IPF Research Programme 2006-2009

The IPF UK Consensus Forecast and the Returns Implied by Property Derivative Pricing: Evolution, Record and Influence

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IPF Research Programme Short Papers Series

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IPF Research Programme 2006–2009

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THE IPF UK CONSENSUS FORECAST AND THE RETURNS IMPLIED BY PROPERTY DERIVATIVE PRICING: EVOLUTION, RECORD AND INFLUENCES

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SUMMARY

- This report extends research undertaken for European Public Real Estate Association which analysed the IPF UK Consensus Forecast and the returns implied by property derivative market pricing. The new research examines the relationships between and the influences behind the evolution of the IPF Consensus Forecast and the returns implied by the derivative market's pricing. It also explores the factors behind their comparative "forecasting" records, in particular the failures to anticipate poor returns in 2007 and 2008.
- With hindsight, the implied returns calculated from the derivatives market's pricing have generally provided more accurate indications of future IPD returns than the IPF Consensus. This is mainly because the pricing in the derivatives market adjusted more quickly following the downturn in mid-2007. However, while the evidence is limited to that for forecasts made around 2006, the IPF Consensus to date has been a better indicator of the medium term outlook.
- The speed at which the downturn in mid-2007 occurred and the severity of the downturn was not anticipated in either the pricing of property derivatives or in the IPF Consensus Forecasts.
- The greatest problem was the substantial revision of rental growth prospects in the 2nd half of 2008. This is a factor which has since continued to weigh on property forecasts and performance. The initial reduction in the risk premium investors were implicitly demanding from property was the dominant factor during 2006/early 2007. Conversely, the reversal of this re-pricing of risk was the most influential factor behind poor performance and forecast downgrades in early 2008.
- Considering the evolution of implied returns to date, the derivatives market and the IPF Consensus for the most part have tracked each other with respect to their short and medium term return outlook. However, summer and autumn both in 2007 and 2008, were pivotal moments when the derivatives market prices reflected a changing outlook much more quickly than the IPF Consensus.
- The property derivatives market reacts more sensitively to changes in market "sentiment" than the IPF Consensus. In particular, it responds more to changes in growth expectations and risk appetite.
- The initial finding is that it does not take its lead from the listed property sector, if anything the derivatives market is ahead of the listed sector.
- There are indications that the divergence in portfolio valuations from underlying property market prices account for some of the variation in derivative prices.
- Caution must be attached to the estimation of the returns implied by property derivative prices. The market is maturing, liquidity varies, and pricing differs from other asset classes on account of property-specific characteristics which are difficult to control for. However, none of these undermine the conclusion that the derivatives market reacted more aggressively than the IPF Consensus to the changing outlook in the 2nd halves of 2007 and 2008.

1 INTRODUCTION

The IPF's *UK Consensus Forecast* has, since 1998, provided information on the outlook for commercial property. The emergence from the mid-2000s of an active property derivatives market has allowed us to observe a further measure of such expectations.

A companion report to this research, carried out for the European Public Real Estate Association (EPRA), has evaluated the comparative accuracy of these two measures compared to future return outcomes. This report extends the EPRA research by assessing the factors behind the IPF Consensus Forecast and its forecast errors (notably the failure to predict the severity of the downturn since mid-2007), and their relationship with the property market returns indicated by the property derivatives market. Of particular interest is the extent to which the influences driving the IPF Consensus and the property derivatives market are common or different. In this respect, the relationship between the pricing/property market returns indicated by the property derivatives market and the listed property sector is also of interest.

The aim of this analysis is to provide insights for property market forecasting and strategy, and a better understanding of the drivers behind pricing in the UK commercial property derivatives market. The focus is on interpreting the pricing of the property derivatives market, rather than on how to price derivatives.

Section 2 considers the property derivatives market, first outlining some conceptual issues and then illustrating the evolution since 2006 of the implied IPD performance indicated by property derivative pricing. Section 3 similarly profiles the evolution of the IPF Consensus Forecast, and then looks at the fundamental factors behind both its forecasting errors and the evolution of the forecasts over time. Section 4 compares the two sets of forecasts and the influences behind them. Sections 5 and 6 continue the latter analysis, looking respectively at the relationship with portfolio valuation lags and with the listed property sector. Section 7 presents the conclusions. Technical information is provided in Appendices 1-3.

2 THE RETURNS INDICATED BY THE PROPERTY DERIVATIVE MARKET'S PRICING

2.1 Conceptual issues around the pricing of property derivatives

Property derivatives, or more accurately property total return swaps, took off in the UK in the mid-2000s. Previous IPF research, *Pricing Property Derivatives: An Initial Review*, reviewed the theoretical issues around their pricing; the authors have subsequently extended their research. There is also an insightful paper by David Geltner and Jeffrey Fisher[1]. The IPF's *Getting into Property Derivatives*[2] provides a more general overview. Three points on the pricing of derivatives and specifically those relating to commercial property should be noted[3]:

1. For most financial asset classes, LIBOR, a low risk asset class, is being swapped for a more risky asset class (e.g. equities) and the expected net difference in the transaction should be the risk premium of the latter over LIBOR[4]. The risk premium at any particular time, however, is difficult to determine.
2. Property derivatives provide advantages over direct property. For example, the opportunity afforded by property derivatives to avoid relatively high transactions costs, illiquidity etc should be reflected in their prices.
3. Another important factor likely to affect commercial property derivative prices is any discrepancy between the portfolio-based valuations on which derivatives indices are based (e.g. the IPD Index) and commercial property prices in the underlying market; the so-called valuation lag. The derivatives price has to reflect any lag, otherwise it would be more attractive for an investor (say) increasing their exposure to buy a property whose price has fallen to reflect market conditions rather than a derivative whose index is lagging. Similarly, any such lag provides information on the future performance of the index; this information should be reflected in derivative prices.

The extent to which the pricing of commercial property derivatives reflects lags in the valuation-based IPD indices is considered in Section 5.

In this report, the approach to quantifying the IPD returns implicit in derivative market pricing corresponds to that suggested in Getting into Property Derivatives. The most difficult element is incorporating the risk premium into the calculation. To ignore it would lead to systematic bias. There are few options easily available other than to assume a long term rate, in this case taken to be 1.75% over LIBOR based on previous research (see Appendix 1 for further details and discussion of this issue)[5].

A number of factors indicate some caution should be exercised over detailed interpretation of the analysis. These include the difficulty in incorporating the risk premium into the returns implied by property derivative prices, the other property specific factors reflected in pricing, and the on-going maturation of the market. These caveats, however, should not detract from the broader estimates and findings.

