1.00							
G7 CPI	0.11	0.12	0.60	0.35	0.49	-0.16	0.96	1.00						
Dvlpd Mirkts REITs	0.74	0.66	0.27	0.54	0.16	0.21	0.14	0.15	1.00					
U.K. Real Estate	0.41	0.20	0.37	0.38	0.35	0.28	0.25	0.23	0.51	1.00				
U.S. Real Estate	0.17	-0.04	0.26	0.31	0.16	-0.10	0.22	0.19	0.15	0.38	1.00			
U.S. Private Equity	0.72	0.52	0.24	0.50	0.15	-0.12	0.15	0.17	0.47	0.39	0.37	1.00		
U.S. Venture Capital	0.43	0.33	0.18	0.23	0.14	-0.20	0.08	0.08	0.17	0.08	0.17	0.64	1.00	
Infrastructure	0.65	0.47	0.18	0.51	0.04	0.33	0.07	0.09	0.71	0.45	0.17	0.37	-0.04	1.00

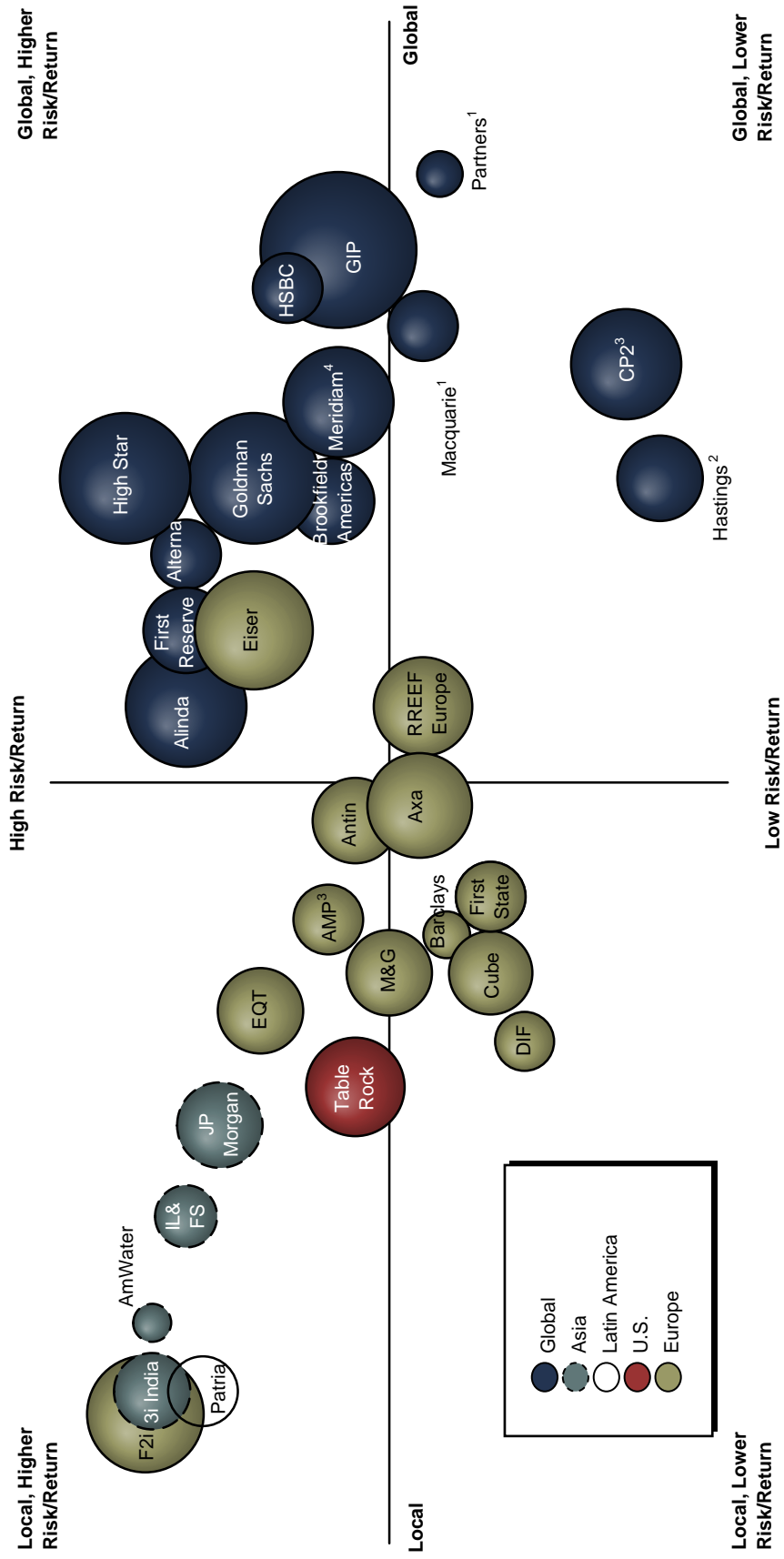
Sources: Barclays Capital, Bloomberg L.P., Cambridge Associates LLC, FTSE International Limited, Investment Property Databank Ltd, MSCI Inc., National Council of Real Estate Investment Fiduciaries, OECD, Standard & Poor's, Thomson Datastream, UBS Global Asset Management, and U.S. Department of Labor - Bureau of Labor Statistics. MSCI data provided "as is" without any express or implied warranties. Notes: Please see Appendix for the indices used to represent each asset class. Data are quarterly. Total returns for emerging markets are gross of dividend taxes. Total returns for developed markets are net of dividend taxes.

Exhibit 6
Annual Infrastructure Fund Raising
2005–10



Source: Preqin.

Exhibit 7 Infrastructure Landscape 2011



Source: Cambridge Associates LLC.

Note: Size of bubble represents fund size.

¹ Fund of funds.

² Debt fund.

³ Evergreen fund.

⁴ Meridiam includes two separate U.S.- and European-based funds.