REAL ESTATE RESEARCH

Should fund managers spend effort trying to diversify their portfolios?

How diversification improves risk-adjusted returns

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Executive Summary

Two potential fund acquisitions with similar standalone IRRs can make quite different contributions to a fund – not only by reducing the risk of the portfolio's returns *but also by increasing the expected return of the fund*.

This paper argues it is possible to improve a fund's risk-adjusted returns by gaining a detailed understanding of the volatility profiles of each property and selecting an asset based on not only its 'stand-alone returns' but also its correlation or diversification from the rest of the portfolio.

Understanding this little noted effect can help managers achieve significantly better fund returns and is the only true way to achieve 'risk-adjusted returns'.

This note lays out the theory and practical implications of this effect.

Summary

Two property portfolios can have identical expected cash flows and different mean internal rates of return. When asset outcomes offset one another, the modelled mean portfolio IRR can rise as volatility falls.

The acquisition question

Two acquisitions with similar standalone IRRs can make quite different contributions to a fund. A property that shares the existing portfolio's letting market and exit window may reinforce its downside. Another property with a different tenant base or lease expiry schedule may hold up in the same scenarios. Comparing the portfolio with each candidate added reveals that difference.

Evidence from a portfolio study

In a 2019 PREA Quarterly study, Radley Associates and the Ontario Pension Trust (OPT) modelled the pension fund's direct Canadian real estate holdings across 10,000 scenarios. The unleveraged portfolio's mean 10-year IRR was 7.11%, versus a weighted average of 6.81% for the individual property IRRs. Portfolio IRR volatility was 2.22%, compared with 3.32% for the weighted average of individual property volatilities.[1]

Holding the assets fixed

Take two properties that each cost $100, pay $10 after one year and sell for $56 or $132 after two years with equal probability. Each has a mean annualised IRR of 0% and expected receipts of $104. Varying how their exits move together changes the portfolio IRR distribution while preserving those expected cash flows at each date.

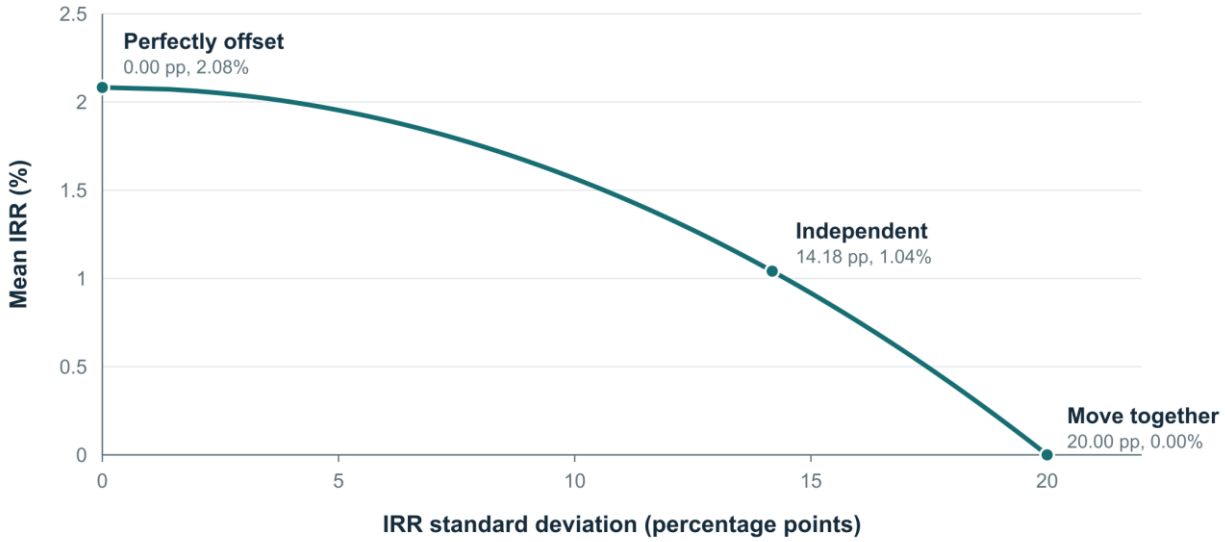


Figure 1. Modelled mean and standard deviation of annualised portfolio IRRs as exit dependence changes. The assets and initial weights are fixed.

Why the mean IRR rises in the example

IRR is the discount rate that makes net present value (NPV) zero. Let F be year-two sale proceeds per $100 invested and let z = 1 + r, where r is the annualised IRR. The year-one receipt is $10. Multiplying the NPV equation by z^2 gives a quadratic.

$$100 = \frac{10}{z} + \frac{F}{z^2} \Rightarrow 100z^2 - 10z - F = 0$$

The positive root gives the IRR as a function of the exit proceeds. Its second derivative is negative.

$$r(F) = 0.05 + \sqrt{0.0025 + \frac{F}{100}} - 1, r''(F) = -\frac{1}{40000\left(0.0025 + \frac{F}{100}\right)^{\frac{3}{2}}} < 0$$

This concavity makes the downside steeper than the upside. If one property exits at $56 and the other at $132, the combined exit is $94 per $100 invested. Its IRR is 2.0824%, above the 0% average of the two standalone rates. The curved line sits above the straight line joining the endpoint IRRs.

