# Alternative Investment Analyst Review™

# Editors' Letter

In this issue of the *Alternative Investment Analyst Review*, we focus on research topics that are generally under-represented in academic and practitioner literature, but are of great interest to CAIA members.

Financial risk management tends to focus on market risk. Given reasonable models, computing power, and attention to the limitations of one's assumptions, investors can generally get a fairly accurate picture of the market risk of their portfolios. In contrast, one might argue that operational risk can be much more difficult to nail down. This issue's "What a CAIA member should know" section provides an applied approach to operational risk management.

Financial theory often is based on the interests of the "average investor." However, the preferences of many investors differ significantly from the average. This can create opportunities for investors to take advantage of prices which may not be in line with their preferences. One area in which an investor may differ from the "average investor" is in their investment time horizon. Many institutional investors face a time horizon that is much longer than the "average investor." To the extent that long-horizon investments are priced based on the needs of short-horizon investors, there may be an opportunity for long-horizon investors to earn abnormal returns. Such opportunities may exist in infrastructure investments as well as other illiquid investments.

We hope that the articles featured in this issue of the *Alternative Investment Analyst Review* will provide insight into some research areas that tend to get limited exposure. As always, we encourage and appreciate your feedback and look forward to your submissions to the AIAR.

Sincerely,
Hossein Kazemi and Edward Szado
Editors, AIAR

# Call for Articles

Article submissions for future issues of *Alternative Investment Analyst Review* are welcom. Articles should be approximately 15 pages, single-spaced, and cover a topic of interest to CAIA members. Please **download the submission form** and include it with your article in an email to **AIAR@CAIA.org**.

Chosen pieces will be featured in future issues of AIAR, archived on **CAIA.org**, and promoted throughout the CAIA community.

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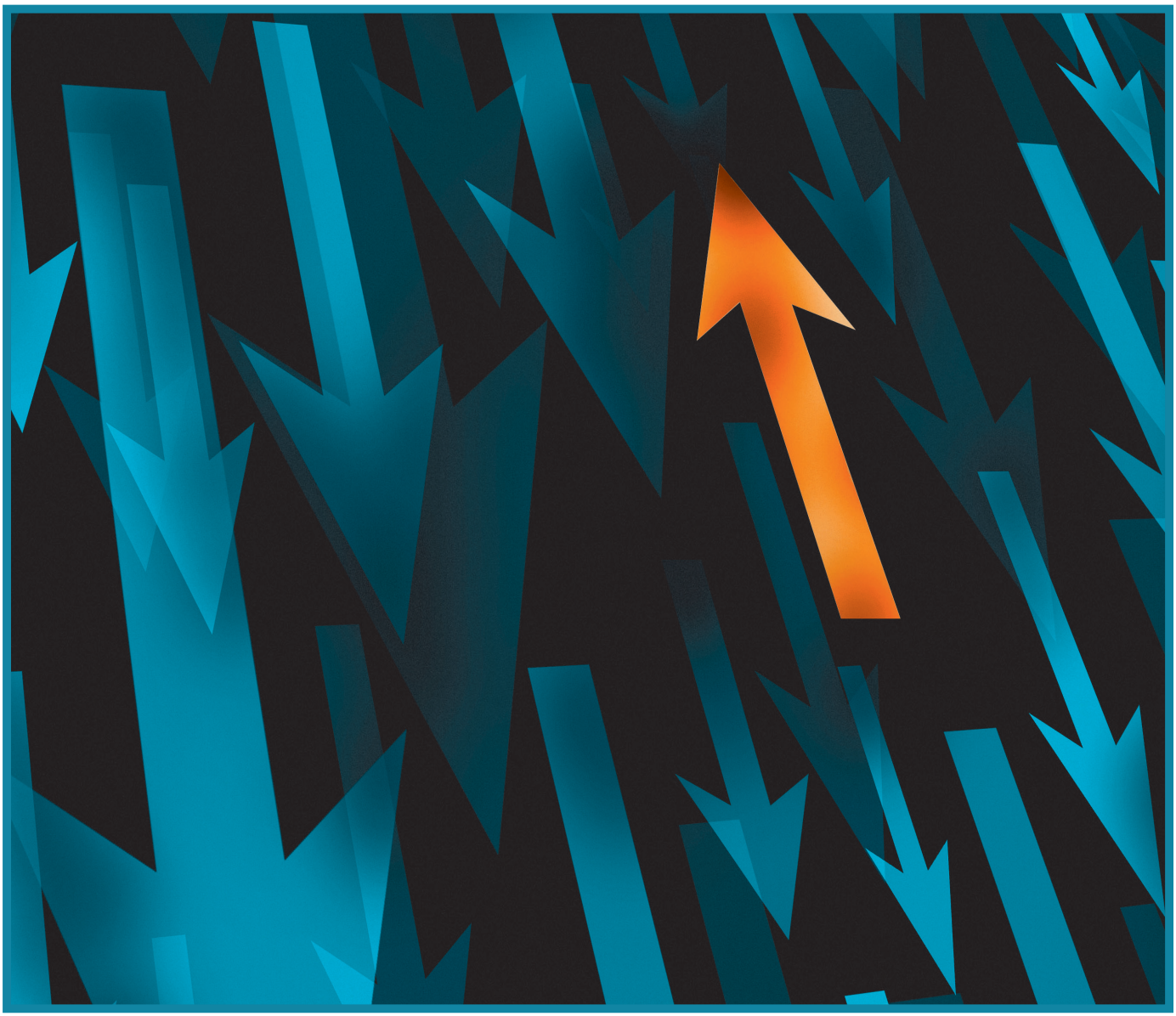

The CAIA Charter offers you immediate credibility in the complex world of alternative investing, along with access to a global network of peers. Find out how you can earn a better rate of return on your educational investment at CAIA.org.

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structures, or highly uncertain future performance), and are required to deliver a return premium because they increase the uncertainty of accessible wealth over the investment horizon. Investors who have the ability to buy and hold these securities may stand to profit by investing in these assets. This article outlines illiquidity considerations as well as the pros and cons of investing in illiquid instruments and long-dated trading strategies.

*Research Review*



*By Edward Szado*

**ABSTRACT**: While infrastructure investment has drawn a great deal of attention in recent years, the supporting literature has been limited. In this document, we provide a brief summary of some of the extant literature in the area.

# Operational Risk Management in Practice:
## Implementation, Success Factors and Pitfalls

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## 1. Introduction

According to the often-cited CapCo study (2003) about hedge fund failures, 50% of those failures were driven by operational risk. Operational risk management is increasingly important, not only for hedge funds, but also for other asset management companies, such as private equity companies, family offices or independent asset managers. Pressure from investors and regulators as well as increasing market competition require these institutions to have state-of-the-art operational risk management systems in place. In this article, we focus on operational risk management for mid-sized asset management companies that are not part of a large international banking organization and hence do not have fully developed staff departments for operational risk, compliance, or internal control. Many of these functions in mid to small size asset management organizations will be part-time activities of several people. With regard to operational risk, these mid-size asset managers face many specific challenges, including:

- They have large assets under management, but a small number of employees. The financial assets are comparable to large industrial corporations with several thousand employees.
- Due to their small size, they cannot segregate various duties.
- Increasing cost of compliance and regulatory burden reduces available resources.
- They need to provide a creative business environment for portfolio managers and structured products developers.
- Young organizations typically lack tradition of risk and control management or structured processes.

We take a practitioner's view of how an operational risk framework can be implemented as part of an enterprise-wide risk and control system in a hands-on approach. We outline how a mid-sized asset management organization can develop systematically an integrated perspective on its main risks and can set priorities on how to mitigate and control these risks.

A pragmatic instrument supporting such an integrated risk perspective is a loss-severity (impact) / loss-likelihood (frequency) matrix or risk map as illustrated in Exhibit 1. It provides an overview for all risks analyzed on the

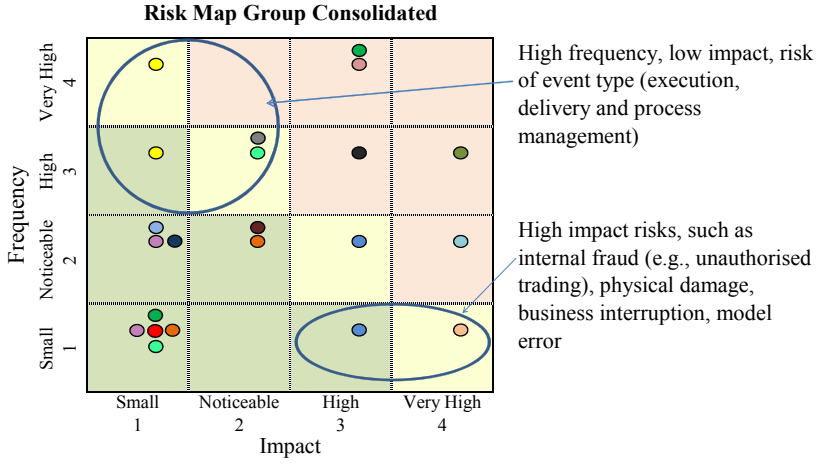



**Exhibit 1** Risk Map
Source: SME Risk Platform: RFM Dr. Imfeld, Acons Governance & Audit AG, Avanon / Thomson Reuters

company level; each bullet representing the expert assessment result of an identified risk scenario. Large risks are shown in the upper-right red zone, smaller risks in the lower left green zone. High frequency, but low-impact risks often related to process or quality issues are shown on the upper left corner, whereas rare, but catastrophic risk scenarios are plotted on the lower-right corner.

Many companies still view (operational) risk management only as a regulatory burden and a cost factor. However, practical experience shows that companies profit from operational risk management, provided that they design and practice it as a management instrument. It then helps to achieve company goals, create competitive advantages, and improve business efficiency. These companies will normally have no problem complying with regulatory requirements. However, in companies that only look for the regulatory minimum and have little interest in how to implement operational risk management, operational risk management deteriorates into a costly paper exercise. Only a true integration of the risk and control system as part of an entrepreneurial management system will contribute to the survival and long-term success of an enterprise.

How can operational risk management within an asset management company as part of an enterprise risk management framework look like? We answer this question in four parts:

- A short overview on the terms used and how risk management needs to be designed to add value.
- An illustration of key operational risks based on a generic process model for asset management activities.
- An outline of the key steps in a systematic operational risk management process illustrated for one specific risk scenario. We show: (1) how structured risk identification and documentation works, (2) how mitigation measures and controls for the risk can be implemented and tracked systematically, and (3) how continuous reporting allows follow-ups on the status of risks and action plans.
- In summary, we highlight typical success factors and pitfalls in the implementation, from the concept phase to the implementation of an IT-supported risk management process.

**2. How to Add Value with Enterprise and Operational Risk Management**

In the financial services industry, an important source of failures in risk management is the silo approach to market, credit, and operational risk. The silo mentality results in a lack of understanding of operational risk management and internal controls as an integral part of the enterprise-wide risk and control management system. Since many functions in the organization, such as asset liability management, operational risk, internal control, internal audit, security and business continuity management, and compliance are all involved in risk management activities, it is very important to set up an integrated risk and control framework based on one risk policy.

To start with, a risk policy statement should be defined as a short (1-3 pages), constitutional document, in easy to understand language. Ideally, the policy covers all types of risks at the top level with operational risk as one important category, but including market, credit and core business (strategic) risks. The policy describes the main principles for how the organization manages its risks and briefly mentions key elements of the risk management framework to be set in place. Besides the risk policy itself, the key elements of the risk management framework are the risk management process, roles and responsibility, organization, methods and instruments, IT-solution, and risk communication. Over time (and it will take years rather than months) the integrated risk management framework will encourage responsible functions in the organization to develop a common enterprise-wide understanding of risks as a basis for better business decisions. In addition, line management will be less disrupted by differing concepts, terms, or repeating workshops about ultimately the same thing, namely the risks the company has to manage.

A starting point of each risk management activity is the identification of potential risks and an assessment of their relative importance for the organization. Which risks may endanger the success of the company and the

achievement of the company goals? Only based on an integrated risk perspective, as illustrated in the risk map in Exhibit 1, the board and the management team are able to prioritize key risks and to prepare effective risk mitigation plans to keep the risks within acceptable limits of the company's risk appetite.

A value-added strategy based on an enterprise-wide risk perspective will help to:

- Prioritize and focus on key risks and risk combinations that may endanger the company's goals and mitigate them with efficient, company-wide mitigation measures and controls.
- Save costs by avoiding unnecessary hedging, insurance, security measures, or by reducing the number of unnecessary controls for risks with only negligible impact.
- Improve process quality through better understanding of risks in all processes.
- Enhance the understanding of dependencies and correlations between different operational risks, but also between operational risks on one side and market, credit or core business risks on the other side.
- Assure adequate, but realistic crisis management and business continuity measures that will allow the survival of the business in critical periods. Often simple measures can have a dramatic (positive) impact.
- Ring-fence operational risks to avoid surprises and simultaneously adding value by consciously allowing investing more risk capital for the core business and wanted market or credit risk.
- Assure compliance with regulations.

What is operational risk? We define this by describing possible risk events leading to an actual outcome(s) of a business process to differ from the expected or targeted outcome(s). These events can be due to inadequate or failed processes, people and systems, or to external facts or circumstances (see also references at the end of the article under Basel II or ORX documents).

In this context it is important to understand that operational risks are often the cause and driver of credit, market and core business or strategic risks. This means that operational risk events can have a direct or indirect impact on the value/earnings of the company or the liquidity available. For example, a direct effect of a burglary in the company building could lead to losses of stolen computer equipment. Indirect effects via market, credit or core business risks often are more severe than the direct impact if, for example, confidential data were stored on the stolen computers that subsequently are published on the internet. In rare cases, such as extreme market or credit risk volatility, one could also argue that market and credit risk may be causing unexpected operational risk events because of a breakdown of the standard processes in such a period.

Overview: Operational risks can cause direct losses or indirect losses via market, credit or core business risk.

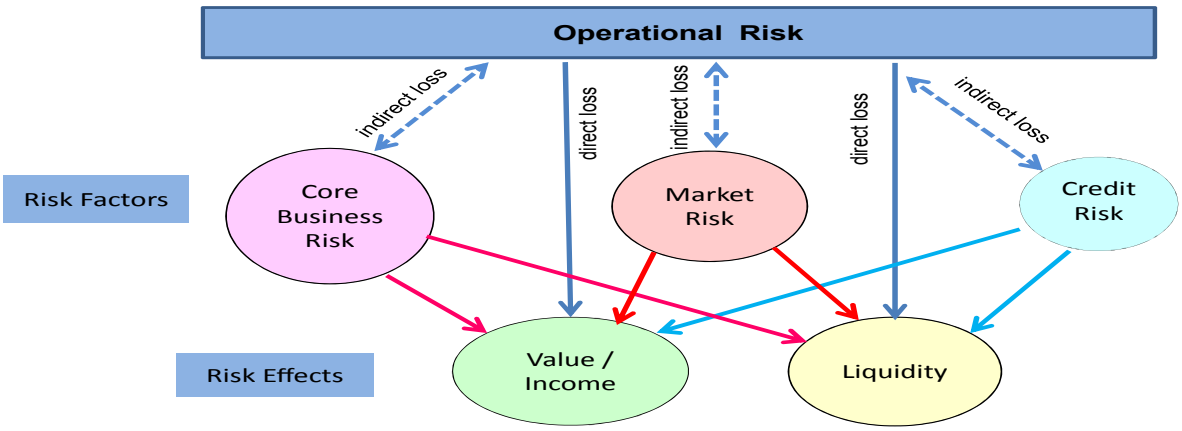



**Exhibit 2** What is Operational Risk?
Source: RFM Dr. Imfeld and W. Brammertz

Operational risk events risk scenarios: what can go wrong?:

- Changing the investment style of the fund without the approval of investors (style drift)
- Error in risk model: for example, wrong duration for a high-yield bond
- Non-consideration of credit risk from complex, badly documented structured product
- Funding liquidity: large investor(s) withdraw money, forcing shut down of the asset manager
- Data error in baseline scenario for market data
- Unauthorized trading and style breaches, breach of investment guidelines
- Material misstatement of asset values
- (Fraudulent) misrepresentation of fund performance (in particular hard-to-value assets)
- Not meeting deadline and quality requirements

**3. A process-driven approach for practical management of operational risk**

Our goal is to systematically develop a full picture of the operational risks the organization is facing. The following two conceptual elements will assure that we can cover the whole risk universe.

