EDHEC Infrastructure Investment Platform

Building benchmarks for infrastructure investors
A Profound Knowledge Gap
EDHECinfra addresses the profound knowledge gap faced by infrastructure investors by collecting and standardising private investment and cash flow data and running state-of-the-art asset pricing and risk models to create the performance benchmarks that are needed for asset allocation, prudential regulation and the design of new infrastructure investment solutions.
The Research for Business strategy at EDHEC is a key component of the school's identity. Due to its not-for-profit aim, its financial independence and the time devoted to conducting research, such efforts contribute to the group's strategic objectives of growing our resources, aiming to have a visible impact on business, and forging close ties with business wherever they may be located.

In this context, EDHECinfra is pushing the research frontier in an area where there is considerable value-added for business. EDHEC is committed to delivering high-quality academic research for long-term investors in infrastructure.

Olivier Oger
Dean
EDHEC Business School
Asia is rapidly urbanising, driving significant expansion in infrastructure and demand for private financing. Infrastructure assets present a great opportunity for institutional investors seeking to diversify their portfolios and participate in the Asian growth story.

EDHEC’s infrastructure performance benchmarks will provide investors with a valuable tool to evaluate their infrastructure investments, and help to support the growth of infrastructure as a mainstream asset class.

Ravi Menon
Managing Director
Monetary Authority of Singapore
Institutional investors have set their sights on private investment in infrastructure equity and debt as a potential avenue towards **better diversification, improved liability-hedging and reduced drawdown risk**. Capturing these benefits, however, requires answering a number of difficult questions:

1. **Risk-adjusted performance measures** are needed to inform strategic asset allocation and monitoring performance;
2. **Duration and inflation hedging properties** are needed to understand the liability-friendliness of infrastructure assets;
3. **Extreme risk measures** are in demand from prudential regulators and others.

**A Lack of Robust Answers**

Today, **none of these metrics is documented in a robust manner**, if at all, for investors in privately-held infrastructure equity or debt.

This has left investors frustrated by an apparent lack of adequate investment solutions in infrastructure.

At the same time, policy-makers have begun calling for a widespread effort to channel long-term savings into capital projects that could support long-term growth.

To fill this knowledge gap, **EDHEC is launching a new platform, EDHECinfra**, to collect, standardise and produce investment performance data for infrastructure investors.
Our objective is the creation of a global repository of financial knowledge and investment benchmarks about infrastructure equity and debt investment, with a focus on delivering useful applied research in finance for investors in infrastructure.

We aim to deliver the best available estimates of financial performance and risks of reference portfolios of privately-held infrastructure investments, and to provide investors with important insights about their strategic asset allocation choices to infrastructure, as well as support the adequate calibration of the relevant prudential frameworks.

We are developing unparalleled access to the financial data of infrastructure projects and firms, especially private data that is either unavailable to market participants or cumbersome and difficult to collect and aggregate.

We also bring advanced asset pricing and risk measurement technology designed to answer investors’ information needs about long-term investment in privately-held infrastructure, from asset allocation to prudential regulation and performance attribution and monitoring.
What We Do

The EDHECinfra team is focused on three key tasks:

1. **Data collection and analysis**: we collect, clean and analyse the private infrastructure investment data of the project’s data contributors as well as from other sources, and input it into **EDHECinfra’s unique database of infrastructure equity and debt investments and cash flows**. We also develop data collection and reporting standards that can be used to make data collection more efficient and reporting more transparent. This database already covers 15 years of data and hundreds of investments and, as such, is already the largest dedicated database of infrastructure investment information available.

2. **Cash flow and discount rate models**: Using this extensive and growing database, EDHECinfra implements and continues to develop the technology developed at EDHEC-Risk Institute since 2012 to **model the cash flow and discount rate dynamics of private infrastructure equity and debt investments** and derive a series of risk and performance measures that can actually help answer the questions that matter for investors.

3. **Building reference portfolios of infrastructure investments**: Using the performance results from our asset pricing and risk models, we can report the portfolio-level performance of groups of infrastructure equity or debt investments using categorisations (e.g. greenfield vs brownfield) that are most relevant for investors’ investment decisions.
By joining our platform investors and infrastructure managers can:

- Contribute to the **development** of infrastructure investment
- **Access** unique risk and return analytics restricted to contributors
- **Request** private analyses of their own infrastructure portfolios

Starting in the 3rd quarter of 2016, the EDHEC**infra** platform will produce three types of outputs:

1. A series of **publicly-available benchmarking reports** for reference portfolios of privately-held infrastructure debt and equity.