[1] *Pricing and Index Considerations in Commercial Real Estate Derivatives*, Journal of Portfolio Management, 2007.

[2] *Getting into Property Derivatives,* IPF, 2008

[3] The effect of counter-party risk and how this may have affected property derivatives prices since the onset of the banking crisis may also be of interest. Academic research suggests that the affect in general is negligible, while feedback from traders indicates no significant change since the banking crisis.

[4] Note that from January 2008 property derivative prices were changed to fixed quotes.

[5] Being relative to LIBOR, the 1.75% estimate is lower than other estimates which are benchmarked against gilts. Note that the other possible option of using the risk premium implicitly assumed in IPF Consensus forecasts would introduce circularity.

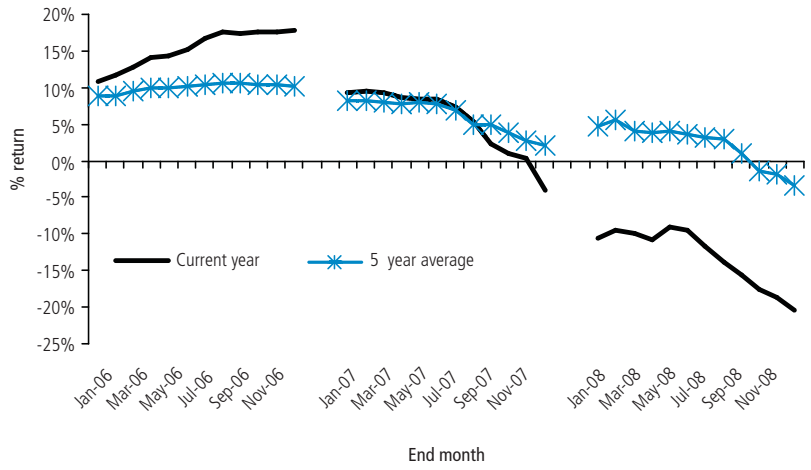
2 THE RETURNS INDICATED BY THE PROPERTY DERIVATIVE MARKET'S PRICING

2.2 The IPD returns implied by derivative market pricing

The implied returns (incorporating the risk premium) for the current year and for the 5 year average are illustrated in Figure 2.1.

Implied returns were on an upward trend throughout 2006 and a downward one during most of 2007 and of 2008. As demonstrated later, similar tendencies are evident in the IPF Consensus Forecast. What is particularly notable are the pivotal downgrades during July-September 2007 and July-October 2008. These account for over half the total downgrade between the start and end of 2007 and around three-quarter's of 2008's total downgrade respectively. The downgrades to the 5 year outlook were particularly sharp in September and October 2008, the time when the banking crisis escalated. In 2007, these sharp downgrades also began the same month the IPD Monthly index deteriorated (although this information was published in the following month) while in 2008 they began ahead of the marked deterioration in the IPD index; this was also the period when problems at the failed investment bank, Bear Stearns, surfaced.

Figure 2.1: Monthly evolution of the total returns (incorporating risk premium) indicated by derivative market pricing



Source: Author's calculations

3 THE IPF CONSENSUS FORECAST AND ATTRIBUTION

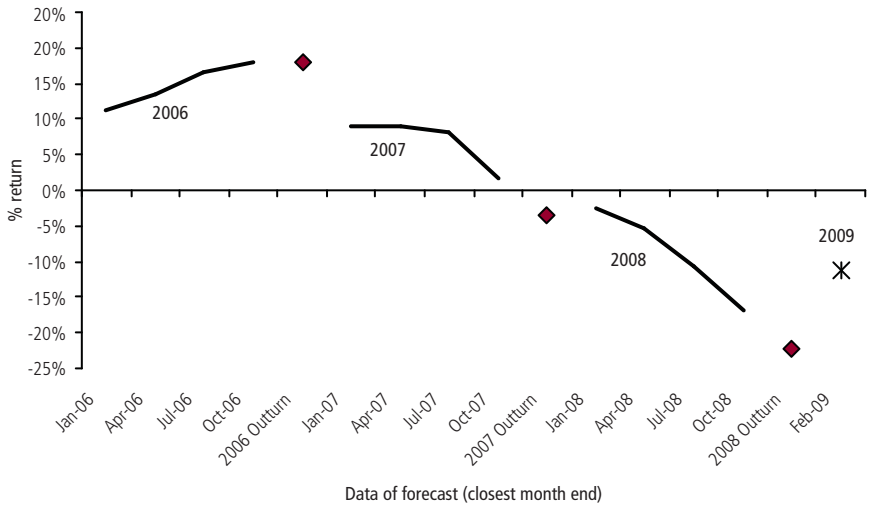
3.1 The IPF Consensus Forecast

The IPF's UK Consensus Forecast Survey started in 1998. Every 3 months, around 30 forecasters, from the property fund management, equity broking, and agency and consultancy sectors contribute their forecasts on IPD total returns, capital and rental growth. Forecasts for each of the next 3 calendar years and for the 5 year average (from which the average over the final 2 years can be inferred) are requested. Only forecasts made within the past 3 months are accepted. Examination of the February and May 2009 survey responses reveals that, on average, forecasts were compiled 3-4 weeks prior to the submission deadline. The dates shown in this report relate to the submission deadline. The results are published approximately 2 weeks after the deadline for submissions.

3.2 The evolution of the IPF Consensus Forecast since 2006

Figures 3.1-3.3 illustrate the evolution (and, where available, the outturns) of the current year, 3 and 5 year forecasts of total returns from the IPF's Consensus Forecast. The analysis begins in 2006, in order to correspond to the information available on the property derivatives market[6].

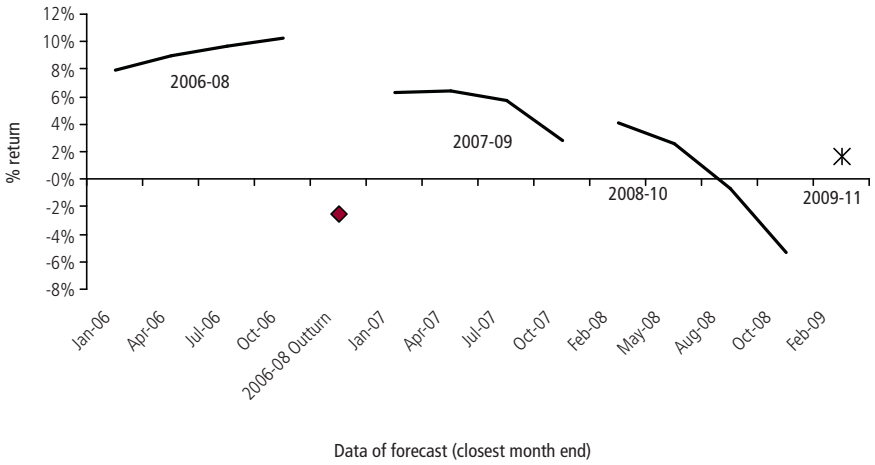
Figure 3.1: Evolution of the IPF Consensus current year total return forecast



Note: ✳ is the Feb 2009 consensus for each graph.