1. A clear risk concept and a categorization that covers all operational risks.
2. An end-to-end basic process model for the key processes in the organization.

**3.1. Risk concept and categorization**

The first important structural element in the operational risk management framework is a clear risk concept with, ideally, an enterprise-wide categorization of risks. To this end, a company-specific risk framework is beneficial. The event-type risk categorization concept based on Basel II or the ORX can provide helpful guidance as a template and first step towards a company-specific risk categorization. In Exhibit 3, the basic idea for risk categorization, based on risk events, is illustrated. Each event can have one or more causes and several impact types. Causes are often categorized as: people, process, systems, and external causes.

How could this risk categorization be applied in practice? Consider the example of unauthorized trading. History has seen several high-profile breaches of investment guidelines and limits. One of the most prominent examples in the recent past was the unauthorized trading by Jerome Kerviel, which led to a loss of EUR 4.9 billion by his employer, Société Generale, in 2008. In September 2011, UBS lost USD 2.3 billion because of unauthorized trading of one of its employees, Kweku Adoboli. This risk event is usually not frequent in occurrence, but it may have a huge impact on market or credit risk and hence it is a rare, but critical event. The risk event "unauthorized trading" is caused by people trading beyond their limits, which is possible because of insufficient controls and processes. Impacts can be, for example, unwanted market risk due to large positions, fines imposed by the regulator, and a damaged reputation because of headline risk.

The official categorizations of Basel II or ORX can provide guidance for defining company-specific operational risk categories. The categorization helps to avoid confusion about risk causes, risk events, and the impact of a risk. It also allows one to group similar risks from the same risk event category and supports a more efficient design of mitigation measures for similar risk events or risks with the same cause. Exhibit 4 gives an overview of operational risk loss events by the Basel II main risk event type categories. It shows that process failures cause the largest amount of operational losses for asset managers (53%), followed by clients, products and business practices (31%) and internal fraud (11%). The latter includes unauthorized trading.

**3.2. Process model**

The second conceptual element assuring a full picture of all risks is a basic process model. An end-to-end perspective on how different processes function together in the asset management organization and an understanding of critical process interfaces is a good starting point for systematic and successful risk identification.

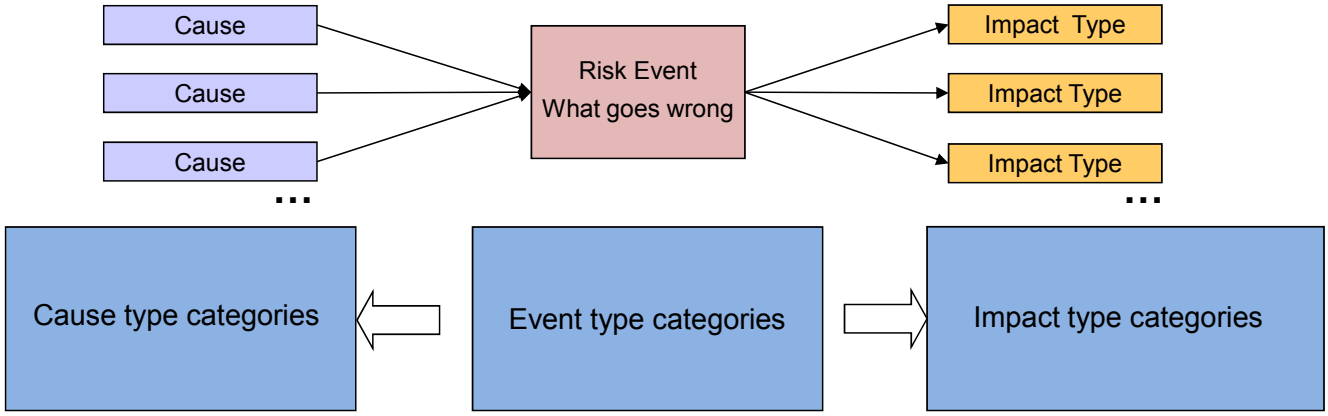



**Exhibit 3** Event / Cause / Impact risk categorization

**Exhibit 4** Distribution of annualized loss amounts by event type for asset management units of banks

| | Internal fraud | External fraud | Employment practices and workplace safety | Clients, products and business practices | Damage to physical assets | Business disruption and system failures | Execution, delivery and process management | All |
|---|---|---|---|---|---|---|---|---|
| in EUR millions | 27 | 2 | 6 | 75 | 1 | 4 | 128 | 243 |
| in % | 11% | 1% | 3% | 31% | 0% | 1% | 53% | 100% |

All identified risks are allocated to a specific process and an organizational unit in order to assure clear ownership in the line management for specific risks. Large organizations often maintain fully developed process models in a specialized process management department. For smaller- or mid-size organizations, the operational risk and control management does not require a costly process modelling infrastructure, but a generic process model with a clear end-to-end perspective that can help to systematically identify risks.

In Exhibits 5a, b, and c we illustrate an example of a generic process model for an asset management company. For illustration purposes, we list typical risk scenarios for each process and describe briefly for each one the actual risk event, the cause of the event, and possible impacts. Consider, for example, the event "unauthorized trading and style breach;" i.e., the breach of investment guidelines. The risk will mostly occur in the process related to asset and portfolio management, which belongs to the core business processes in Exhibit 5b.

Based on the two conceptual elements, risk categorization and process model, we make sure to cover the relevant universe of risks in the organization. A matrix similar to Exhibit 6 can be used to assign identified risks to one risk category and one process. This matrix is typically the result of a risk workshop, where internal and external experts give their assessments about various operational risks of the company.

**4. Systematic Operational Risk Process**

Based on the example, fraudulent breach of investment guidelines and investment limits, from our risk list in Exhibit 5b, we illustrate the systematic risk management process from risk identification and/or risk reassessment to mitigation, controlling, reporting, and to defining a risk strategy in line with the risk policy. Exhibit 7 provides structured documentation for identified risks, mitigation measures, and controls. The illustrations are based on anonymized examples recorded on an IT-Operational Risk platform for SME clients. The sample reports show how to systematically gather structured information on risks, keep up with risk mitigation measures, and assure that necessary controls are known and performed as expected. The structured information allows straightforward risk analysis and aggregation, simple documentation and reporting on risks, action plans, and the status level of the control system at any management level.

Assume that our company has defined the risk management framework and outlined it in the risk policy. The operational risk management cycle starts with the first implementation step: creating the risk inventory by risk identification and risk assessment.

**Exhibit 5a** Operational Risk Events by Management Processes

| Management Processes | | | | |
|---|---|---|---|---|
| Process Name 1st Level | Process Name 2nd Level | Operational risk events risk scenarios: what can go wrong | Impact | Cause |
| Strategy and business Planning | Strategy process | Changing the investment style of the fund without the approval of investors(style drift) | Drift to area of non-core expertise. Investors redeeming, additional market and credit risk | People, guidelines |
| Risk Management Internal Control | ORM, Internal Control, Compliance | No centralized database or only fragmented data about operational risk available | Recurring operational risk incidents causing losses and binding resources | Inadequate systems to deal with operational risk |
| | Market Risk | Error in risk model: for example, wrong duration for a high yield bond | Portfolio overhedged, unwanted P/L | People, processes, systems |
| | | System breakdown | Portfolio manager is left without reliable sensitivities ("flying blind") | System, datafeeds |
| | Credit / Counterparty Risk | Non-consideration of credit risk from complex, badly documented structured product | Wrong estimate of credit risk exposure, higher credit risk than realized | Bad maintenance of Excel based documentation, data not in standard system |
| | | Wrong calculation of credit risk exposure, exceeding credit risk limits on consolidated group basis | Wrong estimate of credit risk exposure, higher credit risk than realized | Old, not up-to-date, counterparty data for group structures of counterparties |
| | | Access to liquidity impeded, forced liquidation | Margin requirements increased due to market volatility, credit lines frozen, liquidity management not prepared | Prime broker going bankrupt, market volatility |
| | Liquidity Risk | Asset liquidity: for example, low market liquidity not adequately reflected in risk tools, thereby underestimating value at risk | Risk figures underestimating actual risk | Inadequate systems to reflect liquidity risk, people |
| | | Funding liquidity: large investor(s) withdraw money, forcing shut down of the asset manager if investor base is not diversified | Fund being forced to liquidate because of redemptions | Narrow investor base |
| | Risk Integration | Risk figures of different departments and risk categories cannot be aggregated | Risk situation distorted, may lead to wrong business decisions | Different measurement methods in place, time delays and measurement asynchronies |

Source: RFM Dr. Imfeld, Rodex Risk Advisers

**Exhibit 5b** Operational Risk Events by Core Business Processes

| Core Business Processes | | | | |
|---|---|---|---|---|
| Process Name 1st Level | Process Name 2nd Level | Operational risk events risk scenarios: what can go wrong | Impact | Cause |
| Product Development | Product Development | Wrong documentation of risk exposure in the product | Liability law suit for faulty consulting of clients | Process, people |
| Sales | Sales | Inappropriate sale and consulting related to complex products for non-institutional clients | Liability law suit for faulty consulting of clients | Process, people: lack of training, badly designed incentive system for sales force |
| Asset Management process | Strategic Asset Allocation process | Data error in base line scenario for market data | Portfolio implementation too far away from SAA benchmark | Manual interface based on Excel sheets, no auditable data versions |
| | Portfolio Management | Back log of (derivatives) trades | Market risk | System, people, processes, and technology |
| | | Unauthorized trading and style breaches, breach of investment guidelines | Market risk, sanctions (fine) as a result of non-compliance, damaged reputation | People, insufficient controls, and processes |

**Exhibit 5c** Operational Risk Events by Support Processes

| Support Processes | | | | |
|---|---|---|---|---|
| Process Name 1st Level | Process Name 2nd Level | Operational risk events risk scenarios: what can go wrong | Impact | Cause |
| Treasury | Liquidity Management, Hedging etc. | Unwanted market risk exposure inadequately hedged (for example, wrong FX or interest rate exposures due to complex spreadsheets rather than robust risk tools) | Unintentional P/L impact, unexpected margin calls and cash impact | System, people, process |
| Finance / Back office | Accounting, Fund Administration and Documentation (Transaction capture, P&L/NAV) | Wrong booking of subscriptions / redemptions (for example, subscriptions erroneously added to NAV when calculating performance) | Leading to wrong NAV and over-/ underestimating the performance<br>Material performance restatements can lead to investors losing confidence in processes | People, processes |
| | | Data processing error. An investor in a PE fund of funds, NAV and unfunded commitments need to be taken from capital account statements, put into the PE FoF's systems, then transferred to the investor's systems in a manual process | Wrong exposure and P/L figures | People, processes, systems |
| | Financial Closing | Material misstatement of asset values | Restatement, loss of reputation, loss of future business | Delay in data delivery, inadequate systems |
| | Management Reporting | Delayed and incomplete reporting | Wrong assumptions for business decisions, market risk | Inappropriate systems |
| | Reporting to Investors | Fraudulent misrepresentation of fund performance (in particular hard-to-value assets) | Wrong exposure and P/L figures | People, wrong incentive structure |
| | Regulatory Reporting | Not meeting deadline and quality requirements | Fines imposed by regulator | People, processes, systems |
| HR | Recruiting | Inadequate resources for fund strategies | Underperformance | People |
| | HR Salary | Wrong data access rights to salary system attributed to employees | Sanction, law suit due to non-compliance with privacy laws | People, system |
| Procurement | Outsourcing, SLA third parties | Failure to supply of key outsourcing provider, not meeting SLA requirements | Market risk, loss of business | External event, catastrophic event |
| IT | IT | Project delay for proprietary software development as a base for new products | Delay of market launch of new product | Process: unrealistic planning<br>People: lack of resources |

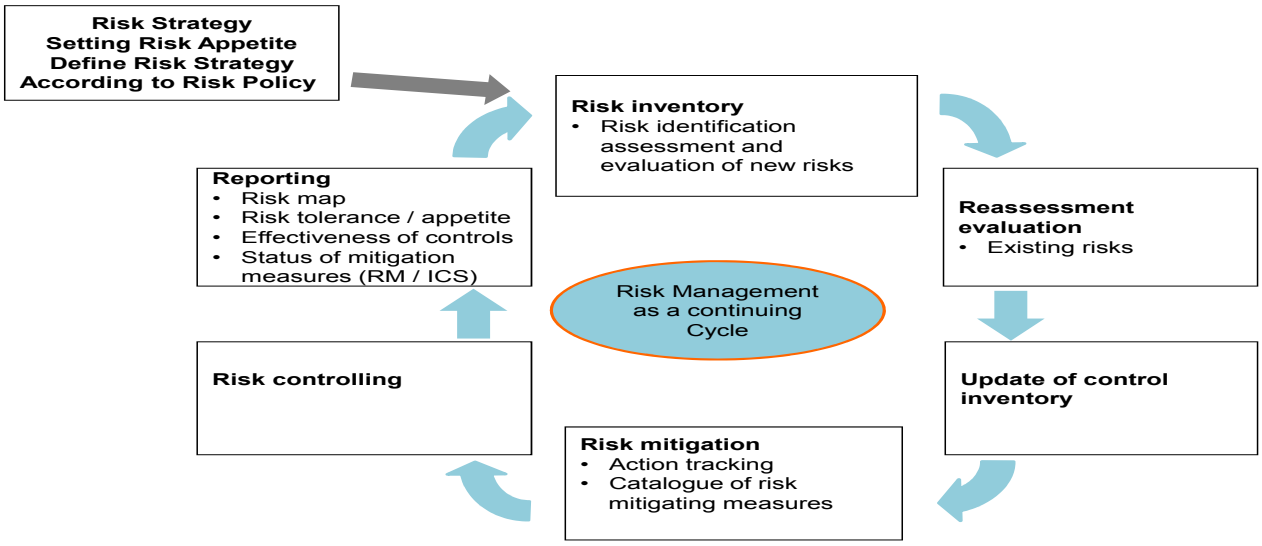
Source: RFM Dr. Imfeld, Rodex Risk Advisers

**Exhibit 6** Matrix for identifying risks by processes and event type category

| Event Type Categories | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Internal Fraud | External Fraud | Employment Practices & Workplace Safety | Clients, Products & Business Practices | Damage to Physical Assets | Business Disruption & System Failures | Execution, Delivery & Process Management |
| Process Name 1st Level | | | | | | | |
| Management processes | | | | | | | |
| Strategy process and business planning | | | | x | | | |
| Risk Management, Internal Control | x | | | x | | x | x |
| Core Business Processes | | | | | | | |
| Product Development | | | | | | | |
| Sales | | x | | | x | | |
| Asset Management process | | | | | | | |
| Support Processes | | | | | | | |
| Treasury | | | | | | x | x |
| Finance / Back office | | | x | | | | |
| HR | | | x | | | | |
| Procurement | | | | | | x | x |
| IT | | | | | | | x |

Source: RFM Dr. Imfeld, Rodex Risk Advisers

**Exhibit 7** Iterative risk management process




Source: RFM Dr. Imfeld

**Step 1: Risk Identification**

A. Risk Assessment

Typically a workshop including key experts from the different processes is used to identify and collect an initial inventory of relevant operational risk scenarios. The better the risk assessment and the risk information gathered is structured, the more successful will be the future continuing reassessment process (Exhibit 8).

In our example, the risk scenario referred to as "fraudulent breach of investment guidelines and investment limits," was identified during a risk workshop as part of the process no. 4.1, "asset management, portfolio management" (see Exhibit 8). A by-product of the risk identification step is that the people in the organization are forced to think about what can happen, who or what might be the cause for the risks, and how the risks can be mitigated and addressed. In Exhibit 8 we illustrate a minimum of structured information that is collected for each risk scenario in the risk inventory database.

Additional important points in this table are that the risk is made visible to people in the organization, thereby raising awareness, naming an owner for the risk and clearly assigning responsibilities.

