WHITE PAPER

InFRAME™

An enduring methodology for building infrastructure portfolios

by Michael Landman

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In 2010 IFM Investors first embarked on the task of creating a suite of analytical tools that could guide the decision-making process of constructing a balanced core infrastructure portfolio.

The result was InFRAME™, a proprietary risk management system that enables IFM Investors to analyse the underlying revenue streams that drive the performance of infrastructure assets. Launched in mid-2011, InFRAME synthesises risk profiling, scenario modelling and portfolio optimisation to help identify and achieve a target strategic asset allocation for the infrastructure asset class.

Almost a decade on, our investment philosophy and framework have remained fundamentally sound, while continuing to evolve incrementally, including through our experiences from the impacts of the COVID-19 pandemic. We expect that InFRAME will continue to be an important contributor to the long-term success of IFM Investors' infrastructure strategy.

INFRASTRUCTURE

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Established in 1994, IFM Investors is today a global leader in infrastructure investment. As the world's sixth largest infrastructure investor[1], we continue to pursue a singular purpose: to protect and grow the long-term retirement savings of working people across the world. Over more than two decades we have steadily developed a strong reputation for acquiring and managing infrastructure assets to build diversified core infrastructure portfolios. The InFRAME risk management and portfolio construction system is one of the critical building blocks of our success.

Prior to launching InFRAME, IFM Investors had largely diversified its infrastructure portfolios using traditional sub-sector analysis, which incorporated a limited set of revenue classifications. We had also investigated using the modern portfolio theory approach (MPT), or mean variance analysis, to guide portfolio asset allocation. However, we found this was largely unsatisfactory for developing a forward-looking strategy, as MPT relies heavily on historical performance and correlation data, which are often lacking in unlisted infrastructure.

Having identified in 2010 that there was scope to develop a more comprehensive approach to profiling risk in order to achieve the long-term returns we target in infrastructure, we commissioned a team of quantitative investment professionals across asset classes, both within and external to IFM Investors.

The story of InFRAME

In 2010, during an IFM Investors Investment Committee meeting, the subject under discussion was: what should the portfolio concentration limits be for various sub-sectors, such as utilities or roads?

What was immediately apparent to all in the discussion was that the characteristics of various assets within a particular subsector, such as roads, can vary significantly. So what was required was a deeper understanding of the drivers and risks of various revenue streams associated with each asset.

As a result, the investment team took on the task of developing a detailed rationale for what asset and revenue stream allocations could produce optimal, robust equity returns.

The result was a year-long project that, at its outset, reframed the task to answer a simple question:

> **How can IFM Investors quantify what constitutes a balanced, core infrastructure portfolio?**

We convened a team made up of IFM's own infrastructure professionals, several of our in-house quantitative equities specialists and a respected professor in the field of Applied Finance and Financial Risk Management.

This team spent a year researching and designing a portfolio construction methodology, culminating in the launch of InFRAME in mid-2011.

The goal of a core infrastructure portfolio

IFM Investors believe pension funds tend to be particularly well-placed to sustain investments in illiquid asset classes such as infrastructure, as members' long investment horizons are well-matched with infrastructure assets' long investment life cycles. Given these timeframes, we believe it is incumbent on us to act as responsible long-term stewards of our infrastructure assets, in order to maintain, de-risk and improve them over decades, to enhance long-term investment returns for members.

IFM Investors targets investments across predominately developed markets. In the construction of our core infrastructure portfolios, target assets will typically possess the following five qualities:

1. Monopolistic characteristics
2. Long asset/concession life
3. Stable and predictable cash flows
4. Inflation protection
5. Exposure to economic growth.

To build a core infrastructure portfolio, we target maximum exposure to the first two of these five qualities, while maintaining a balance between the degree of cash flow certainty and exposures to both inflation and economic growth (GDP). We also focus on investing in countries with established regulatory environments and strong rule-of-law.In a process complementary to InFRAME, IFM Investors undertakes extensive risk analysis prior to new country entry and has a program of ongoing monitoring of country risk.

Assets within the portfolios may exhibit more or less of these characteristics, and, in some cases, may be considered 'super-core' or 'core-plus', but ultimately the objective is to achieve diversification and balance at the portfolio level.