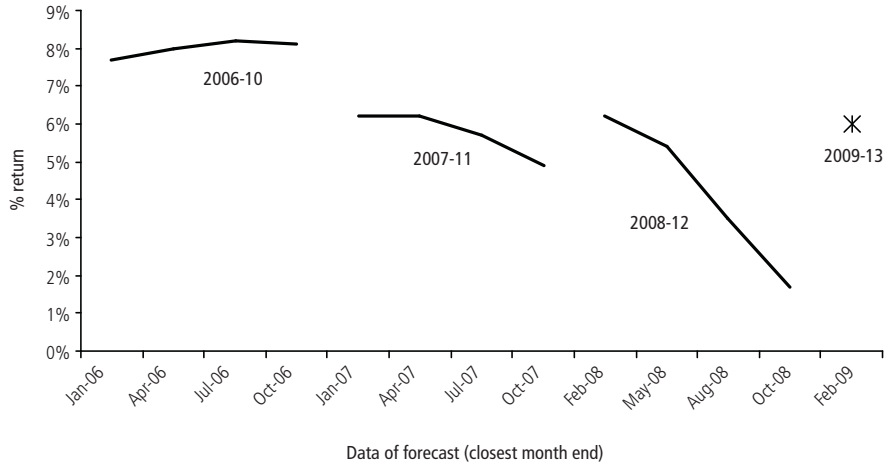
[6] Analysis of the IPF Consensus Forecast's track record up to 2004 is available from earlier IPF research - see McAllister, P. Newell, G. and Matysiak, G. 2006, *Disagreement and Uncertainty in UK Property Market Forecasts*, IPF, London.

Figure 3.2: Evolution of the IPF Consensus 3 year average total return forecast



Source: IPF, IPD

Figure 3.3: Evolution of the IPF Consensus 5 year average total return forecast



Source: IPF

3 THE IPF CONSENSUS FORECAST AND ATTRIBUTION

Three features are particularly notable:

i. The same tendency identified in earlier IPF research[7] for their to be systematic bias in the forecasts of total returns, in this case for the current year forecasts;

ii. The poor, absolute forecasting record of the IPF Consensus as demonstrated so far in the current year forecasts for 2006, 2007 and 2008 and, even more so, for the 3 year forecasts made in 2006; and,

iii. The sharp downgrades to the current year forecasts and to the 3 year forecasts between July and October 2007 and between May and October 2008; and,

iv. the sharp downgrades to the 5 year forecasts between May and October 2008.

3.3 Attribution - IPF Consensus Forecast errors and evolution

To understand the factors behind this poor 1 and 3 year forecasting record of the IPF Consensus and the sharp downgrades between July and October 2007 and between May and October 2008, an attribution of performance has been undertaken. In essence, the approach[8] attributes variations in total returns/capital growth to 3 components:

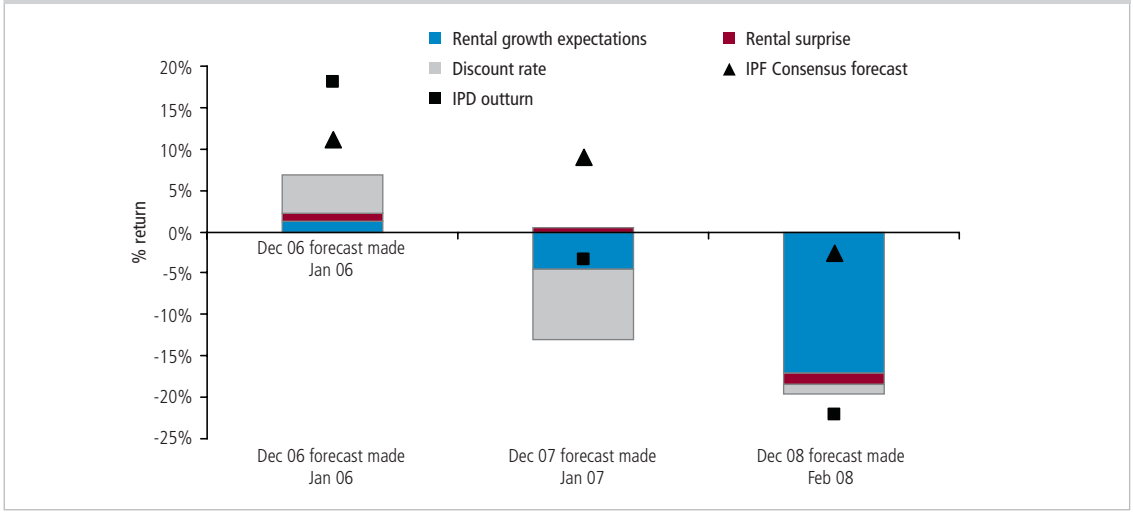
i. *Rental surprise* - the difference between the growth which was predicted and the outturn. A positive rental surprise should increase capital values and returns;

ii. *Changes in expectations of future rental growth* - Again, there is a positive effect on capital values and returns; and,

iii. *Changes in the discount ("hurdle") rate,* with an increase lowering values and returns. This effect can be broken down into changes in interest rates and in the risk premium over and above these interest rates.

Figure 3.4 presents the indicative ex-post attribution of the one year IPF Consensus Forecast errors over the period 2006-2008.

Figure 3.4: Ex-post attribution of the current year IPF Consensus total return forecasts



Source: authors' calculations, IPF, IPD

[7] See footnote 6

[8] Corresponding to the approaches adopted by Schofield, JA, *An attribution of the return on the UK commercial property market*, Journal of Property Finance, 1997, and occasionally by the Bank of England, for example *Financial Stability Review*, December 2005. See Appendix 2 for further details.