In order to quantify the potential loss in monetary terms (e.g., in USD or EUR), additional information about loss frequency (low, noticeable, high, very high) and loss severity (small, noticeable, critical, catastrophic) is collected (see Exhibit 9). The assessment and quantification are based on expert discussions. Good results for risk evaluation are achieved if unit heads and risk or process experts agree on the valuation of the risk.

The collection of the individual risk scenarios is the starting point of a risk inventory database. It includes also reference links to planned or implemented risk mitigating measures or implemented key controls that help to mitigate the risk (see Exhibit 9). A key control for our example could be to introduce a four-eyes principle on transactions exceeding EUR 1 million (see Step 2: Risk Mitigation and Control System).

A mid-size asset manager may start its risk inventory from the initial risk assessment with three to five risks per process, adding up to 30-50 risk scenarios in the database. Not all of those risks are key risks, but experience shows that it is advantageous not to confine the assessment to the top 10 risks only. If 30-50 risks are reassessed systematically in a certain frequency (e.g., annually), chances are high for identifying new risk trends. Hence it is recommended to define the top ten list out of 30-50 main risks and keep the other risk scenarios documented in a watch list.

**Exhibit 8** Structured risk assessment, information stored in the risk inventory

| **Risk Scenario** | |
|---|---|
| Reference Id | ORSA-20110704-00001 |
| Short Description / Name | Fraudulent exceeding of investment guidelines and investment limits |
| Description incl. Examples | Portfolio manager engages on purpose in transactions that exceed trading limits and are not in line with investment guidelines. Systematic (intraday) trading outside of limits. |
| Event Type Category | 3. Operational risks / 3.6 fraud / theft |
| Cause Type | Internal causes / people<br>Internal causes / processes and organization |
| Impact Types | Accounting, profit and loss and balance sheet<br>Financial impact on assets<br>Reputation<br>Cash flow, liquidity |
| Organizational Unit | / 99.9 financial institution / company X AM |
| Process | 4. asset management / 4.1 portfolio management |
| Risk Owner | Head portfolio management |
| Contact Person Tool | Test user |
| Internet Link (http://...) | -- |
| Attachments | 0 |
| Status | TMP: temporary |
| Entry Created At | 2011.07.04 |

Source: SME Risk Platform by RFM Dr. Imfeld, Acons Governance and Audit AG, Avanon / Thomsom Reuters

**Exhibit 9** Frequency / severity assessment

| **Risk Scenario Assessment in terms of impact and frequency** | | | | |
|---|---|---|---|---|
| Assess the frequency and the Impact/Severity of the risk scenario | | | | |
| Frequency: | X low | o noticeable | o high | o very high |
| Impact / Severity: | o small | o noticeable | Xcritical | o catastrophic |

Source: SME Risk Platform by RFM Dr. Imfeld, Acons Governance and Audit AG, Avanon / Thomsom Reuters

B. Other Risk Identification Instruments:

Risk scenario identification is usually the first and simplest method to implement for mid-size asset managers. At a later and more advanced stage, the following two methods could be developed:

1. Loss data collection on actual loss events: in contrast to potential risk scenarios, we identify operational risks also based on experience by systematically collecting information on past actual loss events. It is useful to learn from one's own or other organizations' historical risks that materialized in an actual loss or resulted in a near miss. These methods are widely used in airlines or hospitals, and to some degree in large banks. Typical loss event types that are tracked are:
   - Insured loss events: liability cases with long-term impact for many years, property losses, theft, and business interruptions with complex multi-dimensional impact.
   - Uninsured loss events such as: customer complaints, internal fraud cases, major IT-break downs, data entry errors in transactions with market or credit risk impact, loss of legal documents, and law suits with contingent liabilities where actual reserves are marked on the balance sheet.

Industry-specific loss statistics and loss databases for operational risks are available from a variety of sources including the Bank for International Settlements, from whose reports the data in Exhibit 4 was taken. Operational Risk Data eXchange (ORX) collects loss events by business segments of large banks. Algorithmics offers a database for financial institutions, covering banks, insurance companies, as well as hedge funds.

2. Key risk indicators as an early warning system: key risk indicators can be another useful method to identify, measure and model operational risks. Similar to early warning signs for key performance indicators or for

market, credit or core business risk we look for leading indicators that may serve as early warning signs for operational risks. Typical applications would be:

- IT-related performance indicators for IT-system operations: system errors in transactions,
- Continuous observation of adherence to implemented trading limits,
- Tracking of customer complaints by frequency and topic,
- Number of pending law suits with contingent liabilities,
- Employee turnover by department,
- Indicators for high market volatility and turbulent periods where operational errors may result in more extreme effects on market and credit risk.

Using key risk indicators as a method for risk identification is usually the case in organizations that have developed a few years of experience with risk assessments and systematic loss data collection. Based on the latter, some key risks might have been identified for which an early warning risk indicator system then can be developed. Assuming a critical risk with fraudulent breach of risk limits was identified based on assessments, key risk indicators analyzing intraday limit breaches for trading portfolios could be introduced.

**Step 2: Risk Mitigation and Control System**

In order to adequately assess the impact of an identified risk on the organization's business, one has to consider existing controls and mitigating measures that already reduce the likelihood and/or severity of the risk scenario identified. A risk mitigating measure, in contrast to a control, is usually a one-time measure for which an implementation date and a responsible person is defined. In the risk assessment for the example above we have attached summary information on mitigating measures and key controls that are in place and systematically tracked (see Exhibits 10 and 11). How can risk mitigation and controls be integrated in an operational risk framework? Below we illustrate the structured information that is systematically documented and tracked for risk mitigating activities. A simple workflow support in the IT-solution allows differentiating for each object (risk scenario, mitigation measure, control, loss event) three different statuses and helps to keep track of the implementation steps. Such a work flow support results in improved transparency, efficiency and data integrity compared to the widespread Excel/Word solutions that typically create problems with regard to user access rights, data integrity and confidentiality.

In the simplest workflow we differentiate between:

- a status "Temporary:" data entry on risks, actions or controls not yet finalized,
- "Active:" the documentation is approved and actions can be implemented and risks can be reported, and
- "Completed" or "ready to archive:" action plans are implemented or risks are being reassessed, therefore the information is kept as an archived data entry.

In our example, the risk mitigation techniques to be introduced are a strict screening process of all individuals who work in portfolio management. The head of personnel is responsible for this process (see Exhibit 10).

In addition to one-time mitigating measures, the internal control system will support risk mitigation in systematically reducing identified risks to an acceptable level. For our risk example, a four-eyes principle is to be implemented for transactions above EUR 1 million as a mitigation technique. The control is, however, not yet effective and needs to be improved, as can be seen in Exhibit 11 from the entries in the rows "status" and "control assessment." The risk controller is supposed to follow up on this control and assure a proper implementation. The systematic action and control tracking instrument will allow keeping track of pending

**Exhibit 10** Risk Mitigation

| **Mitigation measure** | |
|---|---|
| Reference Id | ORAP-20110704-00001 |
| Type | Action Plan |
| Type of mitigation measure | Risk Management / Strategy |
| Short Description / Name | Personnel policy and four-eyes principle for transactions with size > 1 million. |
| Description of Measures | Introduce strict assessment of individuals to work in portfolio management. Annual Reassessment and documentation as a key control. Introduction of a four-eyes principle on transactions with size above EUR 1 million. Document as a key control. |
| Responsible Organizational Unit | / Financial Inst./ Company X AM/ |
| Process Allocation | Financial Institution / 4. Asset Mgmt./ |
| Implementation Target Date | 2011.12.08 |
| Priority | High |
| Cost of measure (in local currency) optional | 10,000.00 |
| Responsible for Measure | Head of Personnel |
| Contact Person Tool | Nutzer 2, Test-Demo (Test-Demo) |
| Status | TEMP: Temporary |
| Internet Link (http://...) | -- |
| Attachments | 0 |

Source: SME Risk Platform by RFM Dr. Imfeld, Acons Governance&Audit AG, Avanon / Thomson Reuters

**Exhibit 11** Internal control

| **Internal Control** | |
|---|---|
| Reference Id | ORAP-20110704-00003 |
| Type | Internal Control System, Financial Reporting Control/Operations Control |
| Short Description / Name | Four-eyes principle on PM transaction with size exceeding EUR 1 ml. |
| Description of Control | Double signature required for transactions in PM exceeding EUR 1 ml. 2nd signature required from employees of same or higher hierarchical level. |
| Responsible Organizational Unit | / Financial Inst./ Company X AM/ |
| Risk Description | Fraudulent transaction outside of investment guidelines or investment limits. |
| Relevance of Control | Key Control |
| Process Allocation | / 4. Asset Mgmt. / 4.1 Portfolio Managemnet |
| Control Frequency | Transactional |
| Control Automation | Manual |
| IT-Systems | -- |
| Proof of Control / Evidence | |
| Control Assessment | To be improved |
| Responsible for Control | Head of Asset Management |
| Contact Person Tool | B-Cooper |
| Status | TEMP: Temporary |
| Internet Link (http://...)Attachements | -- |

Source: SME Risk Platform by RFM Dr. Imfeld, Acons Governance&Audit AG, Avanon / Thomson Reuters

optimizations. For example, once per month the responsible person receives an email listing of all "Temp" items.

**Step 3: Risk Controlling and Reporting**

The goal of the risk management process is to keep identified risks in line with the risk policy and risk strategy approved by the board of directors and executive team. The risk and control function assures that existing controls are actually performed and newly approved risk mitigating measures are implemented as planned.

How can the information about operational risks be processed, reported, and followed in a structured way? An integrated risk and control overview can help keep an up to date perspective and allow timely reporting on the status of risks, mitigation measures, and controls. The dashboard function shown in Exhibit 12 gives an idea of how the risk and control function can make use of the structured information on risk scenarios, controls, and mitigation measures. Relevant information about this is stored in a database. A simple workflow support allows keeping track of data versions of actual current and archived data.

The upper part of the dashboard overview (see Exhibits 12a, b, c, d) shows all identified operational risks for the asset manager. For illustration purposes, we show only four different risks. A short description of each risk is displayed, together with the risk owner and the status (temporary, valid and archived). The risk map (Exhibit 12a) gives a quick assessment along the two dimensions; loss frequency and loss impact. Our example risk, "fraudulent breach of investment guidelines and investment limits," shows up in the risk map as the yellow point (i.e., noticeable frequency with very high impact). In the lower part of the dashboard an overview (see Exhibits 12d and c) on the status of mitigation measures and the implementation of controls is given.

The dashboard summary gives an up to date picture on the overall risk situation of the company and supports managers in the actual management of the identified risks. The more developed the risk management approach, the better integrated the risk dashboard is in the overall management information system and business planning.

**Step 4: Risk strategy, integration with market and credit risk**

The basic steps of the risk management process are performed for our example risk "fraudulent breach of guideline/limits." The risk is identified and an action plan and a control are put in place. But is it efficient to manage each risk individually? A practical risk concept allows for aggregation by risk categories and for consolidation across business units. In an initial operational risk concept, simple risk aggregation and consolidation methods can be introduced. For example, relatively simple methods can be introduced to allow grouping of risks by categories to look for worst case risk scenarios, consolidating risks across business units, and evaluating dependencies, correlation, or diversification potential between risks. This is an important step towards an integrated risk perspective. In an early stage of risk management for mid-size asset managers it will not be necessary to engage in complex quantitative measurement such as aggregated loss distribution estimation based on Monte Carlo simulations or risk capital allocation exercises. But it will be worthwhile to evaluate some key "what-if" operational risk scenarios and their impact on market and credit risk in the form of stress scenarios for the integrated risk evaluation of the organization.

The risk manager is able to produce risk reports according to the need of any type of management level based on the structured risk information gathered and the integrated perspective on all relevant risks, mitigation measures, and implemented controls. A key function of an integrated risk report is to allow management to understand the whole risk landscape and to set priorities when answering the following questions:

- Which risks need further mitigation and a prioritized action plan with approved budget for implementation since they might endanger specific company goals?
- Which risks can be accepted without further mitigation?
- Where can the company save costs by giving up historically established mitigation measures or controls since the risks are not really threatening company goals? This will allow it to save costs in insurance, hedging, and unnecessary security measures, or to save time by giving up unnecessary control activities.
- Which risks diversify within the organization? Often risks seem important from one department's point of view, but for the organization as a whole the risk is diversified and acceptable.

**Exhibit 12** Dashboard Overiew

**Exhibit 12a** Risk Map

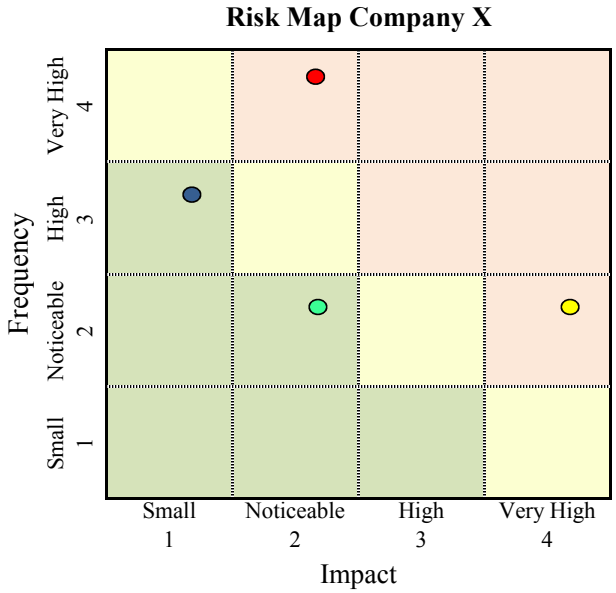



**Exhibit 12b** Risk by Process

| All Risks by Process | | |
|---|---|---|
| **Short Description / Name** | **Risk Owner** | **Status** |
| Wrong data due to manual interface based on Excel spreadsheets | Mister M | VAL:Valid |
| Wrong data due to missing data control within fund management outsourcing partners | Asset Manager | VAL:Valid |
| Errors in counterparty analysis for creadit derivative transactions | -- | VAL:Valid |
| Fraudulant breach or exceeding of investment guidelines and investment limits | Head Portfolio Management | VAL:Valid |

**Exhibit 12c** Overview Control Tasks

| Overview Control Tasks | | |
|---|---|---|
| Name | Contact Person Tool | Status |
| Sign-off Compliance Statement<br>Results: 1 - 1/1 | User 2, Test-Demo (Test-Demo) | COMP: Completed |

**Exhibit 12d** Overview Action Plans

| Overview Action Plans | | | |
|---|---|---|---|
| Short Description / Name | Target Date | Responsible for Measure | Status |
| Inroduce process for systematic data review and comparison with outsourcing data provider | 2011.04.01 | Asset Manager | TEMP: Temporary |
| Access to outsourcers control system and audit report on operational risk | 2011.06.01 | Compliance Officer | TEMP: Temporary |
| Inroduce strict four-eyes principle for transactions with size>2 Mio. USD | 2011.12.08 | Head of Personnel | TEMP: Temporary |

- Which risks or risk combinations need further analysis and investigation, or the development of additional risk evaluation tools like an early warning system, detailed scenario modelling, and stress testing or systematic loss tracking?
- Which risks have to be accepted since no further mitigation is possible if the company is staying in that business? How should the company communicate to stakeholders about these types of risks? What kind of contingency and business continuity plan has to be prepared for actual incident management if these risk

events materialize?

Working through these steps will help to create value based on a systematic risk management framework and move risk management away from a pure cost center to actual value generation by enabling the company to achieve its goals in the core business strategy.

**5. Success factors and pitfalls**

In this final section we highlight some success factors and pitfalls that companies experience when implementing operational risk frameworks.