The benefits of InFRAME

InFRAME comprises a suite of risk management and portfolio construction tools, based on the analysis of the underlying revenue streams that drive the performance of infrastructure assets. Its objective is to deliver more accurate portfolio-wide perspective of risk, based on a bottom-up assessment of the risk exposures and characteristics of underlying assets.

IFM Investors believes the benefits of InFRAME include:

[1]Infrastructure Investor - Infrastructure Investors Top 50 (II 50), November 2020

- Gaining a deeper understanding of the revenue drivers of infrastructure assets and consequently the risks that our investments and infrastructure portfolios are exposed to;
- Building quantitative insights into the way infrastructure assets, and the sub-sectors to which they belong, respond to macro-economic drivers and scenarios; and
- Creating greater awareness of the value in targeting a strategic asset allocation for infrastructure, based upon the revenue characteristics of the underlying assets.

IFM Investors has applied InFRAME analysis – in conjunction with other investment evaluation processes – to our Australian and Global (ex-Australia) Infrastructure strategies since 2011. As a result, we believe our investment analysis and decision making benefits from a deeper and more granular understanding of portfolio characteristics.

The InFRAME methodology

InFRAME is a three-phase methodology supported by a range of analytical tools. These three phases are Risk Profiling, Scenario Analysis and Portfolio Optimisation.

1. Risk Profiling

During the Risk Profiling stage, we identify constituent revenue streams for each asset and classify them based on a defined set of 'revenue types', which are grouped into four main categories. As revenue is the product of quantity and price, these revenue types are analysed within a volume-price risk framework as broadly depicted in Figure 1.

This approach recognises the complexity of infrastructure assets, by highlighting that:

- the vast majority of assets entail multiple sources of income with distinct risk characteristics; and
- targeting asset allocation by sub-sector does not fully reflect the range of asset types that can be found within a particular sub-sector.

The key questions posed in this phase are:

- what are the underlying revenue stream characteristics of the portfolio, and
- what is the corresponding risk profile?

For example, a midstream investment can derive income from a number of distinct revenue streams, including transportation tariffs (take-or-pay, regulated or market-derived) and product storage leases. Each of these revenue streams responds in a distinct way to specific risks and macro-economic factors. Two additional examples are illustrated in Figure 2.

Under the InFRAME risk analysis process, we evaluate the exposure of each revenue streams to a set of over 20 key portfolio-wide risks and value drivers. The risks/drivers span both quantitative and qualitative metrics, ranging from exposure to inflation and asset life to extreme weather risk and regulatory risk. Aggregating the asset analysis across the portfolio allows us to identify common risk factors and risk concentration, including 'what-if' scenarios for potential acquisitions and divestments.

Updating risk profiling as a result of COVID-19

Historically, portfolio-wide risk analysis identified the risk of a pandemic, although its magnitude was expected to be limited, based upon the containment of other recent viral outbreaks such as SARS in 2003. As part of our periodic review of the InFRAME risk framework and investment-level inputs, we have recently introduced a specific "Pandemic Risk" element.

COVID-19 has illustrated that a pandemic is more complex than a GDP-linked risk factor. Our experience has demonstrated there is a significant diversity of responses across transport, utilities and energy assets. In transport-related infrastructure, for example, the following questions are instructive in demonstrating diversification of revenue streams within that sector alone:

- *What is the asset's exposure to direct volume risk?*
  In the toll road sub-sector, the key revenue source can be Patronage style, Contracted (for public private partnerships with

Diversification through counter-cyclical revenue streams

Over the course of 2020, as the COVID-19 pandemic triggered recessionary conditions, the benefit of portfolio diversification was made clear, as was also evident during the economic slowdown in the wake of the global 2008/9 financial crisis.