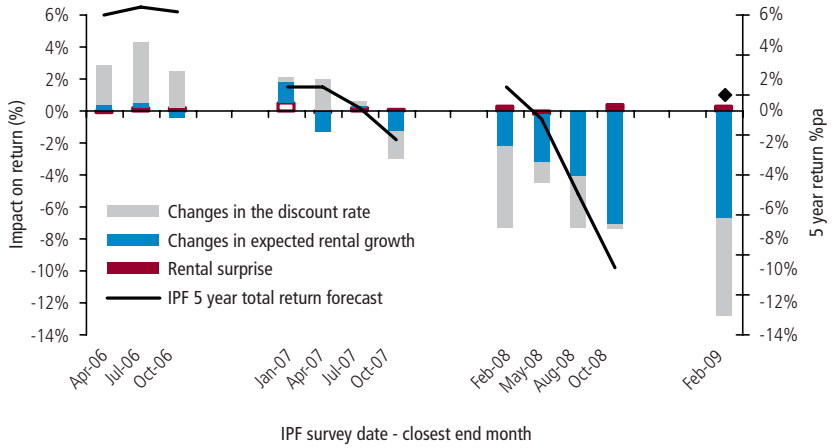
3 THE IPF CONSENSUS FORECAST AND ATTRIBUTION

In both 2006 and 2007, the major source of the IPF total return forecast error was attributable to the discount rate. In particular, property's risk premium fell more than the Consensus implicitly expected in 2006, and rose unexpectedly in 2007.

In 2008, the major source of the error was the downgrading in medium term rental growth expectations - the IPF 5 year rental forecast fell from an average of 1.6% per annum at the beginning of 2008 to -3.1% per annum at the start of 2009.

Figure 3.5 presents a similar type of analysis, this time considering successive IPF Consensus surveys and the impact between surveys of changes in expectations of rental growth etc on capital values and total returns. The impacts of changes in expected rental growth and the rental surprise are analysed on exactly the same basis as in Figure 3.4 above. That of the discount rate is different, given the technical difficulty in working it out on the same basis. Instead, the long run discount rate consistent with the IPF Consensus rental growth forecast is calculated. This also requires assumptions on long term rental growth, depreciation and other costs; these are outlined in Appendix 2. The estimates in Figure 3.5 relate to the impact of the change in this implied discount rate compared to the previous quarter.

Figure 3.5: Attribution of 3 month changes in IPD capital values vs. IPF Consensus Forecast of total returns



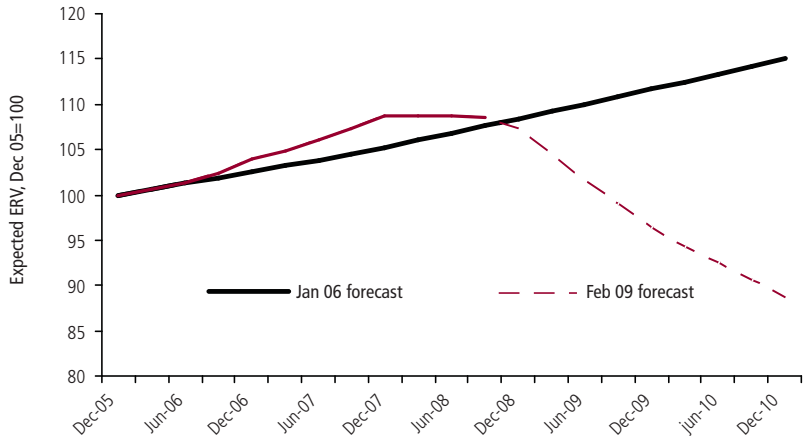
Source: authors' calculations, IPF, IPD

The figure illustrates the dominant effect of a lowering in the discount rate throughout 2006 (in practice this was a lowering in the risk premium). It also yields insights on the sharp downgrades in the return forecasts between July 2007 and October 2007 and between May 2008 and October 2008:

- Those in the late summer of 2007 reflected both reductions in expected rental growth and an increase in the discount rate (effectively the risk premium);
- Those in the summer and autumn of 2008 were largely associated with downgrades to expected rental growth, although there was also a sizeable impact resulting from an increase in the discount rate.

Figure 3.6 suggests that the level of rents in 2010 is now expected to be 23% lower than was predicted by the IPF Consensus in January 2006. This downgrading has been the major source of the decline in both the IPF total return forecast and the fall in capital values compared to December 2005 (which, co-incidentally, is 23%).

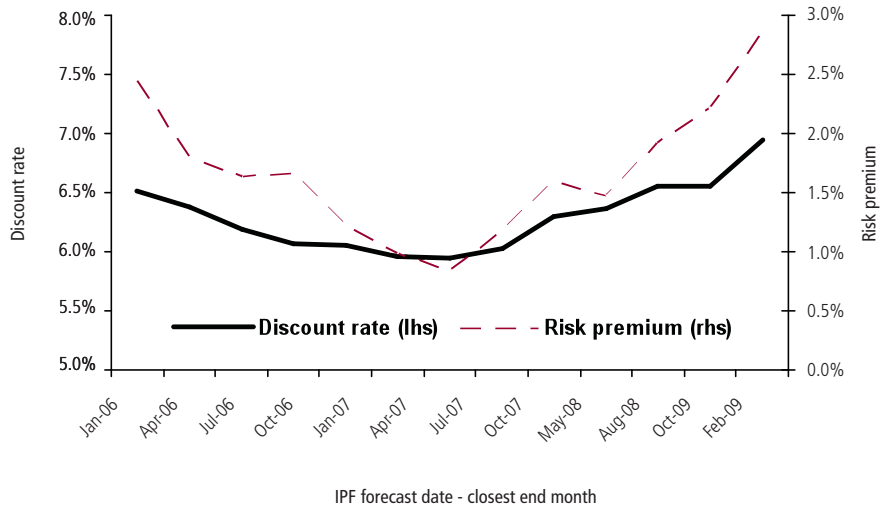
Figure 3.6: December 2010 rental values implied by IPF Consensus Forecast rental growth: January 2006 forecast vs. February 2009 forecast



Source: authors' calculations, IPF, IPD

Figure 3.7 shows how the implied discount ("hurdle") rate, in particular the risk premium, has increased since December 2005, having first fallen and then risen sharply. Over the period as a whole, the impact on the IPF Consensus Forecast of total returns and on capital values has been relatively small (although obviously larger from the mid-2007 peak in the market).