1. A key element for success is to start operational risk management within a well-defined framework. Main elements of such a framework are: a clear risk concept (possibly combining risks and chances), a risk policy, the risk management process, roles and responsibility, organization, methods and instruments, IT-solution, and risk communication.
2. The risk policy should be defined in the beginning as a short (1-3 pages), constitutional document in easy to understand language. It describes the main principles of how the organization manages its risks and briefly mentions key elements of the framework to be set in place. Ideally, the policy covers all types of risks at the top level. The risk policy should be approved by the board. Many companies suffer from inconsistent policies for market risk, credit risk, operational risk, internal control, information security, etc. A consistent enterprise-wide approach can save a lot of resources at the level of line managers, who finally have to manage risks on a daily basis.
3. Ideally derive the goals for risk management from the company strategy. Align interest and incentives of managers to clearly defined goals in the risk management process. Include goals for risk management steps into the individual manager's objectives and assure its relevance for a bonus.
4. Set up a systematic risk management process with clearly defined interfaces to strategy, planning, and budgeting processes. It is too easy to agree on risk mitigation as long as you do not have to pay for it.
5. Define clear risk responsibility (commercial and legal risk responsibility) with the line management and process ownership for the risk management function. Small to medium size organizations who cannot afford a full time risk manager may consider outsourcing the ownership for the risk management process, but not the actual risk responsibility.
6. Define a maturity concept for the implementation and further development of risk management and its key instruments to be used: start small and simple, but define a clear road map in which direction the organization's risk management should go in the mid-term future, for example, the next five years.
7. Combine qualitative and quantitative risk evaluation methods and avoid too complex quantification exercises in the beginning. Try to generate an enterprise-wide perspective on all risk categories with integration of operational risk scenarios into the market and credit risk analysis.
8. Be aware that enterprise-wide risk management is not just a one-time exercise, but a continuous improvement process that will also require change management, adjustments to the IT-landscape, data-warehousing, etc. This may cost money on one side, but also assures that risk management moves from a cost center perspective to a value-adding management instrument.
9. Include outsourced processes into your risk analysis. Whether the process is an in-house process or an outsourced process (e.g., support processes in HR, IT, Finance) is of less importance than whether the risk impact of employee errors or failures in processes, or systems falls upon the organization's balance sheet. Therefore, a systematic risk management approach will also include outsourcing providers into the risk analysis and the risk mitigation action plan.
10. For the IT-support in the risk management process one should test risk management concepts first on

standard office tools (for example, Excel). Once the concept has been proven in a pilot case, it is better to move the daily operations to an efficient IT-solution with a database, simple workflow support, complete and auditable data history and a granular role and user rights concept. The solution should also allow growing your maturity concept for the risk management, since it may take five years for a full rollout of your concept. Mid to small size organizations may also consider an outsourced IT-solution combined with content related support on risk management.

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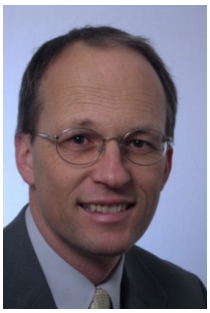
## Author Bios



Since 2002 **Dr. Daniel Imfeld** has served as an independent adviser and project manager in enterprise-wide and operational risk and control management. He is consultant to financial services companies (insurance, banks) and non-financial corporate clients (Energy, Telecom, Technology, Hospitals, Pharma, Administrations). Daniel Imfeld specializes in risk strategy and corporate finance, implementing enterprise-wide risk management from strategy to IT-supported processes, risk management organization and process, risk and financial modelling, DFA, Solvency II, developing innovative risk solutions. In the German-speaking markets Dr. Imfeld is leading the consulting efforts for insurance and industrial clients of the Avanon AG/ COMIT AG partnership. Dr. Imfeld has managed several consulting and implementation projects related to Avanon and IRIS/FRSGlobal software solutions for enterprise-wide and operational risk management. (contact: daniel.imfeld@rfm-imfeld.ch, 0041 (0)41 761 18 92)

Since June 2010 Dr. **Claus Huber**, CEFA, CFA, FRM, has been running Rodex Risk Advisers, a risk management consultancy. A few of the topics covered are tail risk insurance, inflation and deflation protection, and market and operational risk. The Rodex Purchasing Power Protection Indices, an investment solution to protect against inflation and deflation, won the Swiss Derivative Award 2012. In a previous role as Head of Alternative Investment Risk Management at Swiss Re Zurich from 2008 to 2010, he built and integrated the risk management function for Hedge Funds, Private Equity, and Real Estate into the Swiss Re risk management framework. There he dealt with, amongst others, the development of stress tests and value-at-risk-models, concepts of valuation and hedging illiquid assets, the interest rate sensitivity of real estate assets, building a managed account for a fixed income arbitrage hedge fund, and examining the risk/return profile of hedge funds. In a prior role as Chief Risk Officer at Credaris Portfolio Management, London, from 2004 – 2007, Claus developed and implemented the risk management framework for a credit hedge fund. From 2000 to 2004 he worked as a Credit Strategist and Hedge Fund Analyst at Deutsche Bank in Frankfurt/Main. During a stint as a research associate from 1996 to 1999 at the University of Bremen / Germany he wrote a dissertation about forecasting turning points in financial markets with econometric models. At Bankgesellschaft Berlin he traded government bonds from 1994 to 1996. Claus has published numerous papers on various topics in Finance.

# Exploring Global Infrastructure

**Daniel Ung, CFA, CAIA, FRM**
Research & Design Group

## 1. Introduction

After more than two decades of relative price stability, concerns over inflation have been growing since the 2008 financial crisis. Rebounding commodity prices, monetary easing by central banks, and excessive government debt have all played a role in heightening such concerns. Faced with these adverse conditions, investors are increasingly favoring real assets, which maintain their purchasing power and serve as portfolio diversifiers. The most frequently tracked real assets are often those deemed essential to the economy over the long term and include assets such as commodities, real estate, and infrastructure.

Across real assets, infrastructure investments have recently attracted the most interest among investors, partly due to their cash-generative capacity. In addition to this appealing investment characteristic, infrastructure investments also tend to be uncorrelated with the broader vagaries of the business cycle. Even while the global economy remains mired in malaise, governments have continued to increase their investments in major projects. According to a recent report[1], global infrastructure expenditure is expected to reach USD 40 trillion over the next two decades, as the developing world is experiencing unprecedented urbanization and the developed world is grappling with aging assets. In additon, there is a growing recognition that infrastructure investments can boost employment and enhance a country's economic performance, as evidenced by the British government's recent decision to underwrite infrastructure projects, despite its unwavering determination to reduce public expenditure[2].

While infrastructure investments may offer benefits to an investment portfolio, it is essential to consider the properties of the specific infrastructure assets in which you are investing:

1. Infrastructure assets include roads, bridges, seaports, airports, and power generation facilities. This diversity means that performance will vary markedly from one investment to another.
2. Infrastructure projects often incur a high level of risk at the outset, which gradually declines over time, ceteris paribus.
3. Fiscal incentives proffered by governments can substantially change the attractiveness of infrastructure investments. For instance, master limited partnerships (MLPs) in the U.S. do not generally have to pay any corporation taxes.
4. Another important consideration is whether the investment should be made directly through investment funds or indirectly through infrastructure-related securities, for example, equities. Direct investments invariably carry idiosyncratic risks specific to the assets underlying the fund and their performance depends greatly on the quality of these assets and the skill of the investment manager[3]. For this reason, it is difficult to make meaningful and representative observations about the general performance of direct investments.

The analysis provided in this paper appraises indirect investments, with a particular focus on the relevant S&P Dow Jones indices. Exhibit 1 highlights the principal differences between the indirect and direct approaches to investing in infrastructure. In the following sections we will discuss the definition of infrastructure, the salient investment features of infrastructure indices, the performance of infrastructure indices compared to core

**Exhibit 1** Exposure to Infrastructure Assets

| Features | Indirect Investments (e.g., Equities) | Direct Investments |
|---|---|---|
| Underlying investments | Equities of companies engaged in infrastructure activities | Funds investing in tangible assets |
| Liquidity | High | Low – usually subject to a lock-up period |
| Transparency | High | Medium/Low |
| Investor Access | High | Low – eligibility restricted to qualified |
| Ownership of Assets | Indirect via equities | Direct via ownership of infrastructure |
| Diversification | High – consists of companies in an array of different infrastructure businesses | Moderate/Low – subject to asset-specific risks |
| Exposure to Equity | High | Low |
| Underlying Risks | Mainly equity risks | Liquidity, operational, duration, agency risks, etc. |
| Ongoing Expenses | Low | High – annual management fees, carried interests and other fees |

equities and in inflationary environments, the potential diversification benefits of an allocation to infrastructure, and provide a review of S&P Dow Jones Infrastructure Indices.

**2. Infrastructure Defined**

There is no single, universally agreed upon definition of infrastructure, but Dieter Helm, an authority on the subject at Oxford University, describes it as "*what lies between companies and markets, and between consumers and essential services. It incorporates the core network utilities – like transport, energy, water, and communications. But it also extends further – into social infrastructure – the educational networks, the health services, broader social supports, and law and order*."[4] In other words, economic infrastructure supports commerce and a fee is normally charged for its use whereas social infrastructure consists of social service facilities, such as medical and correctional facilities, designed primarily to cater to the needs of society at large.

While all infrastructure enterprises operate under the auspices of a well-defined regulatory framework, certain businesses, in particular those in the economic infrastructure sector, attract less government intervention and are generally more competitive. This may explain why most equities-based indices mainly consist of companies engaged in building economic infrastructure rather than social infrastructure.

Regardless of the nature of the business in which a company is involved, infrastructure companies share some common attributes, notably:

- They often operate as "natural monopolies" and as such, their activities are regulated and not determined on a purely market basis.
- They have high capital requirements, creating significant barriers to entry.
- Their assets have a long lifespan. Roads, bridges, and tunnels may last 50 years or more.
- Final user demand for their output is less responsive to the broader business environment.

**3. Salient Investment Features of Infrastructure Indices**

While infrastructure indices can diverge in some respects, they are also united by basic properties. This section outlines some of the characteristics they have in common.

**Highly profitable companies.** Infrastructure companies enjoy substantial pricing power not only because the services they offer are essential to daily life, but also because they have few competitors. This may partly explain why infrastructure companies have posted a notably higher median operating margin than the "average" global company. A high operating margin means that the company runs less financial risk and is more profitable (see Exhibit 2).

**High dividend yield.** Since 2007, infrastructure companies have consistently distributed more cash to their shareholders than the "average" global company, making them particularly suitable for investors seeking high-income stocks (see Exhibit 3).

**Highly cash-generative.** The development of infrastructure assets can take a long time and requires substantial capital investment. That said, once the assets are in service, they generate a good, stable source of cash and their ongoing operating expenses are relatively low.

**Their assets have a long lifespan.** Infrastructure assets generally have long economically useful lives, often lasting more than 50 years. This makes them particularly attractive to investors with a long investment horizon, such as pension funds that have to meet long-term liabilities.

**4. A Performance Comparison of Infrastructure versus Core Equities Indices**

Compared to core equity indices, infrastructure indices have outperformed on both an absolute and risk-adjusted basis (see Exhibits 4a and 4b).

**5. Performance of Infrastructure Indices in Inflationary Environments**

Unlike many other real assets, infrastructure assets do not drive inflation per se, as they generally do not form part of the basket of goods from which the Consumer Price Index (CPI) is calculated. Nevertheless, the revenues they generate are very often tied to some measure of inflation. An example of this is the pricing structure that

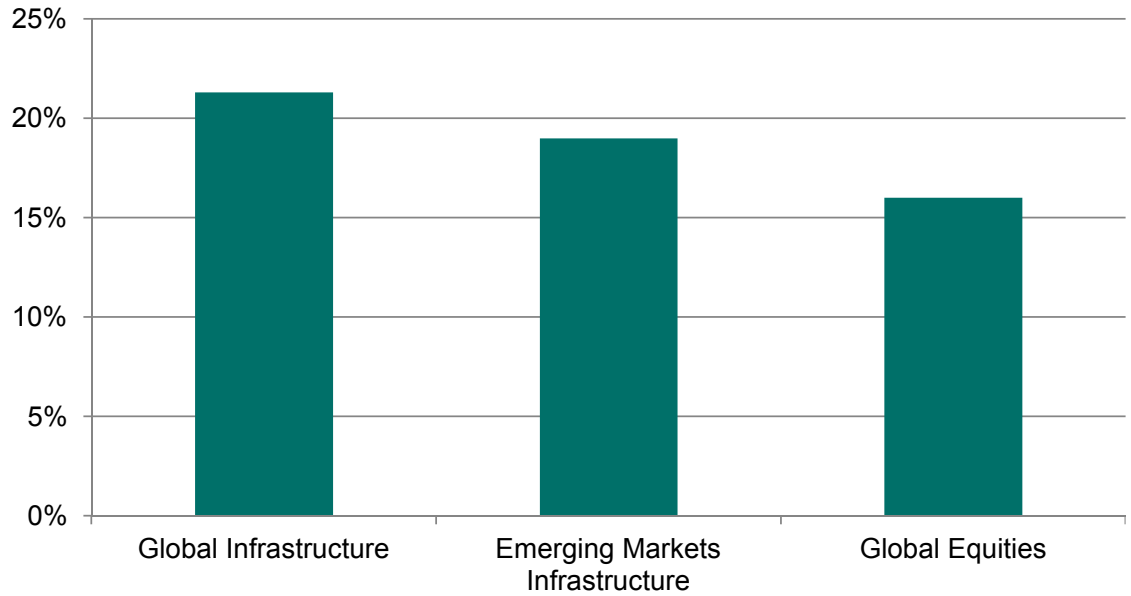



**Exhibit 2** Operating Margin in the Fiscal Year of 2012

Source: FactSet, Diagram created by S&P Dow Jones Indices based on information from FactSet and is provided for illustrative purposes only. Emerging Market Infrastructure is represented by the S&P Emerging Market Infrastructure Index; Global Infrastructure is represented by the S&P Global Infrastructure Index and Global Equities are represented by the S&P Global 1200 Index. Only available data are included in the analysis. Owing to data incompleteness, the S&P Global 1200 Index is used in lieu of the S&P Global BMI Index for this part of the analysis.

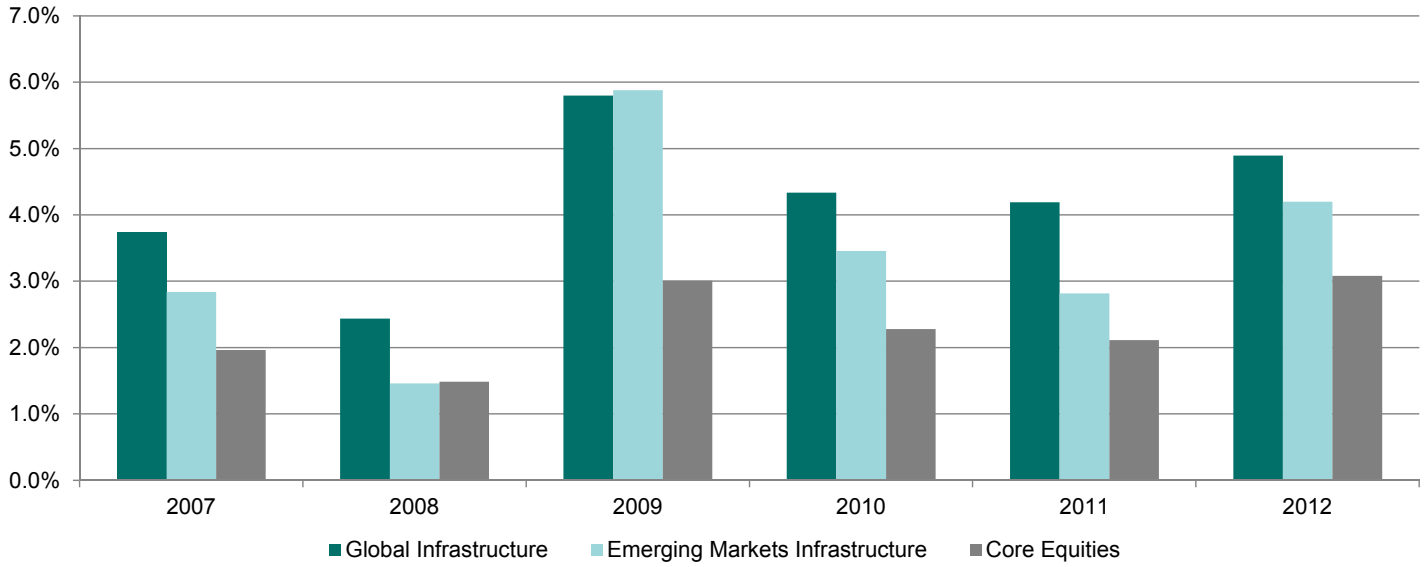



**Exhibit 3** Realized Dividend Yield

Source: S&P Dow Jones Indices. Data from 2007-2012. Emerging Market Infrastructure is represented by the S&P Emerging Market Infrastructure Index; Global Infrastructure is represented by the S&P Global Infrastructure Index and Global Equities are represented by the S&P Global BMI. Charts are provided for illustrative purposes. Past performance is no guarantee of future results. This chart may reflect hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations ssociated with back-tested performance.

