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A new approach to cost of equity for private infrastructure

C. Lennart Baumgärtner, Jorge Cárdenas Prieto, Cameron Hepburn and Robert A. Ritz

Infrastructure investment is a defining challenge of the current age. It spans electricity grids, water reservoirs and pipelines, airports, renewable energy, data centres and so on. It often involves large, long-lived and largely irreversible projects. A central challenge facing investors and regulators is, what rate of return is sufficient to compensate investors for risks borne?

In this context, CAPM, the finance and regulatory practitioner's workhorse model, often reaches its limits. First, empirical implementation can be challenging. It requires either that the asset in question is itself listed on the stock market or that suitable listed comparators are available. The former is likely never the case for a greenfield project. The latter has become challenging in that many infrastructure assets today are owned by private equity and the remaining listed companies are rarely pure plays (especially in energy). With poor listed comparators, CAPM-based hurdle rates may be very noisy (or biased). Second, CAPM's theoretical assumptions sit uneasily against characteristics of infrastructure investment: project risks are often skewed to the downside (for example, in construction cost overruns), infrastructure funds are far from fully diversified, investment faces political and regulatory uncertainty that cannot easily be hedged, and so on.

This paper develops a simple model of hurdle rates for equity investors that is closer to real-world practice. Unlike under CAPM, investors are less than fully diversified so also care about idiosyncratic risk. We refer to the simple model as the Infrastructure Risk Pricing Model; it prices total risk—a combination of overall capital market conditions and idiosyncratic risk. IRPM similarly easy to implement empirically as CAPM but is also less reliant on stock-market data and the existence of comparable companies. This is advantageous again especially for greenfield infrastructure—but also increasingly for brownfield infrastructure companies that are no longer listed.

Our main contribution lies in comparing the relative performance of CAPM and IRPM. We consider a setting in which the true model of expected returns is derived by a standard portfolio problem. This yields a general linear pricing equation which reflects how an asset's returns co-vary with the investor's portfolio. CAPM sits at one extreme where the investor fully diversifies by holding the market portfolio. IRPM lies at another extreme where the investor is undiversified and prices asset-level risk. We ask which simple model, as an approximation of the true model—as assumed to be given by general linear pricing—has the smaller (absolute) error in estimating the cost of equity.

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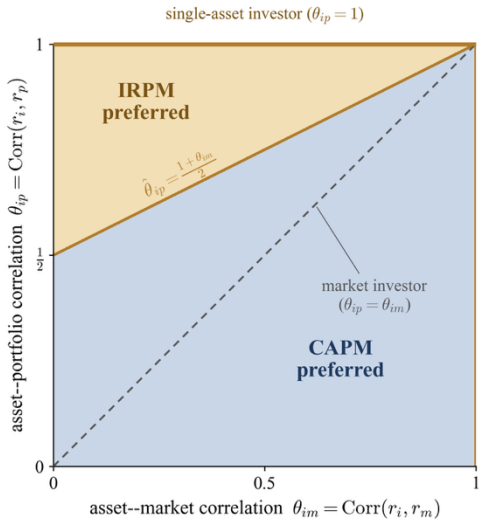
We find that IRPM does better than CAPM under a range of circumstances. An investor who holds the market always prefers CAPM. An investor who holds a single asset always prefers IRPM. The interesting cases lie in between; both simple models are wrong but which is less so? In particular, we show that investors for whom the returns on the asset are relatively more strongly correlated with their portfolio than with the wider market will prefer to employ IRPM. The intuition is that idiosyncratic risk matters for investors with such relatively concentrated portfolios—and so CAPM tends to underestimate their required returns. IRPM is skewed in the other direction by pricing idiosyncratic risk. Under a range of conditions, IRPM provides a better proxy of the true model than CAPM does.

The figure illustrates a benchmark result on the comparison between CAPM and IRPM. The comparison boils down to two metrics: (1) for the asset, its correlation with the wider (stock) market; (2) for the investor, the correlation between the asset and her portfolio. A fully-diversified market investor always prefers CAPM. An investor holding only a single asset in her portfolio always prefers IPRM (as the asset and her portfolio are interchangeable). The figure shows how the parameter space splits more generally.



The final part of the paper presents a case study of Sizewell C, a recent large government-backed new nuclear energy project in the UK. It was awarded in 2025 based on a competitive tender process, which cleared at a bid cost of equity of 10.8%. We argue that IRPM is able to rationalize observed investor behaviour while this outcome is very difficult to explain under CAPM (doing so would require an implausibly high β, even more so for losing bidders).

We also present an extension of the baseline model to incorporate the value of real options, and show that the main insights from the analysis are preserved.

Contact Robert Ritz, rar36@cam.ac.uk

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