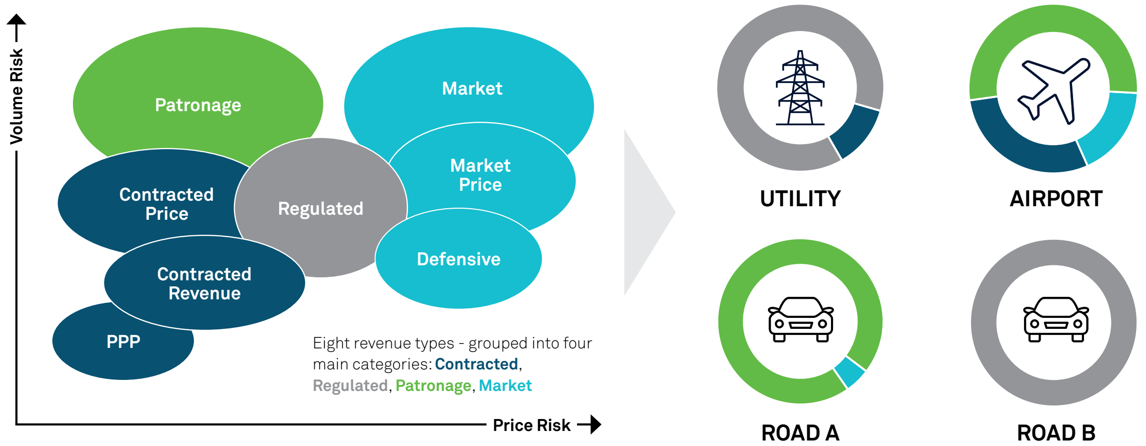
While most Patronage revenue streams are GDP-linked, there is a track record of counter-cyclical performance from fuel storage assets, which also fall into the Market Category, but as 'Market Defensive' revenue types. These assets generally benefit when economic demand is weak and the fuel market takes on a 'contango' structure. Fuel market participants drive up the price and utilisation of uncontracted storage capacity as they seek to store product, that is expected to be more valuable in the future. This has a clear portfolio diversification benefit to aeronautical revenue streams at airports, for example, which have felt both the effects of the health and economic crisis under the COVID-19 pandemic.

availability-based revenues) or Regulated (where there is a government-backed return guarantee), with the latter two more likely to be protected from volume risk. At seaports and airports, these investments generally involve multiple revenue streams, including long-term property-style leases (e.g. airport tenants with businesses not affected by the global downturn in aviation).

- *What proportion of revenues is from transportation of goods versus people?* Through COVID-19, governments generally ensured that the fundamental engines of the economy – the manufacture and distribution of essential goods including food and medicines – were kept running. This meant that the financial performance of seaports and toll roads (with a significant proportion of heavy vehicle traffic) remained relatively robust.

One of the outputs of this analysis enables us to assess how a portfolio is tracking relative to our investment strategy. This is the Core Infrastructure Rating™, which assesses the five

FIGURE 1 **REVENUE STREAM FRAMEWORK FOR RISK PROFILING**



Revenue Stream *Category*	CONTRACTED	REGULATED	VOLUME-LINKED	MARKET-RELATED
Revenue Stream *Type*	Contracted Price	Regulated	Patronage	Market
	Contracted Revenue			Market Price
	Public Private Partnership (PPP)			Market Defensive

Source: IFM Investors

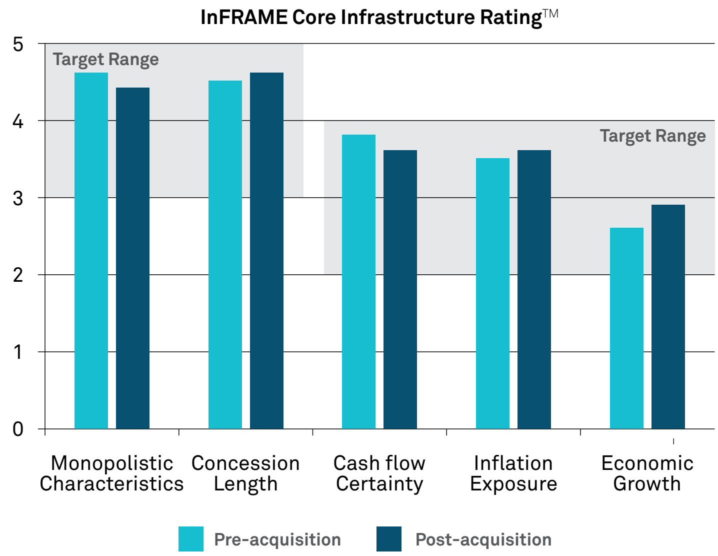
FIGURE 2 **CHARACTERISATION OF TYPICAL REVENUE STREAMS**

	AIRPORT					WIND FARMS	
Revenue Source	Aeronautical	Cargo	Car Parking	Property	Trading	Wind Farm A (under PPA[2])	Wind Farm B (selling into the market)
Typical Revenue Type	Patronage	Contracted Price	Patronage	Contracted	Market	Contracted Price	Market Price

[2] PPA – power purchase agreement

For illustrative purposes only and does not reflect any asset owned by IFM.