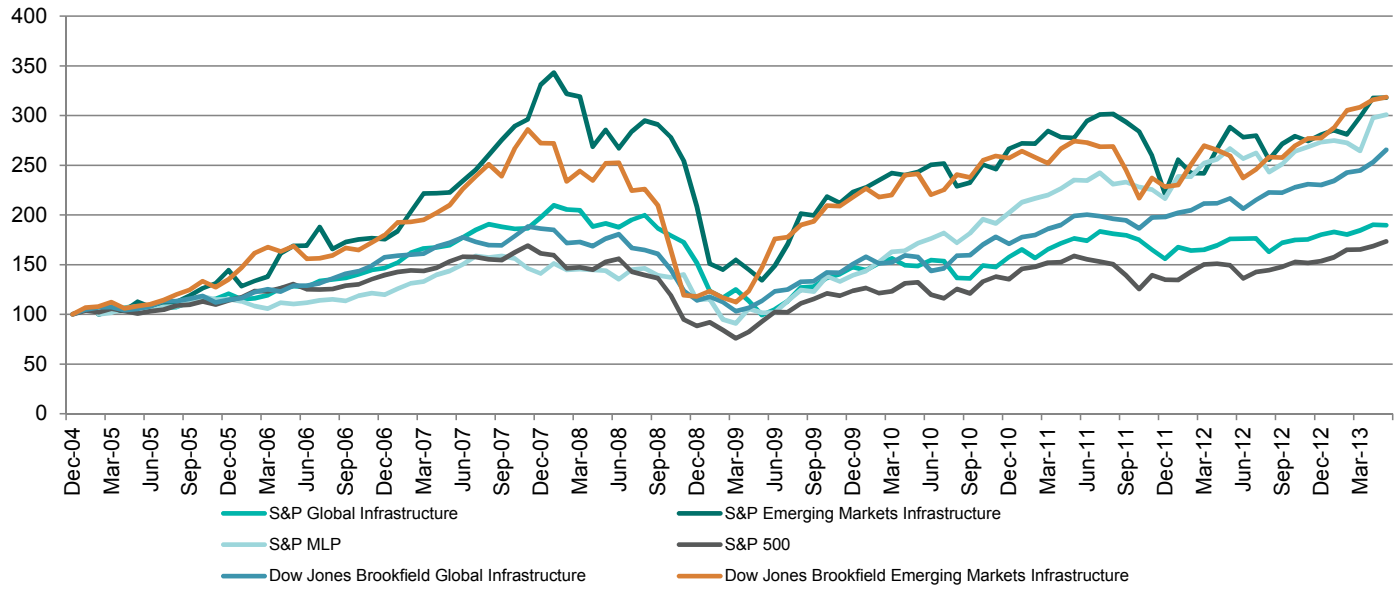



**Exhibit 4a** Performance of Infrastructure Indices versus Core Equities since 2004

Source: S&P Dow Jones Indices. Indices are normalized to 100 as of December 30, 2004. Data is current through May 31, 2013. Charts are provided for illustrative purposes. Past performance is no guarantee of future results. This chart may reflect hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

*Transurban Group* – a constituent of the S&P Global Infrastructure Index – adopts. On a quarterly basis, the company escalates its toll charge by either the quarterly CPI or 4.5% per annum (whichever is greater) for the privilege of using CityLink, the main road that joins the airport and Melbourne city centre in Australia. Given this, it would not be unreasonable to surmise a relationship between the performance of infrastructure indices and inflation.

**Exhibit 4b** Annualized Performance of Infrastructure Indices and

| | S&P Global Infrastructure | Dow Jones Brookfield Infrastructure | S&P Emerging Markets Infrastructure | Dow Jones Brookfield Emerging Markets Infrastructure | S&P MLPs | S&P Global BMI |
|---|---|---|---|---|---|---|
| Annualized volatility | 16.99% | 14.23% | 24.93% | 23.37% | 17.72% | 17.88% |
| Annualized return | 8.03% | 11.47% | 14.04% | 14.17% | 14.44% | 4.06% |
| Return per unit | 0.47 | 0.81 | 0.56 | 0.61 | 0.82 | 0.23 |

Source: S&P Dow Jones Indices. Data from November 30, 2004 through May 31, 2013 Charts are provided for illustrative purposes. Past performance is no guarantee of future results. This chart may reflect hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

A cursory inspection of the monthly correlation matrix in Exhibit 5, may lead to the conclusion that infrastructure investments have only a very weak, though positive, link to inflation. However, it is important to bear in mind that correlation measures can be highly volatile and cannot detect lead-lag relationships. Thus relying solely on them to define the relationship between different assets may lead to spurious conclusions. Furthermore, correlation analysis does not capture investors' experience over typical investment horizons. Therefore, we have opted to put more emphasis on the historical performance of different assets relative to inflation over a 5-year horizon (see Exhibit 6). Our results show that infrastructure indices have beaten inflation more frequently than core equities.

**Exhibit 5** Monthly Pairwise Correlation between Assets

| | Inflation | Global Equities | Global Bonds | U.S. REITs | Global Infrastructure | Emerging Market Infrastructure | MLPs | Commodities |
|---|---|---|---|---|---|---|---|---|
| **Inflation** | 100% | 7% | -11% | 12% | 7% | 15% | 37% | 37% |
| **Global Equities** | 7% | 100% | 26% | 80% | 90% | 87% | 52% | 45% |
| **Global Bonds** | -11% | 26% | 100% | 21% | 46% | 35% | 3% | 22% |
| **U.S. REITs** | 12% | 80% | 21% | 100% | 76% | 83% | 48% | 71% |
| **Global Infrastructure** | 7% | 90% | 46% | 76% | 100% | 84% | 53% | 50% |
| **Emerging Market Infrastructure** | 15% | 87% | 35% | 83% | 84% | 100% | 47% | 61% |
| **MLPs** | 37% | 52% | 3% | 48% | 53% | 47% | 100% | 34% |
| **Commodities** | 37% | 45% | 22% | 71% | 50% | 61% | 34% | 100% |

Source: S&P Dow Jones Indices. Data for S&P Emerging Markets Infrastructure Index from December 30, 2004 and all other indices from December 30, 2001 through May 31, 2013. Inflation is represented by U.S. CPI Non-seasonally adjusted index; Global Equities are represented by the S&P Global BMI Index; U.S. REITs are represented by S&P U.S. REITs Index; Global Infrastructure is represented by the S&P Global Infrastructure Index; EM Infrastructure is represented by S&P Emerging Markets Infrastructure Index; MLPs are represented by S&P MLP Index and Commodities are represented by S&P GSCI Total Return Index. Tables are provided for illustrative purposes. Past performance is no guarantee of future results. This table may reflect hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

### 6. The Portfolio Diversification Potential of Infrastructure

Owing to the relatively high correlation between an equally weighted basket of infrastructure equities, and the broad equities market, an allocation to infrastructure equities has historically resulted in only a very modest reduction in volatility, but the overall return has been enhanced (see Exhibit 7). Clearly, the degree of risk reduction and return enhancement of infrastructure indices depends on the precise make-up of the index in question and facile generalizations cannot be made in this regard.

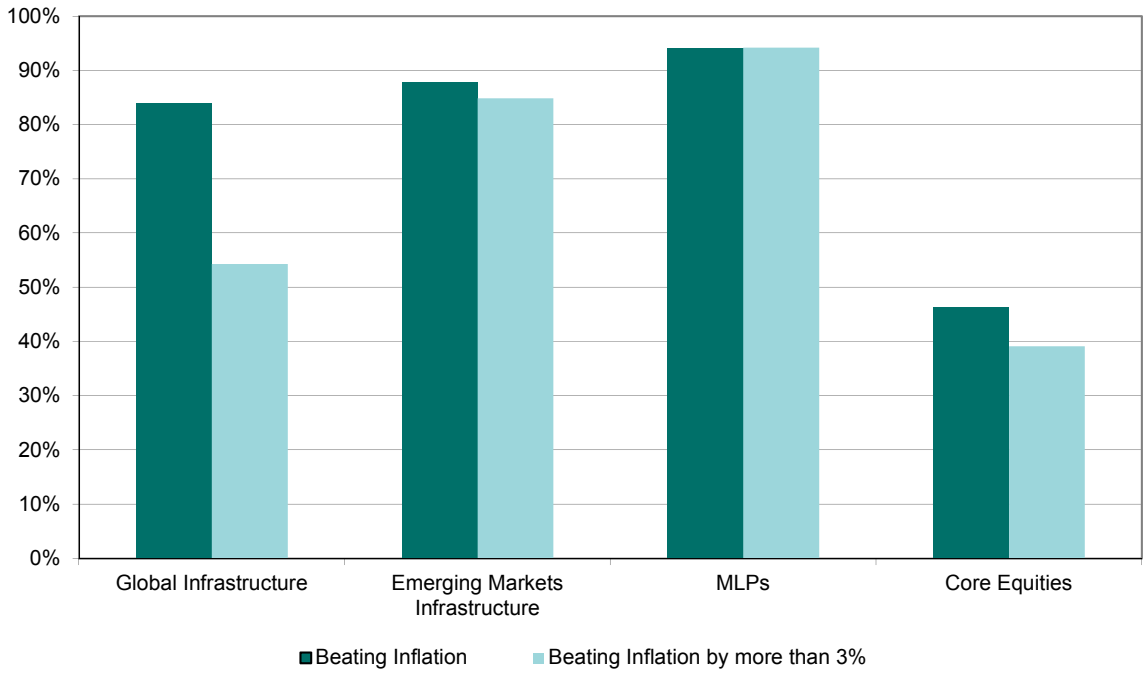



**Exhibit 6** Frequency of Beating Inflation over a Rolling 5-Year Period
Source: S&P Dow Jones Indices. Emerging Market Infrastructure is represented by the S&P Emerging Market Infrastructure Index; Global Infrastructure is represented by the S&P Global Infrastructure Index; MLPs are represented by the S&P MLP Index and Global Equities are represented by the S&P Global BMI. Data for S&P Emerging Markets Infrastructure Index from December 30, 2004 and all other indices from December 30, 2001 through May 31, 2013. Charts are provided for illustrative purposes. Past performance is no guarantee of future results.

### 7. Summary of Infrastructure Performance

Historically, infrastructure equities have not only outperformed global equities (see Exhibit 8), but also performed well in inflationary environments. An allocation to infrastructure equities in an investment portfolio has also tended to help investors achieve a better risk-return trade-off than core equities.

### 8. S&P Dow Jones Indices Tracking Infrastructure

S&P Dow Jones has a wide array of infrastructure-themed indices on its platform including the S&P Global Infrastructure Index, the Dow Jones Brookfield Global Infrastructure Index, S&P Emerging Markets Infrastructure Index, and the S&P MLP Index.

### 8.1 S&P Global Infrastructure Index

The S&P Global Infrastructure Index has 75 constituents and comprises the largest publicly listed infrastructure companies globally in both developed and emerging countries. To create diversified exposure, the index includes three distinct infrastructure clusters: utilities, transportation, and energy. Every six months, the index is rebalanced such that utilities, transportation, and energy maintain a weighting of 40%, 40% and 20% respectively and no single stock exceeds 5%. Exhibit 9 shows the sectoral exposure changes over time and Exhibit 10 shows the sectoral exposure of the index on May 31, 2013.

Unsurprisingly, because of the rebalancing mechanism in the index and the application of individual stock caps, the exposure in the three industries has remained relatively stable over time. However, on a sectoral level, there have been relatively more fluctuations. Between 2007 and 2013, the index had an average representation of 26% in electric utilities, followed by 19% in oil storage and transportation, and 17% in highways and tracks. Over the same period, European- and U.S.-based companies together made up about 60% of the index, in terms of

**Exhibit 7** Portfolios with Exposures to Infrastructure Equities

| | Portfolio 1 | Portfolio 2 | Portfolio 3 | Portfolio 4 |
|---|---|---|---|---|
| Global Equities | 70% | 65% | 60% | 50% |
| Fixed Income | 30% | 30% | 30% | 30% |
| Infrastructure Equities | - | 5% infrastructure equities | 10% infrastructure equities | 20% infrastructure equities |
| Annualized Volatility | *13.88%* | 13.78% | 13.69% | 13.54% |
| Annualized Return | *5.35%* | 5.73% | 6.11% | 6.86% |

Source: S&P Dow Jones Indices. Data from November 30, 2004 through May 31, 2013. Charts are provided for illustrative purposes. Global Equities are represented by the S&P Global BMI Index; Fixed Income is represented by the JP Morgan Global Aggregate Index and Infrastructure Equities are being represented by an equally-weighted basket of S&P Global Infrastructure Equities, S&P Emerging Markets Infrastructure Equities and S&P MLP Index. Past performance is no guarantee of future results. This chart may reflect hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

**Exhibit 8** Absolute Outperformance of Infrastructure Indices over Core Equities

| | S&P Global Infrastructure | Dow Jones Brookfield Global Infrastructure | S&P Emerging Markets Infrastructure | Dow Jones Brookfield Emerging Markets | S&P MLP |
|---|---|---|---|---|---|
| Annualized | 2.66% | 6.10% | 9.44% | 8.28% | 8.59% |

Source: S&P Dow Jones Indices. Data from November 30, 2004 through May 31, 2013. Charts are provided for illustrative purposes. Global Equities are represented by the S&P Global BMI Index; Fixed Income is represented by the JP Morgan Global Aggregate Index and Infrastructure Equities are being represented by an equally-weighted basket of S&P Global Infrastructure Equities, S&P Emerging Markets Infrastructure Equities and S&P MLP Index. Past performance is no guarantee of future results. This chart may reflect hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested

market capitalization.

**8.2 Dow Jones Brookfield Global Infrastructure Index**

The Dow Jones Brookfield Global Infrastructure Index aims to measure the stock performance of global companies that own and operate infrastructure assets. The index is comprised of the largest publicly listed companies from a wide variety of industries, including airports, ports, communications, electricity transmission and distribution, oil and gas storage and transportation, diversified and water. For companies to qualify for inclusion in the index, they must have generated 70% of their cash flows, using EBITDA[5] as a proxy, from infrastructure.

Between 2007 and 2013, the index had an average representation of 28% in oil & gas storage and transportation, followed by 20% in electricity transmission and distribution, and 17% in MLPs. Over the same period, U.S.-based companies made up in excess of 50% of the index, in terms of market capitalization. Exhibit 11 shows the sectoral exposure of the index on May 31, 2013.

**8.3 S&P Emerging Markets Infrastructure Index**

The S&P Emerging Markets Infrastructure Index is comprised of 30 of the largest publicly listed emerging market companies and is a subset of the S&P Global Infrastructure Index. For this reason, the rules pertaining to the construction of the two indices and the resultant sector exposure are closely linked. Between 2007 and 2013, 48% in the index were listed in Asia, followed by 37% in Latin America. Exhibit 12 shows the sectoral exposure of the index on May 31, 2013.