Figure 3.7: Evolution of the long-term discount rate and risk premium implied by IPF Consensus Forecast rental growth

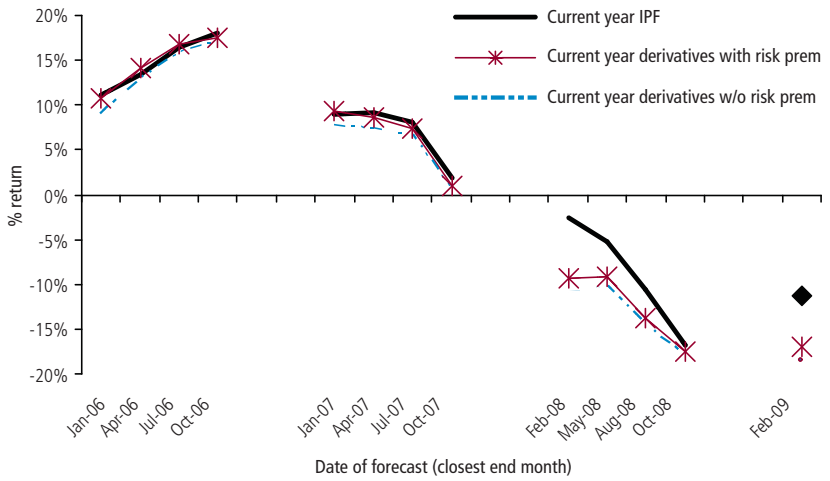


4 COMPARISON OF THE IPF CONSENSUS AND THE RETURNS INDICATED BY THE DERIVATIVES MARKET

4.1 The comparative evolution of the forecasts

Figures 4.1 and 4.2 compare the evolution of the forecasts of total returns made by the IPF Consensus and the returns indicated by derivative market pricing.

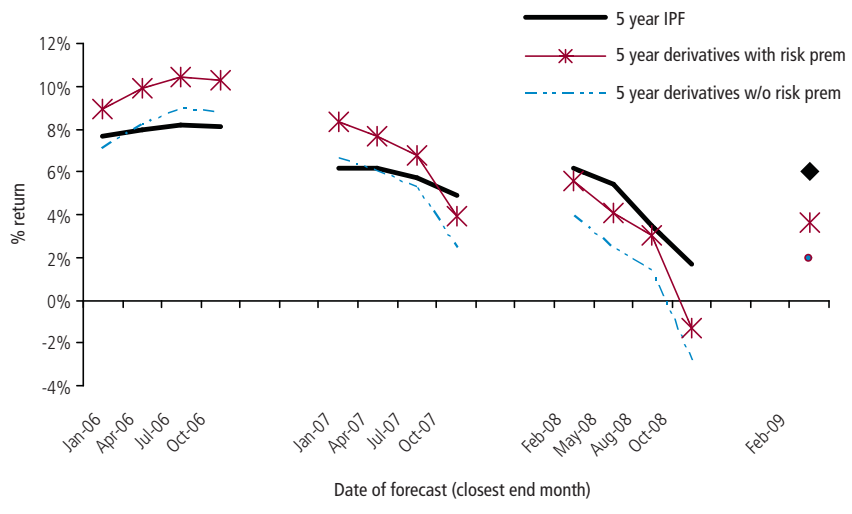
Figure 4.1: Comparative evolution of the current year IPF Consensus Forecast of total returns



Source: authors' calculations, IPF

For the current year forecasts, Figure 4.1 indicates the IPF Consensus and the derivatives market closely tracked each other in both 2006 and 2007. In 2008, the IPF Consensus started higher and then converged with the derivatives market's view as the year-end approached.

Figure 4.2: Comparative evolution of the 5 year average IPF Consensus Forecast of total returns



Source: authors' calculations, IPF

4 COMPARISON OF THE IPF CONSENSUS AND THE RETURNS INDICATED BY THE DERIVATIVES MARKET

For the longer term, 5 year forecasts, the derivatives market moved ahead of the IPF Consensus in 2006, initially remained more optimistic in 2007 and then downgraded sharply, and has since remained more pessimistic than the IPF Consensus. A similar pattern is evident in the 3 year average forecasts.

The most notable feature of the longer term view in Figure 4.2 is that the derivatives market downgraded more aggressively than the IPF Consensus both at the start of the banking crisis (when Bear Stearns' problems first surfaced) in the 2nd half of 2007 and then again when the banking crisis escalated in autumn 2008. Statistical analysis confirms that the derivatives market is generally more sensitive than the IPF Consensus.

The conclusion is that the derivatives market has been more responsive than the IPF Consensus. This is not associated with any specific factor. Statistical analysis confirms that when both the rental outlook and the discount rate are changing, the derivatives market changes its medium term total return forecast more aggressively than the Consensus. This was particularly the case when appetite for risk was growing in 2006, and when risk appetite and growth prospects were diminishing in 2007 and 2008.

4.2 Comparative ex-post forecasting record

An ex-post comparison of the IPF consensus forecasts and the implied return estimated from the property derivatives market is detailed in a companion report prepared for EPRA, *The Information Content of Property Derivatives `(forthcoming).* The key findings are shown in Table 4.1 below. It utilises one measure of ex-post forecast accuracy, the mean square percentage error (MSPE)[9].

Table 4.1: Comparison of Forecast Outcomes Derived from Derivative Prices and the IPF Consensus

Time before IPD outturn*	Average forecast error (MSPE)		
	Derivative implied returns not including risk premium	Derivative implied returns including risk premium	IPF Consensus
One period	-1.7	-2.1	-3.1
Two period	-11.1	-13.1	-14.8
Three period	-12.8	-16.3	-19.2
One year	-12.0	-16.7	-19.9
Two years	-34.9	-43.3	-30.4
Three years	-34.8	-39.3	-36.3

* one period is roughly 3 months and would relate to the current year forecast made this amount of time before the year end and so on. One year would relate to the forecast made approximately 1 year in advance.

As the table shows, the implied return from the derivatives market is generally more accurate than the IPF Consensus (this applies whether or not the property risk premium is taken into consideration in the calculation). The exception is the medium term (2 and 3 year) horizon, where the IPF Consensus is slightly better - although it should be noted, in this respect, that the evidence to date is very thin.