FIGURE 3 CHANGES TO THE CORE INFRASTRUCTURE RATING DUE TO A NOTIONAL TOLL ROAD ACQUISITION



> **We seek to maximise monopolistic and longevity characteristics. A balance is also struck between cash flow certainty, inflation exposure and exposure to economic growth.**

core infrastructure qualities mentioned earlier.

The Core Infrastructure Rating considers each of these qualities on a zero-to-five (low-to-high) scale. Recall that we aim to maximise each of these factors under the constraint of balancing the degree of cash flow certainty against exposure to inflation and economic growth.

Figure 3 (below) provides an example of how we use the Core Infrastructure Rating. It illustrates the assessment of an infrastructure portfolio before and after the acquisition of a notional toll road. The impact of the new asset on the portfolio will necessarily be a function of both the size of the individual asset relative to the portfolio, as well as the characteristics of the existing portfolio. As illustrated, the portfolio impact in this instance is projected to add a relatively long life asset with increased exposure to inflation and economic growth. This would be assessed in the context of the likely accretive return characteristics of the new investment, accompanied by a marginal lessening in expected cash flow certainty.

Understanding and profiling risk parameters of individual assets and how these interact at a consolidated level is critical to the task of building resilient portfolios. The next step is to investigate how these interactions may react under different potential scenarios.

2. Scenario Analysis

With the objective of developing a strategic asset allocation specific to infrastructure portfolios, the initial research led our Investment team to create a holistic, scenario-based approach to risk, rather than dealing with single-point sensitivities to economic factors in isolation. The underlying principle is that a diverse, well-structured infrastructure portfolio should be sufficiently robust to provide acceptable returns under a range of macro-economic scenarios.

The key question considered in this phase of the InFRAME methodology is: How do asset and portfolio returns react under different medium-term, macro-economic scenarios?

Extracting an answer involves:

- **Developing a series of specific scenarios:** Global macro-economic scenarios are considered over a five-year time horizon, with responses specific to each region. In our view, five years is considered sufficient to capture an economic cycle covering a diverse range of economic outcomes.
- **Infrastructure response:** We look at how individual assets respond to each of the scenarios, concentrating on the key metric of equity return over the five-year horizon. Building up a picture, asset by asset across the portfolio, provides insights into the offsets and benefits available in a diversified portfolio.

The impact on forecast outcomes from defined scenarios is tested through direct linkages to key value drivers such as inflation and interest rates. Indirect linkages to value drivers, such as GDP, are also modelled based upon forecast relationships informed by historical performance, and are used to derive patronage outcomes, such as heavy vehicle traffic growth on a toll road.

Note that by having scenarios which affect sub-sectors and geographies in different ways, the InFRAME scenario analysis module implicitly captures diversification benefits across the portfolio due to asset type and geography.

Diagrams are provided for illustrative purposes only. Returns shown do not relate to specific IFM assets.