**8.4 Dow Jones Brookfield Emerging Markets Infrastructure Index**

The Dow Jones Brookfield Emerging Markets Infrastructure Index is constructed in a similar manner to its global counterpart, with one important exception. For a company to qualify as a member in the emerging markets

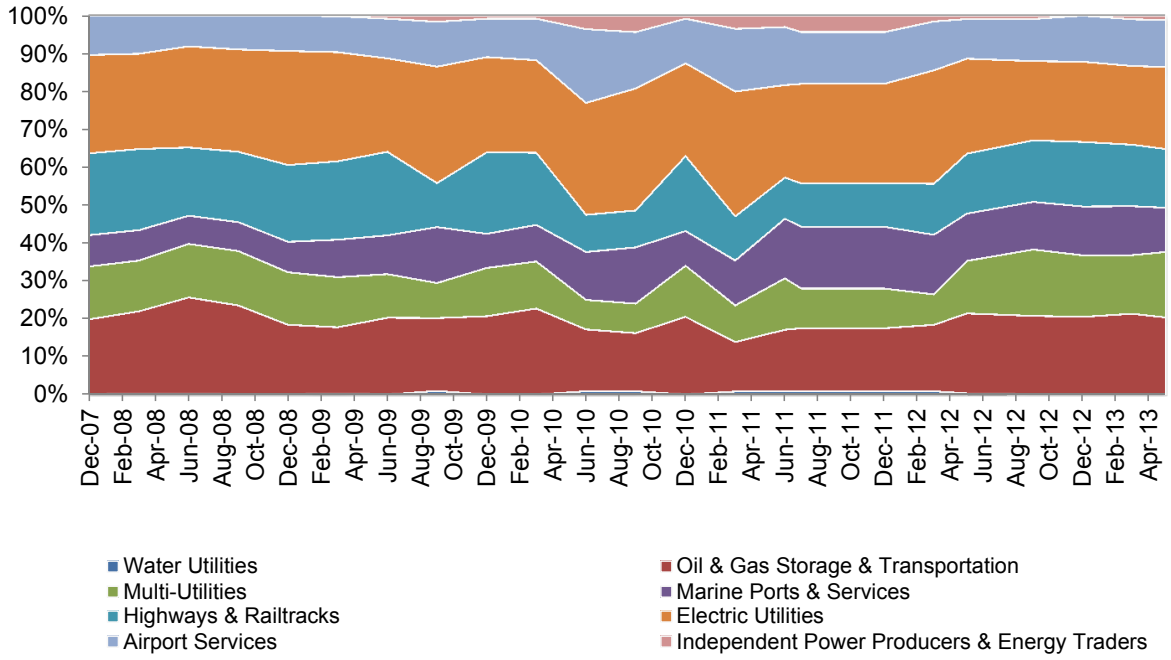



**Exhibit 9** Changes in Sectoral Exposure of the S&P Global Infrastructure over time
Source: S&P Dow Jones Indices. Data as of February 29, 2007 through May 31, 2013. Charts are provided for illustrative purposes. Past performance is no guarantee of future results. This chart may reflect hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

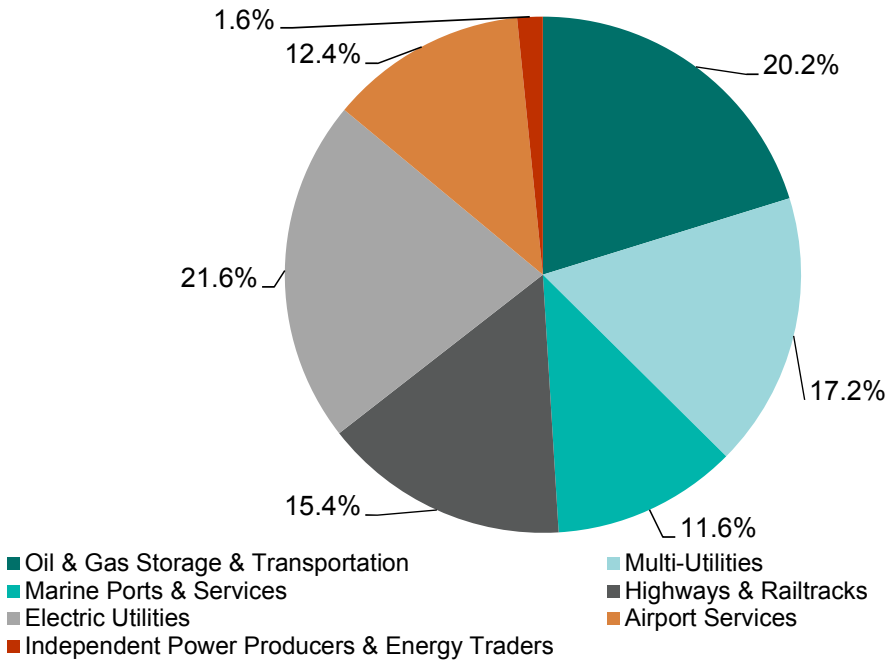



**Exhibit 10** Sectoral Exposure of the S&P Global Infrastructure Index
Source: S&P Dow Jones Indices. Data as of May 31, 2013.

index, it is only required to generate 50% of its EBITDA from infrastructure.

Last year, the index had an average representation of 33% in oil and gas storage and transportation, followed by 19% in toll roads and 17% in ports. Over the same period, Chinese and Hong Kong companies made up 33% of the index, in terms of market capitalization. Exhibit 13 shows the sectoral exposure of the index on May 31, 2013.

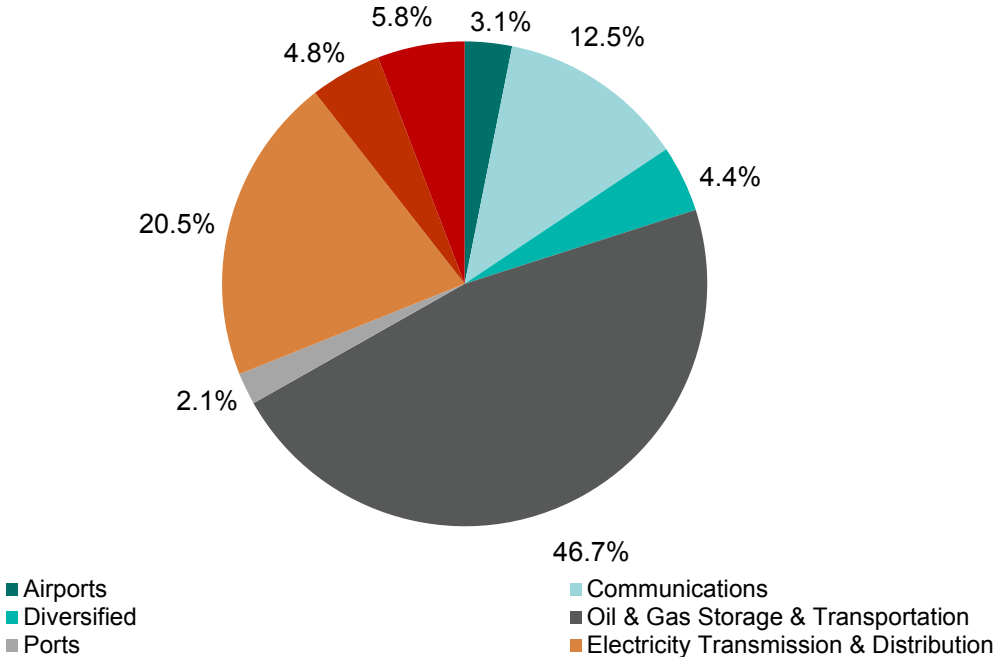



**Exhibit 11** Sectoral Exposure of the Dow Jones Brookfield Global Infrastructure Index
Source: S&P Dow Jones Indices. Data as of May 31, 2013

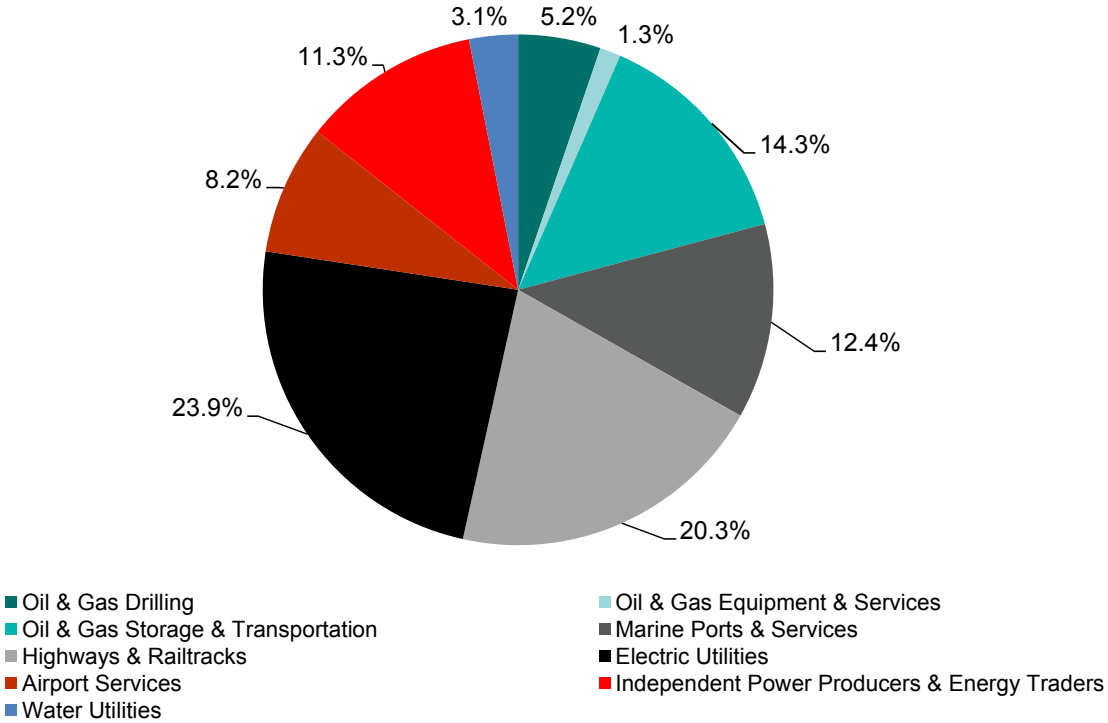



**Exhibit 12** Sectoral Exposure of S&P Emerging Markets Infrastructure Index

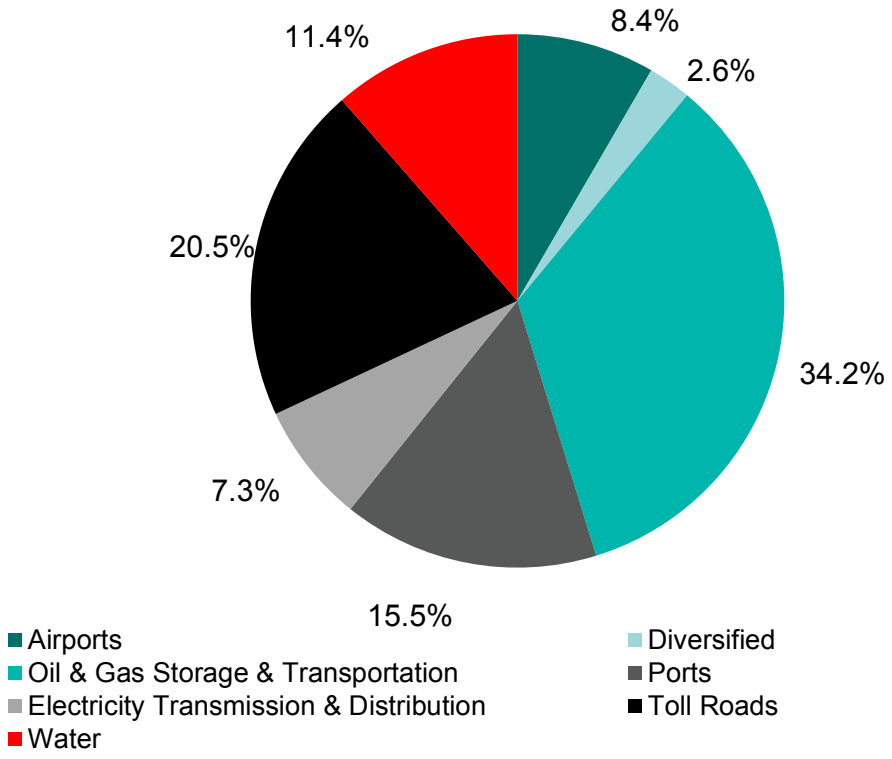



**Exhibit 13** Sectoral Exposure of the Dow Jones Brookfield Emerging Markets Infrastructure Index
Source: S&P Dow Jones Indices. Data as of May 31, 2013.

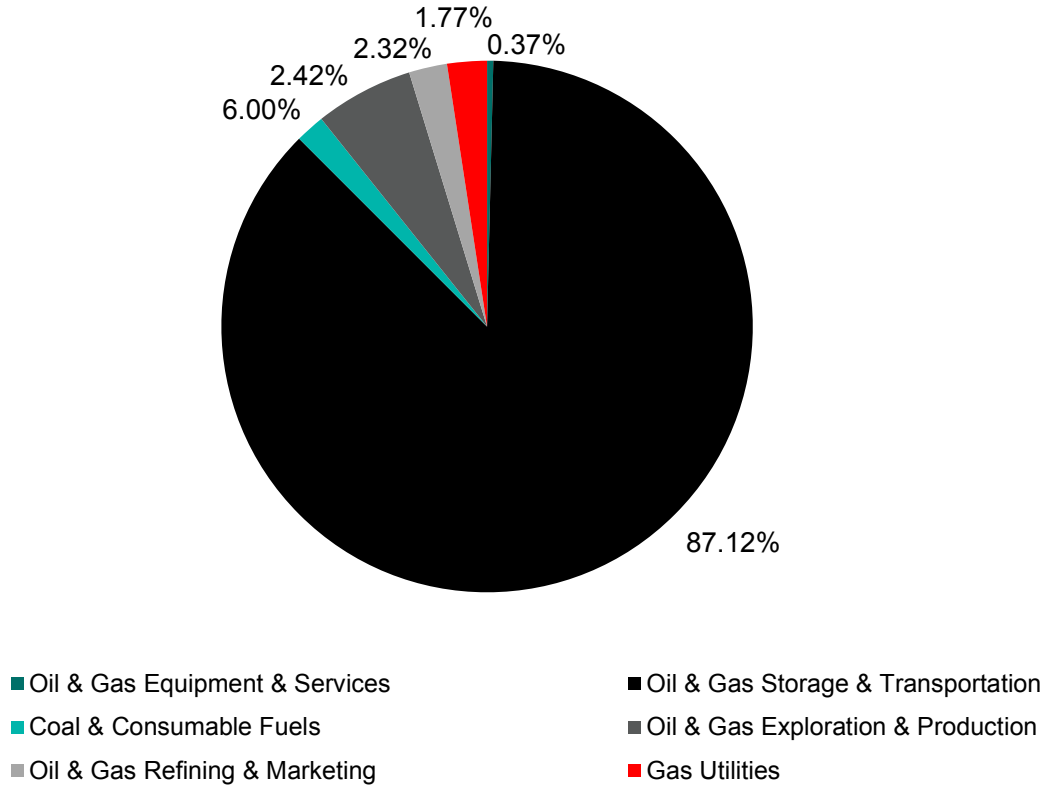



**Exhibit 14** Sectoral Exposure of the S&P MLP Index
Source: S&P Dow Jones Indices. Data as of May 31, 2013.

### 8.5 S&P MLP index

Master Limited Partnerships (MLPs) are publicly traded limited partnerships that operate mainly in the natural resource industry. In the U.S. they are regarded as pass-through vehicles and do not pay any corporation taxes, thereby avoiding the double taxation generally applied to other companies. Revenues and deductions, such as depreciation and amortization from the partnerships, are passed on to investors (unit-holders), who are required to file their own tax return, known as Schedule K-1[6]. MLPs have grown in popularity because they allow investors to enjoy the liquidity of publicly-traded stocks while reaping the tax benefits of limited partnerships.

This popularity has led to the development of the S&P MLP index, which is designed to provide exposure to leading partnerships that trade on major U.S. exchanges. The index has 56 constituents with 95% of them operating in the energy industry. By far, the largest sector is oil and gas storage and transportation. All the companies included in the index are either master limited partnerships or traded limited liability companies, and they benefit from a preferential tax regime in the U.S. Two companies, Enterprise Products Partners and Kinder Morgan Energy Partners, represented about 20-25% of the index between 2007 and 2013. Exhibit 14 shows the sectoral exposure of the index on May 31, 2013.