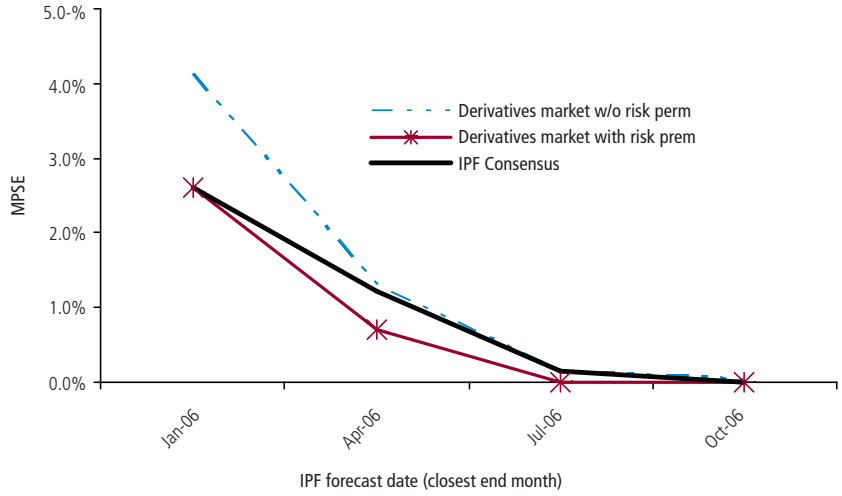
[9] The MSPE represents how accurate the implied forecast derived for either the derivatives price or the IPF consensus is compared to the actual IPD return outcome for each year. To allow for the fact that sometimes the forecast error will be positive and in other instances it will be negative, in the MSPE calculation, the forecast error is squared. This forecast error is then divided by the actual outcome so the importance of the forecast error is measured relative to the size of the return outcome.

4 COMPARISON OF THE IPF CONSENSUS AND THE RETURNS INDICATED BY THE DERIVATIVES MARKET

The EPRA report discusses some of the reasons for these results, including a tendency for IPF contributors to prepare their forecasts a month or so in advance of the submission date.

In each of the charts below, the improvement in the forecast accuracy of the implied derivatives return and the IPF Consensus Forecast, as the year-end approaches can be observed. Each chart represents the information available from the years 2006, 2007 and 2008.

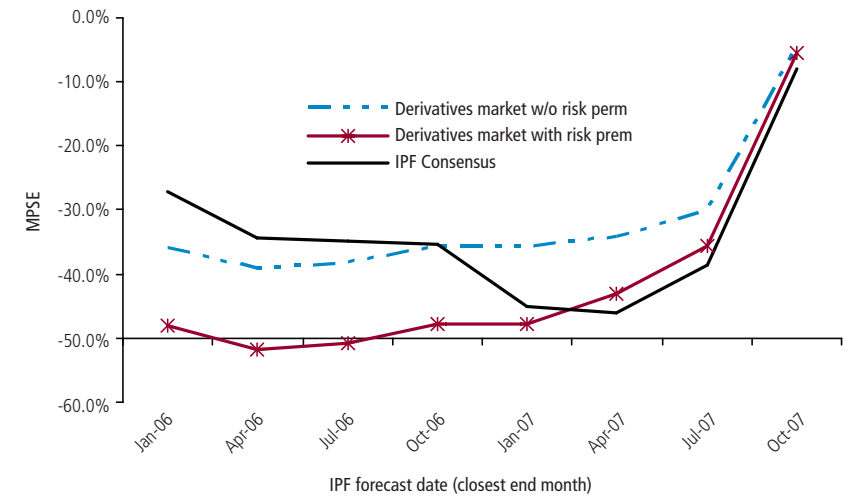
Figure 4.3: Mean percentage square errors of forecasts for calendar 2006 by date of forecast



Source: authors' calculations, IPF

In the early part of this chart the IPF Consensus estimates provided a slightly more accurate forecast of the 2006 total return than the implied return from the derivatives contract. It must be remembered that in early 2006 the derivatives market was still relatively underdeveloped at this time.

Figure 4.4: Mean percentage square errors of forecasts for calendar 2007 by date of forecast

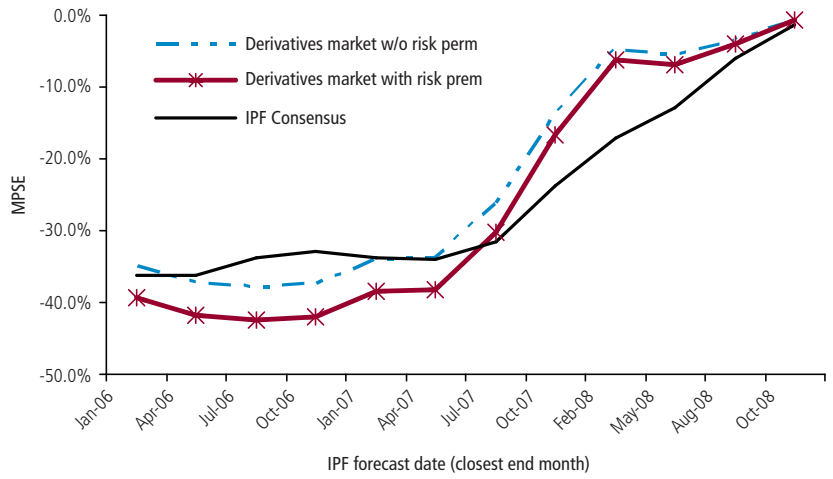


Source: authors' calculations

4 COMPARISON OF THE IPF CONSENSUS AND THE RETURNS INDICATED BY THE DERIVATIVES MARKET

In 2007 a similar pattern emerges; the earlier forecasts from the IPF Consensus were slightly more accurate than the implied return estimates from the derivatives market. However, after the middle of 2007 - the period of the banking crisis - the returns implied by derivative market pricing tend to be more accurate. In both instances, it is clear that market expectations in 2006 and the early part of 2007 severely overestimated the returns for 2007.

Figure 4.5: Mean percentage square errors of forecasts for calendar 2008 by date of forecast



Finally the forecast errors for the December 2008 contract show how rapidly market expectations changed in late 2007 and early 2008. However, the chart demonstrates how these lower expectations were more rapidly incorporated into derivatives prices than into the IPF Consensus estimates.

5 VALUATION SMOOTHING AND DERIVATIVE MARKET PRICING

Over the last 5 years, property market practitioners have constantly pointed to discrepancies between valuations (which are the basis of the IPD indices) and the prices paid and received in the market for commercial property assets. In 2005 and 2006, the anecdotal evidence was that prices in the market were racing ahead of valuations, while in 2008 and early 2009 the talk was of valuations being well above market prices.

Geltner and Fisher[10] argue that such valuation lags have important implications for derivative pricing. For example, if the valuation lag is expected to correct itself over the next year, the spread on the forthcoming year's contract should reflect this adjustment.

In order to consider whether derivatives pricing moves in line with potential bias in the IPD Index, the amount of over/under valuation is derived from an estimate of the unsmoothed annual index obtained using Geltner's (1993) unsmoothing procedure[11].

This analysis suggests that valuations underestimated the growth in the market over the 2004 to 2006 period. Valuations also appear to have lagged the market during the downturn, with IPD estimates appearing to significantly understate the fall in returns during 2007 and 2008.

