

Index smoothing and the volatility of UK property

Recent research from Tony Key and Gianluca Marcato addresses whether property indices understate property risk.

The property industry relies on valuation-based property indices – like IPD's – for forecasting, benchmarking and, these days, as the basis for derivatives markets. Academic researchers are unanimous that while indices may offer robust measures of period rates of return, they understate true property investment risk. So it is surprising to find that there is still no widely publicised or generally accepted measure of what the 'true' level of risk of property investment actually is – perhaps a disturbing omission now that property investment is being marketed to a much wider range of non-specialist investors.

That gap is not due to any shortage of analysis or suggested techniques to adjust property risk. A mass of academic articles do that, though they lack consistency in their estimates of what property risk really is because they use a variety of methods on data from different countries, index sources and time periods. Industry reports and fund prospectuses, on the other hand, frequently note that historic index results may understate investment risk, but tend to be coy about exactly how much, or the methods they used to tinker with risk figures.

Against that background, the IPF study had four main elements:

- First, from the academic literature, to revisit briefly the basis for the belief that valuation-based property indices are 'smoothed' and understate risk.
- Secondly, to identify techniques available to desmooth indices, and apply those methods to the standard UK index series to demonstrate how much estimates of property risk vary with choice of method and data used.
- Third, to explore how much desmoothing, which cranks up property risk, affects the weighting of property indicated by asset allocation models, in short whether desmoothing destroys the conventional risk reduction and diversification case for property.
- And finally, from an industry survey, to find out what desmoothing methods are used by leading fund managers and investment advisors, and whether there is in fact already an unrevealed consensus on the corrected, or true risk of property investment.

Our overall objective is to provide a basis for a broad industry consensus on the representation of property risk, not to devise new methods for adjusting risk, or even to recommend the use of any one method. Any estimate of true or adjusted property risk remains in part a matter of judgement, and leaves room for alternative views. In that spirit, the Desmoothing Project Spreadsheet available alongside the final report includes all the property data sets and formulae used in the work, with tools which allow the user to apply assumptions different from our own.

Why do we think property indices understate risk?

The idea that valuation indices understate risk rests on several, mutually supporting, sources of evidence.

For individual properties, we know that the valuations rely on backward-looking comparables, often surrounded by a large measure of uncertainty. Blundell and Ward (1987) were among the first to suggest that this makes valuations 'sticky'. They can be represented as a weighted average of the last valuation estimate and new market evidence, with the weights depending on the volume and quality of new evidence. In the language of behavioural finance, current valuations are partially 'anchored' on past valuations, and will therefore tend to smooth out shifts in the true market price.

On top of that pure valuation smoothing, constructing an index is done by adding up results for many individual properties. If those valuations are done at dates spread around the notional valuation date, and by different valuers who respond to the same market information with varying lags, the resultant index will again smooth out fluctuations in market prices (Matysiak and Brown, 2000). In effect, any shift in the underlying market is spread over a period of time in the valuation index.

So, from a mainly theoretical standpoint, it is likely that a valuation index will dampen shifts the prices which would be achieved on transactions, and therefore smooth out some of the true property risk. Since we have very little robust information on general movements in transactions prices, however, we cannot see directly how much risk may be understated.

But there is indirect evidence on that point in the behaviour of the index results. In an efficient market, financial theory suggests (Fama, 1965), it is impossible to predict changes in asset prices or total returns purely from their past performance – because traders would already have built that evidence into current prices. Returns will be a random walk, with no statistical relationship (serial correlation) between returns in one period and any previous period. Which is, broadly, what we see in equity and bond returns, but do not see in property returns (Figure 1).

Property index results in fact show a simple statistical linkage – serial correlation – between returns in successive periods. UK monthly and quarterly returns show very high serial correlation (as do annual returns for non-UK countries), which suggest returns measured at a high frequency are very heavily smoothed. This is, of course, unsurprising if we believe that rather little new



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Figure 1: Serial correlation in IPD returns

	Annual 1971-2005	Annual 1981-2005	Monthly 1987-2005	Quarterly 1987-2005
Serial correlation	0.28	0.42	0.87	0.85
T statistic	1.66	2.17	25.93	13.60
P value	0.06	0.02	0.00	0.00

market evidence arrives each month and therefore that monthly valuations are often carried over. For annual returns in the UK, however, the results suggest a rather weaker smoothing effect, with a low level of statistical significance over the longest available runs of history.

A further, more practical, pointer that property indices understate risk comes from the comparison with other asset classes. The fundamental nature of property cash flows, with mix of fixed-income and equity characteristics, and the fact that returns on property run between those on gilts and equities, suggest that property risk should also be above gilts but below equities. Index results, however, show UK property risk little more than two-thirds that on gilts – an implausibly low figure.

Finally, because property risk seems to have been very low in relation to its return, many studies (for example, Lee 2003) have demonstrated that asset allocation models run with index figures produce implausibly high weights of property in optimal asset portfolios. On our calculations, using unadjusted index figures on return and risk, the optimum historic portfolio of UK assets (defined by the maximum Sharpe ratio) should have held a minimum a property weighting from 30%, and up to 80%, depending on the period over which the exercise is estimated.

So, overall, there is a strong theoretical, empirical and practical case that valuation indices understate property risk, with a consistent picture from varying perspectives. The evidence leaves the analyst faced with a choice. Either the standard financial theories applied to all other asset classes cannot be applied to property, or index results have to be adjusted to fall in with financial theory, or more importantly with the asset allocation models used by investment practitioners.