The five infrastructure indices discussed above are only a sampling of the many indices that cover this asset class. While they are all categorized as infrastructure indices, they are by no means identical. Exhibit 15 underscores the

**Exhibit 15** Comparison of Five S&P Dow Jones Infrastructure Indices

| Parameters | S&P Global Infrastructure | Dow Jones Brookfield Global Infrastructure | S&P Emerging Markets Infrastructure | Dow Jones Brookfield Emerging Market | S&P MLP |
|---|---|---|---|---|---|
| Constituent Market Capitalization (USD | 7,720.17 | 2,967.99 | 4,593.61 | 951.2 | 2,789.24 |
| Geographical Coverage | Global (with tilt to Europe, U.S.) | Global (with tilt to U.S.) | Emerging markets | Emerging markets | U.S. |
| Universe | GICS | Stocks covered by Brookfield Asset Management | GICS | Stocks covered by Brookfield Asset Mgmt. | GICS |
| Industries Represented | Utilities, transportation and energy | Utilities, transportation, energy, communications | Utilities, transportation and energy | Utilities, transportation, energy, communications | Mainly energy (>95%) |
| Exposure to Utilities | Higher | Lower | Higher | Lower | N/A |
| Sectoral Diversification | Diversified | Diversified (including MLPs) | Diversified | Diversified | Mostly focus on mid-stream energy companies |
| Index Weight of the Three | 14% | 15% | 24% | 21% | 33% |
| Summary of key Index Rules | •Rebalance to target weights of 40% in utilities, 40% in transportation and 20% in energy every six months<br><br>•No single stock exceeds 5% | •70% of EBITDA[7] generated from infrastructure | •Rebalance to target weights of 40% in utilities, 40% in transportation and 20% in energy every six months<br><br>•No single stock exceeds 10% | •50% of EBITDA generated from infrastructure | •Master limited partnerships traded in the U.S. |

Source: S&P Dow Jones Indices. For illustrative purposes only. The market capitalization of the three largest holdings are as of March 29, 2013.

**Exhibit 16** Investment Products Linked to S&P Dow Jones Infrastructure Indices

| Index | Investment Product |
|---|---|
| S&P Global Infrastructure | iShares S&P Global Infrastructure ETF |
| | db x-trackers Global Infrastructure ETF |
| S&P Emerging Markets Infrastructure | iShares S&P Emerging Markets Infrastructure ETF |
| | iShares S&P Emerging Markets Infrastructure ETF |
| Dow Jones Brookfield Global Infrastructure | BMO Global Infrastructure Index ETF |
| | ETFX Dow Jones Brookfield Global Infrastructure Fund |
| Dow Jones Brookfield Emerging Markets Infrastructure | ETF Securities Dow Jones Brookfield Emerging Markets Infrastructure ETF |

Source: S&P Dow Jones Indices. This is a complete list of all ETFs currently linked to the indices noted in the chart. While we have tried to include all ETFs we do not guarantee the completeness of such list. S&P Dow Jones Indices does not sponsor, promote or sell any product linked to our indices.

1. Moser, Joel H,, 2011, Global Infrastructure – Volume 1, Bingham McCutchen LLP
2. Infrastructure plan: U.K. to guarantee investments, 2012, BBC News (http://www.bbc.co.uk/news/business-18880354)
3. Like private equity, returns from infrastructure funds persist across different funds of the same manager, implying that skill is a key ingredient in determining success. A fuller discussion of the tradeability of indices across asset classes, authored by Xiao Wei Kang and Daniel Ung, can be found in Evaluating Index Tradability, Journal of Indexes, August/September 2012.
4. Investing in Infrastructure through Private Equity, Investment Insight, Segal, Rogerscasey, May 2011.
5. EBITDA is the abbreviation for Earnings Before Interest, Tax, Depreciation and Amortization.
6. S&P Dow Jones Indices does not give tax advice. Tax rules change frequently and you are advised to contact your tax advisor for further clarification.
7. EBITDA stands for Earnings before Interest, Tax, Depreciation and Amortization and is used as a proxy for cash-flow.

**AUTHOR BIO**

Daniel Ung is Daniel Ung is the Associate Director of the Index Research & Design group at S&P Dow Jones Indices. He is responsible for conducting research and developing index products across all asset classes. Prior to this, Daniel worked at Barclays Wealth and Investment Management in the Structured Products Group and at BNP Paribas Fortis Bank in the Commodities Investor Derivatives Group. He holds a master's degree from the Ecole Supérieure de Commerce de Paris (ESCP Europe) and is a CAIA and FRM charterholder.

**Performance Disclosure**

The launch date of the S&P Global Infrastructure Index was February 27, 2007 at the market close. All information presented prior to the index inception date is back-tested. Back-tested performance is not actual performance, but is hypothetical. The back-test calculations are based on the same methodology that was in effect when the index was officially launched. Complete index methodology details are available at www.spdji.com/spindices.

The launch date of the S&P Emerging Markets Infrastructure Index was November 15, 2007, at the market close. All information presented prior to the index inception date is back-tested. Back-tested performance is not actual performance, but is hypothetical. The back-test calculations are based on the same methodology that was in effect when the index was officially launched. Complete index methodology details are available at www.spdji.com/spindices.

The inception date of the Dow Jones Brookfield Global Infrastructure Index was December 31, 2002, at the market close. All information presented prior to the index inception date is back-tested. Back-tested performance is not actual performance, but is hypothetical. The back-test calculations are based on the same methodology that was in effect when the index was officially launched. Complete index methodology details are available at www.spdji.com/spindices.

The inception date of the Dow Jones Brookfield Emerging Markets Infrastructure Index was December 31, 2002, at the market close. All information presented prior to the index inception date is back-tested. Back-tested performance is not actual performance, but is hypothetical. The back-test calculations are based on the same methodology that was in effect when the index was officially launched. Complete index methodology details are available at www.spdji.com/spindices.

The launch date of the S&P MLP Index was September 6, 2007, at the market close. All information presented prior to the index inception date is back-tested. Back-tested performance is not actual performance, but is hypothetical. The back-test calculations are based on the same methodology that was in effect when the index was officially launched. Complete index methodology details are available at www.spindices.com.

Past performance is not an indication of future results. Prospective application of the methodology used to construct the S&P Global Infrastructure Index, the S&P Emerging Markets Infrastructure Index, the Dow Jones Brookfield Global Infrastructure Index, and the Dow Jones Brookfield Emerging Markets Infrastructure Index may not result in performance commensurate with the back-test returns shown. The back-test period does not necessarily correspond to the entire available history of the index. Please refer to the methodology paper for the index, available at www.spdji.com or www.spdji.com/spindices for more details about the index, including the manner in which it is rebalanced, the timing of such rebalancing, criteria for additions and deletions, as well as all index calculations. It is not possible to invest directly in an Index.

Another limitation of back-tested hypothetical information is that generally the back-tested calculation is prepared with the benefit of hindsight. Back-tested data reflect the application of the index methodology and selection of index constituents in hindsight. No hypothetical record can completely account for the impact of financial risk in actual trading. For example, there are numerous factors related to the equities (or fixed income, or commodities) markets in general which cannot be, and have not been, accounted for in the preparation of the index information set forth, all of which can affect actual performance.

The index returns shown do not represent the results of actual trading of investor assets. S&P/Dow Jones

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# Investment Considerations in Illiquid Assets

**Sameer Jain**
Chief Economist and Managing Director, American Realty Capital

## 1. Introduction

Investing opportunity sets in inefficient market cycles tend to vary. Often, given market anomalies, they come to reside for extended periods in less liquid instruments such as distressed debt, private equity, certain types of loans, or in the securities of firms experiencing turnaround situations. These securities, because they are difficult to price (due to limited market participants, infrequent transactions, complex structures, or highly uncertain future performance), offer potential for excess returns over the risk free rate. Investors who have the ability to buy and hold these securities may thus stand to profit.

## 2. Structural Illiquidity

Hedge funds, for example, vary in the degree to which one can redeem one's interests. A typical hedge fund share agreement stipulates the share redemption policy for its funds. A redemption policy may generally have the following provisions that restrict investors from redeeming their shares:

- Lockup Period: Not all the initial money allocated to the fund can be withdrawn for a certain period of time. After the initial lockup period, investors can only redeem their shares at certain periods. Lockup periods range from three months to three years although not all hedge funds impose lockups. For those funds that do impose lockups, the typical lockup period is one year. Private equity, private real estate, and some credit structures can have lockups that are even longer, as much as seven to ten years. During this period, investors can receive some of their investment back in the form of distributions, but are restricted from receiving the remaining principal back except at a discount or via the secondary market.

- Redemption Frequency: After the lockup period, investors in hedge funds may redeem their shares. However, the redemption process is not continuous and investors can only redeem at certain points in time. The periods which investors are allowed to withdraw funds are controlled by the redemption frequency. For instance, if the redemption frequency is three months, an investor can only withdraw funds every three months after the lockup period has expired. This translates into a maximum of four withdrawing events each year. Redemption frequencies can range from daily to annually. However, not all hedge fund managers impose redemption frequency restrictions.

- Redemption Notice: Investors are generally required to give advance notice before any redemption. This minimum notice period is known as redemption notice. Redemption notice periods range from 30 days to one year, although the most common periods notice periods are 30, 45 and 60 days. Some hedge funds do not impose a minimum redemption notice period.

Example: Quarterly liquidity with 45 days notice requires the investor to notify the fund 45 days prior to the quarterly redemption date. If the redemption date is March 31, the investor must notify the fund on February 15 to redeem.

- Gate Provision: Hedge funds may limit the amount of withdrawals on a specific redemption date called a "gate." Gates can range from 5% to 15% and are imposed to slow redemption outflows in times of severe

market stress. Gates can be imposed as a percentage of a fund's net assets or as a percentage of a client's invested assets. Gates are important to some hedge fund strategies that have more illiquid underlying positions.

**3. Compensation Demanded for Illiquidity Varies**

Fundamentally, the varying degree of tradability means that rebalancing a portfolio with illiquid assets is not, as it is assumed in standard asset allocation models, an option that can be continuously exercised. Investing in assets that restrict trading such as a private equity or real estate fund carries costs; it restricts an investor from rebalancing the portfolio, restricts ability to respond to unforeseen cash flow requirements, and curbs ability to take advantage of topical investment opportunities. What this means is that investors have to be compensated for these limitations on top of the market risk premium.

We stress, however, the cost of illiquidity is very different for different investors; while some individual investors may need quick access to their capital, others with very long horizons for investment may not, and they therefore ought to collect an illiquidity premium.

We assert that illiquidity requires a return premium. As a corollary, in order to entice investors into illiquid assets, it will be necessary to offer either return enhancement or risk reduction relative to liquid assets. This premium arises from two sources.

1. The first source is that illiquidity limits investment flexibility – the ability to rebalance the portfolio at will in response to new information about investments. The undesirable consequence of this is that there is greater uncertainty in overall portfolio volatility and return, as compared to the investor's original target. In other words, over time, an investor's actual risk-return profile may differ from their original target due to illiquidity constraints.
2. The second source is that illiquidity reduces investor flexibility – the ability to respond to new investor circumstances and preferences. This has implications and trade-offs for investors who need to decide how important flexibility is, given individual circumstances, and balance decisions against return and volatility.

It is important to be aware that the illiquidity premium is not solely a function of an investor's individual situation. The premium is not a stationary amount and tends to fluctuate with time. It tends to increase during times of market stress and abate when markets function normally. Less risk averse investors with longer investment horizons can therefore collect this premium, which in essence is a transfer of economic rents from illiquid risk avoiders to risk takers.

**4. Issues with Illiquid Investing**

Investors may have current and future spending requirements, which dictate some absolute maximum level of illiquidity, for example, the need to make a major purchase within the next ten years. After taking into account identifiable spending needs, investors need to consider a variety of issues, some of which are highlighted in the following section.

1. Making tactical calls: like all asset classes, illiquid asset classes exhibit return cycles. Prudent investors who are tolerant of illiquidity should invest in a range of asset classes that includes both liquid and illiquid assets. Because illiquid assets cannot be traded (except at great cost), it is practically impossible to react to new and relatively unfavorable information about them. This applies at the aggregate asset class level: investors cannot reduce private equity or real estate allocations in the short to medium-term. If investors believe

that tactical (or medium-term) asset allocation can add value, they will be restricted from undertaking this activity with the illiquid portion of the portfolio.

However, illiquidity can be a benefit for investors. During tumultuous markets, asset prices become disconnected from fundamental values and bid/ask spreads may gyrate violently. Investors in liquid assets are sometimes prone to instinctively react to market movements and make hasty selling decisions at precisely the wrong time. In such cases, being locked-in (i.e., given a lack of exit opportunity) may be a blessing in disguise.

2. Portfolio rebalancing: because illiquid assets cannot be easily rebalanced, it is difficult to maintain a target risk-return profile. This means that the risk-return profile will drift for extended periods of time, to some extent beyond the investor's control. If illiquid assets outperform liquid assets, they become a greater proportion of the portfolio, which might increase overall portfolio risk beyond target levels. While corrective action may be taken in the liquid portion of the portfolio to reduce overall risk (e.g., selling public equities), that may also have unfavorable consequences such as reducing diversification and incurring taxes.

3. Changing portfolio risk profile: some investors may not want to maintain a constant portfolio risk profile (which implies selling outperforming and buying underperforming asset classes). These investors may have a higher (lower) tolerance for volatility as their overall wealth increases (decreases). If the value of their portfolio drops sharply, these investors will have difficulty reverting to a low-risk portfolio if they are heavily invested in illiquid assets.

4. Liquidation time: the trading difficulty of illiquid asset classes applies to both the fund and the underlying investments. Some assets such as credit products take longer than others to liquidate given higher search costs and contracting frictions. As a result, short-term returns may not be reflective of a manager's future performance. In times of market stress such as when liquidity dries up, managers may reflect negative performance due to mark-to-market or paper losses, but ultimately realize significant profits when they exit their positions. Due to the latency in liquidation, an investor's overall portfolio volatility may be higher than target level portfolios. In this sense, illiquid assets have much more specific risk than liquid asset classes.

   In some cases, it makes sense to have a longer redemption period, one that allows for asset disposal at the right prices as opposed to being a forced seller. Restricting liquidity in such cases actually helps protect investor interest.

5. Unexpected Spending Requirements: When investors with large illiquid asset holdings encounter unexpected spending requirements, they have two main options. They can sell down the liquid portion of the portfolio (with consequences as described earlier), or they can borrow (which increases their overall risk profile and incurs borrowing costs). Borrowing costs will depend on the specific circumstances of each investor.

6. Change in Risk Tolerance: If investor circumstances change due to unforeseen events it may be difficult to reflect the changes in the portfolio if there are large holdings in illiquid assets.

**5. Conclusion**

Illiquid assets can provide a return premium and risk reduction characteristics that can enhance an investor's overall wealth objective over the long term. By investing in illiquid assets, investors can further distance themselves from short-term market shocks and exogenous noise that may detract them from their long-term portfolio risk/return profile.

Additionally, illiquid assets may provide investors with a return premium through alternative investment sources and opportunities, which one cannot participate in through liquid markets. These opportunities include various forms of credit investments like going long or short corporate and sovereign credit, real estate, venture capital, and leveraged buyouts.

However, alternative asset liquidity constraints impose costs and risks to investors. In addition, investors are limited in their ability to make tactical decisions, reallocate their positions and meet unforeseen liquidity events. In the long-term, many investors are not able to make consistent tactical calls on markets. They tend to follow markets; often buying when markets are peaking and selling when markets are in a trough. Being locked in to an illiquid strategy often shields investors from their own biases and leaves the work of investing to professional money managers.

Whereas some of the variation in the public markets should be reflected in corresponding private markets, private markets do not behave in lockstep with their public market counterparts. One reason for this uniqueness is that the asset liquidity risk differs across public and private markets. However, this discrepancy can also provide investors with an additional source of return that cannot be realized in liquid markets.

Illiquid investments are required to deliver a return premium because they increase the uncertainty of accessible wealth over the investment horizon. Uncertainty is increased beyond the forecast volatility of the asset classes as a whole because of the inability to rebalance, higher specific risk, inability to react to new information about investments, and inability to respond to modified investor circumstances. Because illiquidity limits investment flexibility, investors will tend to drift away from their targeted risk-return profiles for substantial periods of time. This means the range of portfolio volatility and return will be greater than would be experienced with an all-liquid portfolio. In principle, one may be able to quantify the premium arising from limited investment flexibility, although these estimates will vary widely.