Table 5.1 shows the estimates of this valuation lag/smoothing bias in the IPD Annual Index (a positive estimate indicates that the portfolio-based valuations were less than market prices, and vice versa) at the beginning of the years from 2006 to 2009. The unsmoothing procedure shows that there was a degree of under-valuation in the end-2005 IPD Index, while the 2007 and 2008 IPD indices display a significant amount of over-valuation bias.

These are compared with the 1 year derivatives prices and the corresponding implied IPD returns. If the valuation lag were the sole factor in derivative pricing, the smoothing bias and the derivative price (spread over LIBOR) would be equal.

The estimates in the table do not display this exact correspondence; however, the broad magnitudes are comparable. This indicates the valuation lags in the IPD Annual Index explain a large part of property derivative pricing but that there are other factors (such as the transactions costs savings and liquidity advantages over direct property) also affecting derivatives prices.

Table 5.1: Derivative market prices and implied returns for the current year vs. IPD Annual Index smoothing bias at start of year

Beginning year	Derivatives price - spread over LIBOR %	Implied 1 year IPD return (incl risk premium) %	Smoothing bias %
2006	4.5	11.2	1.7
2007	1.6	9.4	0.5
2008	-17.0*	-10.4	-11.5
2009	-19.0*	-16.9	-14.6

* - fixed prices re-estimated as spread over LIBOR.

Importantly, it must be acknowledged that this conclusion is dependent on the unsmoothing procedure adopted. Also it is not clear over what time frame the market expects valuations to move to the correct level. Hence caution must be exercised in directly comparing the columns in the table above. However, these findings point to the need for further research on the connection between appraisal smoothing and derivatives prices.

[10] Op cit.

[11] For more information on the issue of unsmoothing see the IPF report *Index Smoothing and the Volatility of UK Commercial Property*. For a more technical explanation consult Geltner et al (2007) or Bond and Hwang, Smoothing, Non-synchronous Appraisal and Cross-Sectional Aggregation in Real Estate Price Indices, Real Estate Economics, 2007.

6 THE LISTED SECTOR, DERIVATIVE MARKET PRICING AND THE IPF CONSENSUS FORECAST

Past research has considered the relationship between listed ("public") and direct ("private") property markets, in particular the speed and direction in which information is incorporated by the 2 markets.

It is typically found that information is first incorporated into listed property markets (this reflecting the faster pace of transacting in public markets) and then more slowly into the direct market. Such a process can also be examined for the property derivatives market, i.e. does knowing information about one market (either derivatives or listed property) help predict movements in the other market?

This type of question can be explored through a *Granger Causality* test. The comparison in this instance is made between monthly changes in the price of the EPRA UK listed property index and monthly changes in the rolling 5 year average IPD return implied by derivative market pricing, for the period January 2006 to December 2008.

This analysis revealed in Table 6.1 below shows that movements in the derivatives market helped to forecast changes in property company returns[12].

Table 6.1: Grange Causality Tests. Monthly Returns in UK Property Companies and Implied Returns from Property Derivatives

Null Hypothesis:	Obs	F-Statistic	Probability
EPRA_UK does not Granger Cause DERIVATIVES	32	0.19287	0.90026
DERIVATIVES does not Granger Cause EPRA_UK		4.65287	0.01021

Some caution should be exercised when interpreting these results as the timing of the data might not precisely correspond. However, it does allude to the intriguing possibility that the information transmission mechanism may be different between listed property companies and property derivatives. Further the information on changes in the derivatives market may offer valuation information about future movements in the listed property sector.

[12] This is confirmed by the non-rejection of the null hypothesis that returns on the EPRA UK index do not Granger cause changes in implied returns in the derivatives market i.e. the test accepts the idea notion that EPRA UK returns do not 'cause' implied returns from property derivatives. However, on the last line of the table, the null hypothesis that changes in implied returns in the derivatives market do not Granger cause changes in UK property company returns is clearly rejected. i.e. the test suggests that they do.

7 CONCLUSIONS

This report has documented several important findings on the IPF Consensus Forecast and information about future implied returns derived from the derivatives market. Firstly, the information obtained from the derivatives market tended to provide a more accurate indication of future property return outcomes than did the IPF consensus forecast. However, the difference was small and was more pronounced for the near term outcomes. Overall the two measures tended to move in line with each other, with the exception being the periods around autumn 2007 and autumn 2008, when the derivatives market tended to respond more quickly to the downturn than the IPF Consensus.

A second finding is that when the forecast inaccuracies were analysed for the IPF consensus, it was found that in 2006, the IPF Consensus forecast for 2006 was too conservative because it under-predicted the favourable decline in the risk premium investors attached to property, whilst the opposite applied to its forecast for 2007. A large downgrading in rental growth prospects in the 2nd half of 2008 and a corresponding rise in yields accounted for most of its substantial under-prediction for 2008.

A third important finding of this study is that there is empirical evidence linking the valuation lag in the IPD index to the pricing for property derivatives. This is generally important for forecasting IPD returns and for pricing property derivatives.

Finally, when movements in the derivatives market and the listed property sector are considered, there is some evidence to suggest that changes in the derivatives market are helpful in predicting price changes in the listed sector.

APPENDIX 1: DERIVATIVE MARKET PRICING AND IMPLIED PROPERTY MARKET RETURNS

The IPF's *Getting into Property Derivatives* briefly outlined how to derive the IPD total returns implied by property derivative market pricing. The principle is that, in a perfect market, the net present value of the expected cashflows from the swap should be zero.

With respect to these cashflows, property total return swaps were initially priced on the basis of 3-month LIBOR plus a fixed spread (positive or negative): the seller received this payment every quarter while the buyer received the IPD Annual Index total return on the 31 March following the December year-end. However, the first IPD and LIBOR payments depended on the date of the contract: the property payment was based on the total return between the most recent month's IPD Annual Index estimate at the time of the contract and December year-end while the first LIBOR payment related to the period between the month-end of the latest IPD Annual Index estimate and the next quarter-end.

As an illustration, Table A.1 presents these cashflows for December 2006 and December 2007 contracts made on 24 November 2006 priced, respectively, at LIBOR+800bps and LIBOR+265bps. The forward 3-month LIBOR rates are derived from LIBOR spot rates; these LIBOR rates are also used to discount the future cashflows. For each contract, the final year's implied property payment is that which sets the NPV of the cashflows to 0. With the latest monthly Annual Index estimate relating to end October, 2 months' worth of property payments for 2006 are due and the implied payment of 2.2% is compounded to the IPD Annual estimate return to October of 15.1% such that a calendar year return of 17.6% is implied.