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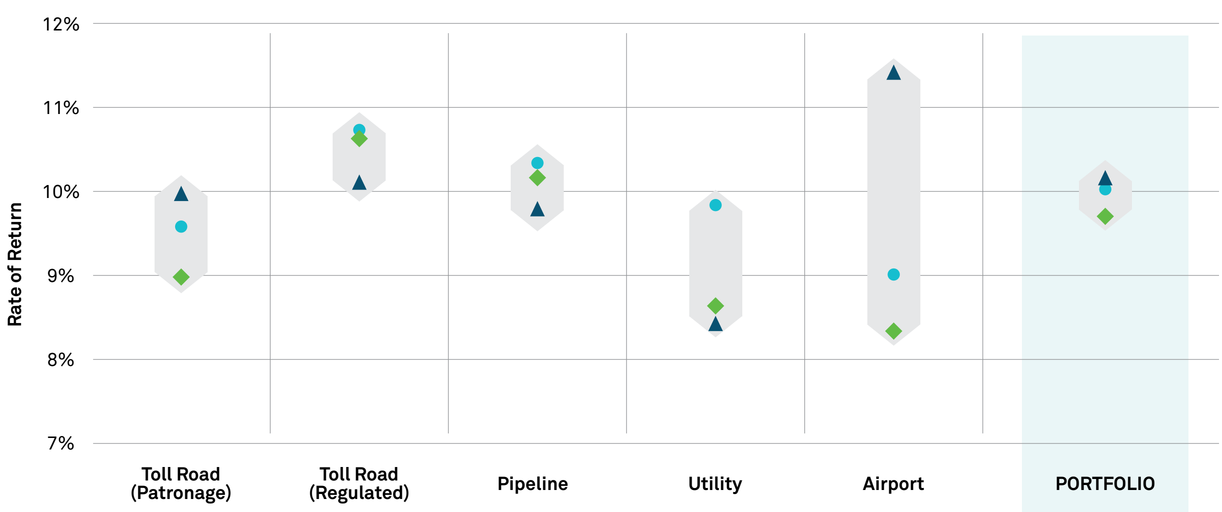
> **Scenario analysis is about understanding how infrastructure asset returns react under different medium-term outcomes and the extent of portfolio-wide diversification benefits.**

For example, Figure 4 shows a simplified consideration of three macro-economic scenarios for five specific assets and the net portfolio exposure. The scenarios in this illustrative example are analysed for the potential return impact that results from changes to GDP, inflation and interest rates.

We believe having the insight into the risk factors of infrastructure investments and how these are expected to react under a number of scenarios enables our team to set about building an optimal portfolio of assets.

FIGURE 4 MODELLING MACRO SCENARIOS FOR ILLUSTRATIVE ASSETS AND AT A PORTFOLIO LEVEL

MACRO SCENARIOS	GDP	INFLATION	INTEREST RATES
● Stagflation	↓	↑	↑
◆ Trade War	↓	↓	↓
▲ Global Recovery	↑	↓	↓



COVID-19 pandemic scenarios

The scenario analysis we had routinely carried out over the past decade was typically based upon plausible scenarios provided by independent forecasters and supplemented by various shock scenarios (for example, a scenario replicating the 2008/9 financial crisis). Prior to COVID-19, our portfolio-wide risk analysis anticipated that the impact of a pandemic was expected to be limited, in line with the outbreak of SARS in 2003. However, as the more significant effects of COVID-19 emerged in March 2020, we evaluated a range of more severe bespoke scenarios and their potential impacts on investments, with increased emphasis on liquidity management and maintaining debt covenants.

These scenarios have been refined over time, with the common theme that with a diversity of responses across geographies, sub-sectors, assets and ultimately revenue streams, a well-constructed portfolio should continue to show robust performance despite significant global disruption events. Our long-term portfolio construction is guided through the Portfolio Optimisation step discussed in the following section.

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3. Portfolio Optimisation

The third stage of the InFRAME process aims to build a long-term, stable return profile for a diverse infrastructure portfolio.

The key question considered in this phase of the InFRAME methodology is: What portfolio allocations of revenue streams can potentially achieve targeted returns?

At the optimisation stage, we identify target asset allocations within the context of the InFRAME revenue framework. The portfolio optimisation model accomplishes this via stochastic simulation, generating thousands of randomly weighted portfolios with different asset allocations and revenue stream mixes.