By considering the factors described above, one can suggest reasonable ranges for illiquidity based on an investor's particular circumstances. However, investors need to understand the costs and risks associated with making investments in illiquid alternative investments based on their personal circumstances and liquidity needs.

## Author Bio

Sameer Jain serves as Chief Economist and Managing Director of American Realty Capital, an investment services firm expressly focused on the alternative investment industry. Mr. Jain's executive management and multifaceted responsibilities at American Realty Capital, include risk management, firm strategy, and direction development, as well as the analysis and evaluation of alternative investments. He has 18 years of industry experience during which his responsibilities have included formulating investment strategy, developing risk management practices and asset allocation models, creating thought leadership, and assessing and engaging real estate, private equity, and hedge fund managers. Prior to joining American Realty Capital Mr. Jain headed Investment Content & Strategy at UBS Alternative Investments, where he was also responsible for all illiquid investing across the platform. Prior to UBS, Mr. Jain served at Citi Capital Advisors Alternative Investments and SunGard System Access. He has written a number of academic and practitioner articles on alternative investments, many of which are available in the public domain at ssrn.com.

Mr. Jain is a graduate of Massachusetts Institute of Technology and Harvard University.

# Investing in Infrastructure

**Edward Szado, PhD, CFA**
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**Inderst, Georg,**
**"Infrastructure as an Asset Class,"**
EIB PAPERS, Volume15 (1), 2010.
Available at: http://ssrn.com/abstract=1860947

Inderst (2010) provides a comprehensive review of the major issues surrounding infrastructure investment. In particular, central to the paper is the question of whether infrastructure is a distinct asset class. Inderst discusses the evolution of infrastructure investment, the economic and financial characteristics, the investment vehicles and benchmarks, performance and risk, and the role of infrastructure in asset allocation.

While investors have held infrastructure equities and bonds (e.g., utilities sector equities and municipal bonds) as part of their traditional sector allocations for many years, the treatment of infrastructure as a distinct asset class is more recent. Dedicated infrastructure funds were first developed by Australian investment banks in the mid-1990s and they began to expand significantly in the 2000s in the U.S., as well as Europe and Asia. The expansion was largely driven by a search for diversification into new alternative asset classes in the years following the dot-com crisis.

Infrastructure can be divided into two types: economic infrastructure (e.g., transport, utilities, communication, and renewable energy) and social infrastructure (e.g., schools, healthcare, prisons, and stadiums). The economic characteristics that make infrastructure a unique investment include: high barriers to entry, economies of scale, inelastic demand, high operating margins, and long lives. The resulting financial characteristics include: high returns, low correlations with other asset classes and economic conditions, steady cash flows, inflation hedging ability, low default rates and a good match for long-term pension liabilities.

Inderst identifies a variety of infrastructure vehicles, including private equity-type investments (mostly closed-end funds), listed infrastructure funds (closed-end or open-end, including ETFs), and direct unlisted investment. A recurring theme throughout the paper is the degree of heterogeneity within these vehicles, largely due to variations in geography, industry sector, and stage of development.

More than one-third of the global investment in infrastructure funds is attributed to pension funds. Most investors classify unlisted infrastructure investments as a stand-alone investment category, while just over one-quarter include them in the private equity category and just over 15% classify infrastructure investments in the real asset category. In contrast, Inderst argues that most listed infrastructure investments are likely categorized within the traditional stock and bond classifications. While three-quarters of investors have target allocations to unlisted infrastructure funds of 1% to 10%, the actual allocations tend to be much less (less than 1%, globally). Allocations to listed infrastructure (dominated by utilities) tend to be much higher. While the global financial crisis has tempered the growth of infrastructure investment, in 2010 Prequin indicated that almost half of investors planned new investments in infrastructure funds.

Infrastructure investments contain a myriad of risks, which may not be captured in typical ex-post statistical

measures. For infrastructure projects, the risks include: construction risk, operational risk, business risk, interest rate risk, refinancing risk, legal risk, regulatory risk, environmental risk, political and taxation risk, and social risks. At the fund level, the risks include concentration risk, illiquidity risk, valuation risk, and governance risk.

While target returns have dropped since the financial crisis, Preqin reports that three-quarters of funds report IRR targets of 10.1% to 20%. Along with a drop in target returns, there has been a drop in leverage, now generally in the 60% to 80% range.

While absolute return benchmarking is the predominant approach, Inderst lists a variety of approaches to benchmarking infrastructure funds, including absolute return, inflation plus margin, bond yield or GDP plus margin, inflation-linked bond plus margin, equity, real estate plus private equity, listed-infrastructure indices, peer groups, and unlisted-infrastructure indices.

Listed infrastructure indices are essentially equity market sector indices. In historical studies, they generally show superior performance over equity markets prior to the financial crisis, while the performance wanes in later years. Generally, they display high correlation with equity indices, with negatively skewed and fat tail returns. However, their applicability to unlisted infrastructure investment is limited. Historically, performance analysis of unlisted funds has generally been limited to Australian funds. These analyses find high risk-adjusted returns and diversification benefits in weak market environments.

Inderst analyzes a more diverse set of global unlisted infrastructure funds from the Preqin database and compares them to a larger set of private equity funds for the period of 1993 to 2009. Since fund vintage has a significant impact on performance characteristics, and the majority of funds were introduced in the three years from 2006 to 2008, Inderst divides the period into three sub-periods: 1993-1999, 2000-2004 and 2005-2008. The average IRR over the full period is 6.3%, with a standard deviation of 15.4%. More than one-quarter of the funds exhibited negative IRRs. Newer funds experienced significantly lower IRRs, in keeping with the J-curve effect observed for private equity funds. Over the full period, infrastructure funds performed slightly better than private equity funds overall, but worse than buyout and mezzanine funds. Infrastructure and mezzanine fund returns tended to be more consistent over vintage years than other private equity funds and infrastructure returns tend to have less variance cross sectionally than most private equity categories. However, Inderst cautions that the results should be considered in light of the data limitations (a small sample, concentrated in later vintages).

The evidence of diversification benefits of infrastructure is mixed, largely due to data limitations. Much of the research is based on readily available listed infrastructure indices, which tend to be highly correlated with equity indices (0.50 to 0.80). Unlisted infrastructure funds exhibit much lower correlations with equities (0.05 to 0.27) and bonds (-0.10 to 0.17), based on Australian data. This suggests unlisted funds have diversification potential for traditional portfolios, although data limitations mitigate the significance of the results and make optimal allocation determinations challenging. Furthermore, infrastructure may provide a degree of inflation protection and stable cash flows that are uncorrelated with equity markets; however, it is not yet clear whether these benefits pass directly to investors in infrastructure funds or which type of infrastructure vehicles best provide these benefits to investors. While research tends to focus on equity-based infrastructure, infrastructure bonds and syndicated loans have garnered a great deal of interest in the years following the onset of the financial crisis.

Inderst identifies a number of new developments in infrastructure investment. In response to agency concerns and high fees related to private equity structures, there is a trend toward alternative means of accessing infrastructure returns, including direct investment in infrastructure, co-investment, club investment, listed infrastructure funds,

and infrastructure bonds. There is also a trend towards longer lived funds to better match fund live times to asset lives. Investors are also seeking greater transparency and more rigorous corporate-governance.

Finally, there remains a great deal of controversy around the labeling of infrastructure as a distinct asset class. From the author's perspective, the extant evidence and financial theory suggests that infrastructure is simply a sector within other standard asset classes such as equity, bonds and private equity.

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**Hammami, Mona, Jean-Francois Ruhashyankiko, and Etienne B. Yehoue,**
**"Determinants of Public-Private Partnerships in Infrastructure,"**
IMF Working Paper WP/06/99, April 2006.
Available at: http://www.imf.org/external/pubs/ft/wp/2006/wp0699.pdf

Hammami, et al. (2006), focus on the factors that led (and continue to lead) to an increased private investment in public infrastructure. Since the 1970s, developing countries have faced an increasing divergence in the supply and demand for infrastructure. Since infrastructure is fundamental to economic growth, and fiscal constraints have limited the ability of the public sector to provide infrastructure development and maintenance, governments have turned to the private sector as an alternative means of financing and providing infrastructure. Since the late 1990s there has been significant growth globally in the delivery of public goods by private firms, including, designing, maintaining, managing, owing, or financing a wide array of infrastructure products, such as schools, hospitals, and roads. World Bank estimates suggest that about 20% of infrastructure in developing countries in the 1990s were financed by the private sector.

The authors empirically address a number of questions regarding public-private partnerships (PPPs): the sources of their growth, the factors that drive a countries ability to attract PPP investments, the factors that result in concentration of PPP investments in certain industries, and the factors that drive private sector interest in participation with the public sector.

The authors focus on seven channels that determine the level of PPPs based on constraints and incentives in the public and private sectors, government constraints, political environment, market conditions, macroeconomic stability, institutional quality, the legal system, and past experience with PPPs.

The authors find that the most important channel affecting the formation of PPPs is the market conditions channel. In particular, market size and customer purchasing power are important variables in PPP development, as they help curtail demand risk.

The authors find that stable prices and exchange rates are important components of the macroeconomic stability channel. In fact, many governments have had to guarantee prices or revenues to attract sufficient PPP partners.

Previous PPP experience is also a significant determining factor for the development of future PPPs. Similarly, assistance from global and local development agencies with the established skills to aid PPP development can further foster PPP growth.

The political environment channel can reduce the formation of PPPs if significant political risk exists in the form of ethnic tensions, political biases, and the lack of political oversight. In particular, PPP development can be fostered by eliminating corruption and ensuring effective rule of law.

At the industry level, PPP development is driven by the marketability of the goods and services, the capital and technology requirements, and "impurity" of the goods and services (a mix of public and private, rather than purely public or private). The authors find greater PPP development for impure and technologically intensive goods and services, consistent with high PPP development in telecommunications, and few PPPs in water infrastructure, with energy and transportation sectors in between.

Finally, the authors find a concentration of PPPs in Latin America, the Caribbean, Europe, and Central Asia. While this paper does not address the viability or appropriateness of infrastructure as an investment from a portfolio management perspective, it does make great strides toward understanding the basis of past and future development of infrastructure-based investment vehicles.

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**Clark, Gordon L., Ashby H. B. Monk, Ryan Orr, and William Scott,**
**"The New Era of Infrastructure Investing,"**
Working Paper, May 2011.
Available at: http://ssrn.com/abstract=1837813

The authors argue that long-horizon investors such as insurance companies, pensions, endowments, and sovereign wealth funds are in a unique position to take advantage of asset classes such as infrastructure since the time horizons for most infrastructure investments significantly exceed the time horizon of the typical investor. Furthermore, the large scale of most infrastructure investments creates a barrier to entry to the typical investor. Ultimately, institutional investors have been attracted to infrastructure investments because of their competitive advantage and the investments' stable cash flows, diversification potential and ability to provide a hedge against inflation. While institutional investors initially accessed infrastructure investments through intermediaries, the authors focus on the growing interest that institutional investors have in accessing infrastructure investments directly to minimize agency problems.

Direct investment in infrastructure involves its own set of considerations. The authors address a number of these considerations and provide some direction for investors interested in developing a direct infrastructure investment program. In order to assess whether the investor should pursue direct investment, the authors recommend beginning with an assessment of the aim of the infrastructure investment as set out by the board, including risk and return goals, diversification/hedging goals (e.g., inflation protection), cash flows and allocation to the asset class, the investment strategy including geographical or sector focus and degree of activism, and the resources required to implement the direct investment program.

Once the investor decides to pursue direct investment in infrastructure, they should focus on the people, process and politics required for successful implementation. The people must possess skills that differ in fundamental ways from the typical institutional investor skill set. Since individual infrastructure investments tend to be very large, long term, and Illiquid, transaction level considerations may outweigh market level considerations. Executing the right deal efficiently is critical when the costs of exit are as high as they are in direct infrastructure investment. Similarly, the processes utilized by institutional investors may need to adapt for infrastructure investment. Decisions are costly to reverse, often need to be made quickly, and must consider a broad range of risks that may or may not be present in more typical investment alternatives. Furthermore, long-term investment horizons require a refocusing of goals from their typical short-term focus. The long-term investment horizon of direct infrastructure investment also involves internal and external politics. Externally, the investments may result in an increased public visibility. Internally, an appropriate political environment and structure is required to allow the long-term

focus that is inherent in direct infrastructure investment.

Ultimately, the authors provide some brief guidelines for what does and does not work in direct infrastructure investing, once the funds have overcome the challenges outlined above. The authors suggest that the following approaches work well:

What works:

- A focus on core operating assets and quality management.
- Designing a deal which is well aligned with long-term goals and efficiently uses capital.
- The "buy a fox to catch a rabbit" strategy in which the investor buys a firm that already possesses the required operational expertise and then acquires similar companies.
- In order to fill out their expertise and access larger investments, investors may work together in clubs.

What doesn't work:

- Some strategies that may work for indirect investment do not seem to work well for direct investment. One example is greenfield PPPs.
- Another difficult direct investment is the privatization of previously public assets.
- The inherent conflicts of interest involved in partnerships with industrials, contractors or operators on newly created assets make these strategies difficult to implement.

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**Rödel, Maximilian and Christoph Rothballer,**
**"Infrastructure as Hedge against Inflation—Fact or Fantasy?"**
*The Journal of Alternative Investments*, Summer 2012, Vol. 15, No. 1, pp. 110-123.
Available at: http://www.iijournals.com/doi/pdfplus/10.3905/jai.2012.15.1.110

Rödel and Rothballer (2012) describe their paper as "the first to analyze the inflation hedging of infrastructure in a comprehensive and methodologically robust study." While there is a general belief in the investment community that infrastructure is an effective inflation hedge, Rödel and Rothballer's analysis suggests this may not be the case. The authors argue that the extant literature provides four main sources for infrastructure's inflation hedging ability: (1) infrastructure's replacement cost rises with inflation, (2 )the quasi-monopolistic position of many infrastructure firms allow them to pass on cost increases to consumers, (3) regulation allows inflation-linked revenues (e.g., inflation-linked rent agreements), and (4) infrastructure firms tend to have low operating costs after the initial high capital investment.

The authors use a diverse dataset of 824 infrastructure firms across 46 countries. The dataset covers all sectors of economic infrastructure (e.g., transport, utilities, and telecommunication) and excludes social infrastructure (e.g., schools and hospitals). While it does contain some PPPs, it is predominantly made up of fully privatized assets. While the data covers the period from 1973 to 2009, most of the analysis is based on the period from 1990 to 2009. Thus, the analysis focuses on moderate inflation environments, possibly biasing the results towards finding less hedging abilities for both equities and infrastructure.

The primary analysis uses a regression model based on 1- and 5-year investment horizons in which real returns are regressed on inflation, changes in inflation, and real GDP growth. In addition, dummy variables are introduced to allow the comparison of the hedging abilities of infrastructure and equities.

Their results suggest that, in general, infrastructure investments provide no additional inflation hedging ability when compared to traditional equity investments. The one exception appears to be high pricing power infrastructure at the 5-year time horizon. More specifically, their findings are as follows:

- At a 1-year time horizon, infrastructure is slightly more effective at hedging inflation than equities are, but the difference is not statistically significant. The same, but weaker, pattern holds for the 5-year horizon.
- At the 5-year horizon, infrastructure is worse than equities for hedging unexpected inflation.
- At the sector level, both telecommunication and utilities infrastructure provide similar inflation hedging to equities.
- The authors find that infrastructure with high pricing power provides more effective inflation hedging than infrastructure with low pricing power or equities. This pattern is particularly evident at the 5-year time horizon. In fact, the authors find that high pricing power infrastructure is almost a perfect hedge for inflation at the 5-year horizon.

## Author Bio

**Edward Szado,** PhD, CFA, is a Visiting Assistant Professor at the University of Massachusetts Amherst, the Director of Research of the Institute for Global Asset and Risk Management (INGARM), an Editor of the Alternative Investment Analyst Review (AIAR) and Assistant Editor of the Journal of Alternative Investments (JAI). He earned a B.Comm. at McMaster University in Canada and an M.B.A. in finance at Tulane University and a PhD in Finance at the University of Massachusetts Amherst.

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