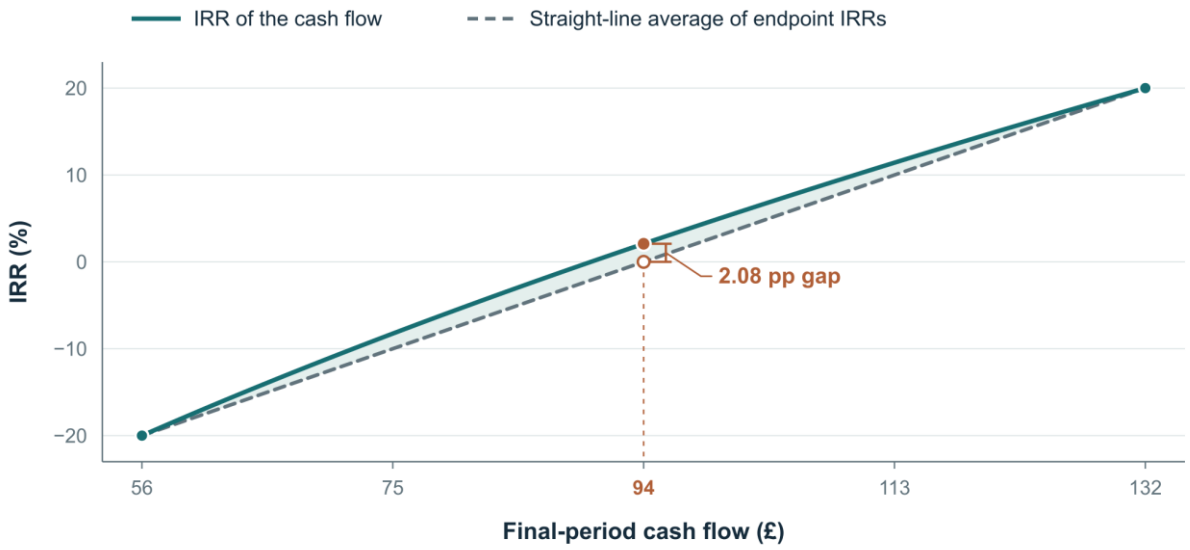


Figure 2. In a mixed exit scenario, combining the cash flows before solving for IRR gives the rate on the curve at $94.

Let p be the probability of a mixed exit and q the IRR at $94. Both low and both high exits each occur with probability (1 − p)/2, since the two properties have the same marginal exit probabilities. This gives the mean and variance behind Figure 1.

$$\mathrm{E}[r_P] = pq, \mathrm{Var}(r_P) = 0.20^2(1-p) + p(1-p)q^2$$

Independence gives p = ½ and a mean of 1.04%. By comparison, applying IRR directly to the expected cash flows gives 2.08% in every case. The order of averaging and calculating IRR changes the statistic.

The standalone IRRs are symmetric. With independent exits the portfolio IRRs become slightly negatively skewed even as their mean rises. This example shows that a reduction in negative skewness is unnecessary for the uplift.

When income and exit proceeds both vary

When interim and exit payments both vary, the direction of the IRR gap depends on which cash flows move together. For asset i, let I_i be initial capital, w_i its share of total initial capital, r_i its standalone IRR and C_{it} its signed cash flow after investment in period t. Let m be the weighted standalone IRR. Define P_{it} as the present value of C_{it} at r_i per unit of initial capital and x_i as the relative change in the one-period discount factor when moving to m.

$$m = \sum_i w_i r_i, P_{it} = \frac{C_{it}}{I_i(1+r_i)^t}, x_i = \frac{r_i - m}{1 + m}$$

For each asset, the P_{it} sum to one because NPV is zero at its IRR. Valuing the cash flows at m multiplies each P_{it} by $(1 + x_i)^t$. Subtract the initial capital and separate the term linear in x_i from the remaining curvature. This gives the pooled NPV per unit invested, $f_p(m)$.

$$f_P(m) = \sum_i w_i \left[x_i \sum_t t\, P_{it} + \sum_t P_{it} \left[(1+x_i)^t - 1 - t x_i\right]\right]$$

The first term depends on the timing of payments. The second captures the curvature of discounting. Since portfolio IRR r_p sets f_p to zero, for distinct rates on a decreasing NPV branch the gap equals the NPV at m divided by the average magnitude S of the NPV slope.

$$r_P - m = \frac{f_P(m)}{S}, S = \frac{f_P(m) - f_P(r_P)}{r_P - m} > 0$$

A positive NPV at the weighted rate places the pooled IRR above it. The timing and curvature terms can balance differently when rent, capital expenditure and sale proceeds all vary. With multiple cash-flow sign changes, check which IRR root is economically relevant.

Comparing strategies with PROMS

PROMS Investor projects property cash flows under shared economic scenarios and combines them at portfolio level. Keep the horizon and financing basis consistent when comparing an acquisition, disposal or change in weights. Examine the change in mean IRR alongside the probability of falling short of the fund's target and the cash required in adverse scenarios.[2]

Compare expected NPV at a common discount rate to separate a change in the IRR distribution from a change in the value of forecast cash flows. Then stress the assumptions behind diversification, particularly the tendency of rents, vacancy and exit yields to move together under pressure. The investment decision is whether the proposed portfolio better meets the fund's return and downside objectives across those conditions.

[1] Cardozo et al. A Practical Approach to Understanding CRE Portfolio Risk, Diversification, and the Impact of Leverage. PREA Quarterly, Fall 2019, Exhibit 2. Modelled results.

[2] Radley Associates. PROMS Investor and White Papers.