2. A series of **restricted reports** presenting the details of the benchmarking analyses, including the distributions, correlations and other assumptions derived from the database and used in the public reports, and available only to data contributors.

3. **Confidential reports** focusing on the performance of specific investor portfolios and available only to the relevant asset owners.
The EDHEC\textit{infra} Benchmarking Reports

The EDHEC\textit{infra} Equity Benchmarking Report is an in-depth econometric and financial study of the performance of several reference portfolios of privately-held infrastructure equity investments.

Typical reference portfolios will include investments in projects located in different regions, structured according to different contractual arrangements or at different stages in their lifecycle, or a combination of such portfolios.

Performance measures include: realised period returns, internal rates of return, mean and extreme risk measures (VaR, Expected Shortfall, Drawdown), Sharpe ratio, Sortino ratio, and, where relevant, duration (e.g. for investment projects with a final date).

The EDHEC\textit{infra} Debt Benchmarking Report is the equivalent analysis with respect to portfolios of private infrastructure loans or bonds, also including different types of reference portfolios by project type, geography or lifecycle stage.

Performance measures include: realised period returns, internal rates of return, mean and extreme risk measures (VaR, Expected Shortfall, Drawdown), Sharpe ratio, Sortino ratio, modified and effective duration, probability of default and expected loss given default.
The **EDHEC infra Restricted Debt Report** includes more detailed analyses of the database for debt investors:

1. **Cash flow models**: statistical characteristics up to the 4th moment of Debt Service Cover Ratios; conditional probability of default, recovery or liquidation in each period; probabilities of transitions between different DSCR buckets in each period.

2. **Pricing models**: statistical determinants of observed credit spreads in infrastructure debt and market-implied loss given default and its bounds; dynamics of credit spreads and decomposition between a credit risk, liquidity and other factors; estimation of the trade-off between duration and credit risk in different types of infrastructure projects.

3. **Correlations of returns**: linear and non-linear correlation measures between infrastructure debt returns and other assets and between different sub-categories of infrastructure debt investments (e.g. different groups of revenue risk)

4. **Factor loadings**: assessment of the factor exposures created by privately infrastructure debt to market or macro factors.
Published annually, the EDHECinfra Restricted Equity Report includes more detailed analyses for infrastructure equity investors, including:

1. **Cash flow models**: statistical characteristics up to the 4th moment of realised dividend, shareholder loans, and free cash flow distributions; conditional probability of payout, lockup or bankruptcy in each period; conditional (forward looking) volatility measures of dividend payouts.

2. **Pricing models**: implied term structure of discount rates given observed transaction prices and estimated cash flow volatility; market-implied bounds on expected returns; evolution of required rates of returns in time.

3. **Correlations of returns**: correlation measures between infrastructure benchmark returns and other assets and between different sub-categories of infrastructure equity investments (e.g. different groups of revenue risk).

4. **Factor loadings**: assessment of the factor exposures created by privately-held infrastructure equity, from market factors to fundamental exposures to GDP or inflation, as well as the illiquidity premia found in such investments.

These measures are generated while controlling for the different key drivers of investment performance including geography, contractual frameworks, industrial sectors or investment stage.
The EDHECinfra Private Reports

EDHECinfra Private Reports use the information in the Database to derive valuation and performance measures of our investor’s own portfolio of infrastructure investments, as informed by the raw investment and cash flow data they contributed.

Such reports include the metrics derived in either the Equity or the Debt Reports, reported at the level of an investor’s portfolio.
Monetary Authority of Singapore

In October 2015, the Deputy Prime Minister of Singapore, Tharman Shanmugaratnam, announced officially at the World Bank Infrastructure Summit that EDHECinfra would work in Singapore to create "usable benchmarks for infrastructure investors."

The Monetary Authority of Singapore is supporting the work of the EDHEC Infrastructure Institute-Singapore (EDHECinfra) with a five-year research development grant.

Sponsored Research

Since 2012, private sector sponsors have been supporting research on infrastructure investment at EDHEC with several research projects that are now under the EDHEC Infrastructure Institute:

- The EDHEC/NATIXIS Research Chair on the Investment and Governance Characteristics of Infrastructure Debt Instruments, 2012-2015
- The EDHEC/Meridiam/Campbell Lutyens Research Chair on Infrastructure Equity Investment Management and Benchmarking, 2013-2016
- The EDHEC/NATIXIS Research Chair on Infrastructure Debt Benchmarking, 2015-2018
- The EDHEC/Long-Term Infrastructure Investor Association Research Chair on Infrastructure Equity Benchmarking, 2016-2019
- The EDHEC/Global Infrastructure Hub (G20) Survey of Infrastructure Investors

Partner Organisations

As well as our Research Chair Sponsors, numerous organisation have already recognised the value of this project and have joined or are committed to join the data collection effort. They include:

- The European Investment Bank
- The World Bank Group
- The European Bank for Reconstruction and Development
- The members of the Long-Term Infrastructure Investor Association
- Over 20 other North American, European and Australasian investors and infrastructure managers.