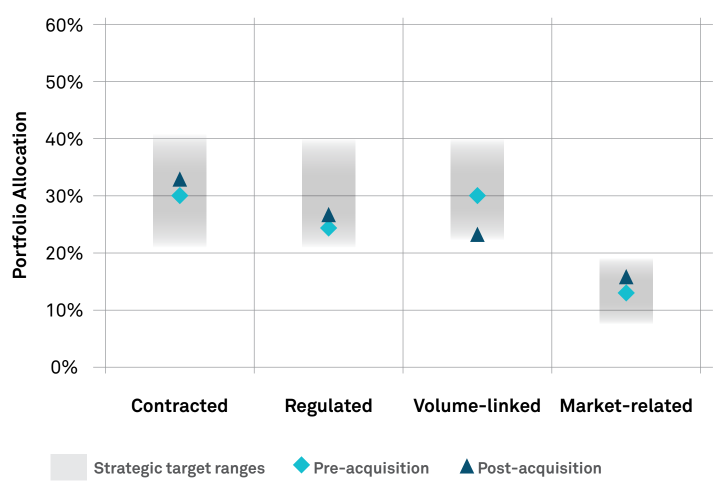
We calculate the projected portfolio-level return for each of these weighted portfolios under each macro-economic scenario. If this return is above a prescribed threshold, the portfolio is considered to be acceptable; otherwise it is rejected. The process provides a residual range of robust portfolios which forms the basis of our strategic asset allocation, within the framework of the four InFRAME revenue categories outlined in Figure 1.

Figure 5 illustrates an optimal target portfolio allocation based on the four key revenue categories. Through an in-depth understanding of current and proposed investments, the portfolio allocation analysis lends itself to 'what-if' analyses relating to portfolio acquisitions or divestments, in this case the effect of acquiring a diversified mid-stream business.

We have performed two periodic reviews of our target allocations over the past decade, with the most recent incorporating some of the learnings from the COVID-19 pandemic. The chart illustrates that the target portfolio seeks a fairly even mix of the first three revenue categories, with a lower allocation to potentially higher risk/reward market-related revenues, noting that a greater proportion of the Market category can be accommodated when the portfolio includes the diversifying Market Defensive type. The notional acquisition in this example keeps the portfolio within the target ranges, but shifts the relative exposures away from the Volume-linked category.

Private market transactional activity is often opportunistic. However, IFM's investment strategy involves creating our own opportunities, guided by our portfolio construction framework. Examples include our intent to increase economic asset exposure through entry into the UK airports sector in 2013, increasing regulated revenue stream exposure in 2015 – not from utilities, but through toll roads with guaranteed rates of return – and most recently, through the acquisition of a diversified mid-stream investment which has brought our portfolio closer to the mid-point of our long-term strategic revenue targets.

FIGURE 5 TARGET PORTFOLIO ALLOCATION RANGES INCLUDING PORTFOLIO CHANGES DUE TO AN ILLUSTRATIVE MID-STREAM ACQUISITION



An essential component for generating long-term returns

Individual core infrastructure investments tend to have long lives, provide essential services to society, and are fundamental components of an efficient economy. Many will be critical to recovery as economies emerge from COVID-19, with assets that should continue to both serve their communities and generate potential returns for many decades.

InFRAME was constructed to form a new perspective on how to build a robust diversified portfolio of such investments. The results of InFRAME are routinely included in IFM Investors' decision-making processes and have become powerful tools for our infrastructure investment team. Not only can InFRAME enable investment professionals to better understand the risks posed by a particular asset, it aids in the search for long-term, resilient portfolio performance.

What is perhaps most notable about the InFRAME methodology is that although it is regularly reviewed, very little of its core suite of analytical tools has had to change since it was first launched in mid-2011.

We believe the long-term investment horizon and open-ended structure of our existing infrastructure strategies are well suited to InFRAME's design and, to this day, InFRAME continues to provide investment insight and differentiates our approach from others in the marketplace.

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About IFM Investors

IFM Investors was established more than 25 years ago with the aim to protect and grow the retirement savings of pension and superannuation fund members. Owned by a group of Australian industry superannuation funds, the organisation has A$151.3 billion under management as of 31 December 2020. Aligned with the objectives of our owners, IFM prioritises the interests of more than 510 like-minded investors worldwide by focusing on assets that combine excellent long-term risk/reward characteristics with broad economic and social benefits to the community. We actively engage on ESG issues with the companies in which we invest with the aim of enhancing their net performance while minimising investment risk.

Operating globally from offices in Melbourne, Sydney, London, Berlin, Zurich, New York, Hong Kong, Seoul and Tokyo, IFM Investors manages investments across infrastructure, debt, listed equities and private equity assets.

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