Desmoothing methods and their results

Over 20 years, a string of academic articles have proposed a wide range of methods to correct for index smoothing (see, for example, Geltner, Macgregor and Swann, 2002). From this range, we have selected five which form a mainstream of the most widely used, and readily reproducible, desmoothing methods. They are all rooted in the basic proposition that a smoothed index is, like a valuation, the weighted average of past values and new market evidence. On this view, a desmoothed estimate of returns can be recovered from a series of valuation based by the formula:

$$\text{True return}_t = \frac{(\text{Valuation return}_t - k \times \text{Valuation return}_{t-1})}{(1 - k)}$$

Where k is a desmoothing coefficient taking a value between 0 and 1, which represents the weighting in current valuations of old market evidence. The set of five desmoothing methods, described in detail in our full report, elaborate on this basic theme, using alternative lags or calibration methods.

Our tests applied the five methods to UK indices over varying frequencies and time periods to tease out how far estimates of risk are sensitive to choice of method, or how long a run of history is used in the estimation, or to the criteria were used in the calibration of the desmoothing models. We were looking for a preferred method which was least likely to produce extreme and implausible results when applied to different data sets, and also preferably demand the least subjective judgement from the analyst. And we were looking for the most robust figure for long-run historic property risk, taken as the central estimate which emerged from the variety of methods and data sets.

These tests show a simple technical desmoothing solution. With what look like reasonable assumptions, the estimates of adjusted property risk run from less than that observed in the original index to three times that figure. Often, it is the more sophisticated methods which are more likely to produce extreme results, and often demand more judgemental input. We therefore regard the simplest Lag 1 autoregressive desmoothing technique, based on the formula above, as the most robust.

At the end of the day, our central, or preferred, estimate of property's long-run historic standard deviation in annual total returns is 13% to 15%, or 1.3 to 1.5 times that observed in the unadjusted index results.

The impacts of desmoothing on asset allocation

The dominant practical application of desmoothing property returns is to offer a more credible comparison of property with other asset classes, and to make property a better fit in standard asset allocation models. We have tested the impacts of varying desmoothing assumptions on the property weights indicated by models based on mean variance portfolio theory (MVPT) and asset liability modelling (ALM). Our preferred estimate of property risk is a base case for these exercises, but we also show the results of much more extreme desmoothing which doubles the observed risk.

Desmoothing does produce a significant change in the relationship between property and competing asset classes. Thus our preferred estimate of property standard deviation at 13% to 15% puts property risk in its expected position between equities and gilts (though still closer to the latter), and also results in higher correlations between property returns and those on equities and gilts returns. The increase in correlations with

equities and gilts however tends toward upper limits well below 1, so that property retains substantial diversification benefits even at extreme levels of desmoothing.

Even with reasonable levels of desmoothing, therefore, property remains an asset with moderate (rather than low) risk, and only mildly diluted diversification benefits. So asset allocation models using the standard MVPT methods continue to indicate high property weights with all but the most extreme desmoothing assumptions. When our preferred 13% to 15% estimate of property risk is used, indicated optimum property weight in historic portfolios remains in the range of 20% to 65% (depending on time period covered). And the weight of property falls below 10% only if property risk is assumed to be over 20%, more than double that shown by index figures.

Similarly, runs of ALM models show that with property risk adjusted to our preferred level, the indicated property weight falls in the range of 12% to 20%, and again the property weight falls below 10% only if the assumed property risk is more than doubled. Overall the property weights indicated by ALM methods are below those produced by MVPT models when run over the same period, but still well above the typical weights of institutional investors.

Industry practice in desmoothing and asset allocation

A survey of 13 leading fund managers, asset allocators and advisors was undertaken to gather opinions on the importance of desmoothing, use of desmoothing methods and the implications of desmoothing for their advice on property weightings in multi-asset portfolios.

There was general agreement that historic property risk is understated by valuation indices, and should be adjusted. A majority of firms use their own estimates of risk, mostly produced by the simplest Lag 1 autoregressive desmoothing method. Their estimates of true property risk averaged 13.8%, with almost all in the range 13% to 15%, falling in line with our own preferred estimate of risk.

The forward-looking assumptions used in asset allocation modelling reflected this view. Over a five to 10 year horizon, property returns were on average expected to run just under 7%, with an expected standard deviation a little over 13%, slightly higher correlations between property and other assets from those observed historically.

Run with these expected return profiles, quantitative asset allocation models indicated property weights in from 15% to as high as 50%. The typical advice to clients offered by respondents was, however, a recommended property weight in the range 10% to 15%.

Findings and conclusions

There is an overwhelming case that property valuation-based indices are smoothed, and property risk should be adjusted. We believe that the most robust estimate of long-run historic property risk is 13% to 15%, or 1.3 to 1.5 times that observed in the valuation index. And we find a fairly strong agreement among fund managers and investment advisors that expected property risk for the future lies in the same range.

Aside from those interested in the technical details, the most general point of interest is how far reasonable assumptions on desmoothing change the conventional case for property as a strong portfolio diversifier. As our full report discusses at length, the precise answer to that question depends on what period of history you choose to take as typical, and the details of your desmoothing method. But the general answer has two parts.

First, you have to combine very extreme desmoothing assumptions (more than doubling property risk to 20% or more) and use the worst available period of relative property performance (1980 to 2005) to cut away the historic case for property to a weighting below 10%.

And second, assuming property risk in future at our desmoothed estimate of 13% to 15%, alongside consensus expectations of returns across asset classes, quantitative asset allocation models continue to indicate optimum property weights above 15%, and often much higher.