EDHECinfra is also a member of the Advisory Council of the World Bank's Global Infrastructure Facility
One of the reasons why infrastructure investing remains ill-understood is the difference of perspectives, concepts and even vocabularies between the institutional investment world and that of infrastructure projects and corporate finance. The multi-disciplinary team of EDHECinfra combines the expertise allowing a fully-fledged asset management perspective, including the asset allocation, portfolio construction and benchmarking issues that are at the heart of the investment management process, with a deep understanding of infrastructure finance and investment at the underlying level, including project financing, utilities regulation and public-private partnership contracts.
Origins & Recent Achievements

In 2012, EDHEC-Risk Institute launched a thematic research program on infrastructure investment and established two Research Chairs dedicated to long-term investment in infrastructure equity and debt, respectively, with the active support of the private sector.

Since then, infrastructure investment research at EDHEC Business School has led to more than 20 academic publications and as many trade press articles, a book on infrastructure asset valuation and the creation of an executive course on infrastructure investment and benchmarking.

Testament to the quality of its contributions, EDHECinfra’s research team has been regularly invited to high-level fora on the subject, including G20 meetings. Likewise, active contributions have been made to the regulatory debate, in particular directly supporting the adaptation of the Solvency-2 framework to long-term investments in infrastructure.

This work has contributed to growing the limited stock of investment knowledge in the infrastructure space.

Significant empirical findings already include:
- The first empirical estimates of construction risk for equity and debt investors in infrastructure project finance;
- The only empirical tests of the statistical determinants of credit spreads in infrastructure debt since 2008, allowing controlling for the impact of market liquidity and isolating underlying risk factors;
- The first empirical evidence of the diversification benefits of investing in greenfield and brownfield assets, driven by the dynamic risk and correlation profile of infrastructure investments over their lifecycle;
- The first empirical documentation of the relationship between debt service cover ratios, distance to default and expected default frequencies;
- The first measures of the impact of embedded options in senior infrastructure debt on expected recovery, extreme risk and duration measures;
- The first empirically documented study of cash flow volatility and correlations in underlying infrastructure investment using a large sample of collected data covering the past fifteen years.

Key methodological advances include:
- A series of Bayesian approaches to modelling cash flows in long-term investment projects including predicting the trajectory of key cash flow ratios in a mean/variance plane;
- The first fully-fledged structural credit risk model of infrastructure project finance debt;
- A robust framework to extract the term structure of expected returns (discount rates) in private infrastructure investments using conditional volatility and initial investment values to filter implied required returns.

Recent contributions to the regulatory debate also include a parsimonious data collection template to develop a global database of infrastructure project cash flows.
Frédéric Blanc-Brude, Director
PhD (finance), thirteen years of experience in infrastructure finance and investment research, including direct involvement in more than USD6bn of project finance transactions.

Qi Wang, Head of Risk Modelling
PhD (statistics), eight years of experience in financial and stochastic modelling in the investment banking sector. Qi is responsible for cash flow and portfolio modelling.

Grace Chen, Senior Relationship Manager
Seven year of experience managing investor relations across the real estate investment trust, private real estate and private equity markets.

Deyber Cano, Senior Research Engineer
Ten years of experience in the infrastructure (Oil & Gas) and risk industry. Deyber is specialised in the analysis of infrastructure corporates and projects.

Tim Whittaker, Head of Data Collection
PhD (finance), ten years of experience in auditing financial information in infrastructure projects. Tim oversees a team of analysts that collect the data used by EDHECinfra.

Terrance Teoh, Information Systems Manager
Twenty years of experience managing financial sector data and building information systems for financial intermediaries.

Majid Hasan, Head of Asset Pricing
PhD (finance), five years of experience in stochastic modelling and asset pricing. Majid is responsible for developing price measures of private infrastructure assets.

Karen Sequeira, Project Manager
Twenty years of experience managing complex projects and teams. Karen oversees events and logistics for EDHECinfra’s masterclasses, seminars and board meetings.