Table A.1: Cashflows, and property returns implied by derivative pricing, November 2006

	Dec 2006 contract		Dec 2007 contract	
Date	**Cashflow**	**Description**	**Cashflow**	**Description**
31 Dec 06	-2.2%	Payment of 2 months of LIBOR+8%	-1.3%	Payment of 2 months of LIBOR+2.65%
31 March 07	**2.2%**	The receipt which sets NPV of the cashflows to 0. Equivalent to the Implied property return Oct 06 - Dec 06	0.2%	Receipt of implied property return Oct 06 - Dec 06 less payment of 3 months of LIBOR+2.65%
30 June 07			-2.0%	Payment of 3 months of LIBOR+2.65%
30 Sept 07			-2.0%	
31 Dec 07			-2.0%	
31 March 08			**7.4%**	The receipt which sets the NPV of the cashflows to 0. Equivalent to the implied property return Dec 06 - Dec 07

In January 2008, the pricing convention changed to a fixed rate[13]. Table A.2 illustrates the cashflows and derivation of implied property returns for December 2008 and December 2009 contracts priced on 30 October at, respectively, -1800bps and -1600bps. LIBOR is used as the discount rate in the NPV calculations.

For the current calendar year contract, the implied property return simply turns out to be the price (in this case -1800bps).

[13] Other than changing the basis on which prices are quoted and the approach to calculating implied returns, the switch from LIBOR to fixed pricing has little effect as the floating LIBOR payments could have been hedged, at negligible cost, against fixed in the interest rate swaps market.

APPENDIX 1: DERIVATIVE MARKET PRICING AND IMPLIED PROPERTY MARKET RETURNS

Table A.2: Cashflows, and property returns implied by derivative pricing, October 2008

	Dec 2006 contract		Dec 2009 contract	
Date	**Cashflow**	**Description**	**Cashflow**	**Description**
31 March 09	**-18.0%**	The receipt which sets NPV of the cashflows to 0. Equivalent to the Implied property return Dec 07- Dec 08	-2.0%	Receipt of implied property return for Dec 07 - Dec 08 less payment of -16.0%.
31 March 10			**-13.9%**	The receipt which sets the NPV of the cashflows to 0. Equivalent to the implied property return Dec 08 - Dec 09

Accounting for a risk premium

In most financial markets where total return swaps are typically priced with a negligible spread over LIBOR, the implied returns calculated in the same way as in Table A.1 would approximate to LIBOR. This does not make sense: LIBOR, a low risk asset class, is being swapped for a more risky asset class (e.g. equities) for which the buyer of the swap would expect a higher return (i.e. a risk premium). This suggests a risk premium should be added to the estimates to derive the implied returns. The same applies to property.

The ex-ante risk premium, for property as well as all other asset classes, is very difficult to determine and this applies even more so to the property derivatives market which so far is less integrated with the physical market and less mature than other derivatives markets. Furthermore, there is empirical evidence that the risk premia investors demand from both property and other asset classes vary over time.

Simply ignoring this difficult issue of accounting for the property risk premium, however, would systematically under-estimate the returns implied by property derivatives. In the IPF's *Multi-asset allocation in the modern world* report, institutional investors were found to be assuming a *prospective* long term property risk premium of 2.1% over 10 year gilts, which is in line with Paul Mitchell Real Estate Consultancy's historic *ex-ante* estimate of 2.0%. Given the yield difference over the last few years between 10 year LIBOR and 10 year gilts of about 35bps, a property risk premium of 1.75% over LIBOR is assumed.

Because the current calendar year return for a derivatives contract struck (say) in October is less uncertain than for a contract struck at the beginning of the year, the property risk premium for current year contracts is pro-rated according to the number of months of unknown property returns which remain. This fits in with the suggestion in the IPF report *Getting into Property Derivatives.*

Data on property derivatives prices.

Merrill Lynch's data on property derivatives prices from February 2006 are used. Where necessary, these were supplemented by data either provided by Andrew Baum or extracted from the websites of the various brokers. Comparison of the various sources does reveal differences in estimates for some periods, although these are not big enough to affect substantially the conclusions. Mid-prices (the average of the purchaser's "bid-price" and the seller's "offer-price") are used throughout.

APPENDIX 2: ATTRIBUTION OF THE IPF CONSENSUS FORECAST RETURNS

The attribution analysis in Section 3 is based on the premise that asset values are the discounted value of expected future cash flows; similar approaches to attributing the performance of property have been used by Schofield (1997) and the Bank of England in its December 2005 *Financial Stability Review*.

On this basis, changes in property capital values can be attributed to changes in expectations of rental income growth, changes in the discount rate, and the extent to which any realised income has not meet previous expectations.

To undertake the analysis, a quarterly cash flow model (extending to perpetuity) was established to be roughly representative of "All Property" in the IPD Annual Index. It comprised 20 leases with 5 year upwards only reviews: 10 leases had evenly spread 10 year terms, the other 10 had 20 year terms, implying an average unexpired term of 8.25 years. Voids were also included.

The models were refreshed every quarter with the realised rental and capital values and future income based on the latest IPF Consensus ERV growth forecast and the lease structures.

A further step of inputting the previous period's IPF Consensus ERV growth forecasts allows an estimation of the impact on capital value of any changes in these growth expectations and of any difference between any realised income and that which was implied by the previous period's forecast. These impacts are referred to in Section 3 as, respectively, those resulting from *changes in expectations of future rental growth* and from *rental surprise*.

Given capital values and expected income, the long term discount rate can be inferred from the cash flow model (the risk premium is the residual of this discount rate and the risk-free rate which is assumed to be the 10 year gilt yield). The impact on capital values of changes in this discount rate between periods can be calculated in the way described above; these are the estimates illustrated in Figure 3.5[14].

Some additional assumptions are required in the inputs to the cash flow model. IPF Consensus rental growth assumptions are only available up to the 5th calendar year - from the 6th year to perpetuity, the historic long term rate (in real terms, -0.5%) is assumed. Allowances are also made for costs. In line with evidence from the IPF's *Depreciation in Commercial Property Markets* capital expenditure, averaged across the IPD Universe, of 0.75% per annum is assumed. Other costs (e.g. property management, ground rents etc) at 3% of gross income are assumed.

[14] This discount rate calculation does not have to be undertaken in the ex-post attribution of the IPF Consensus total return forecasts illustrated in Figure 3.4. The component attributable to the discount rate is simply the residual. This component, as well as that in Figure 3.5, will also incorporate any errors in the cash flow model.

APPENDIX 3: VALUATION SMOOTHING

The process used to unsmooth the IPD annual estimates is based on Geltner (1993). The key assumption underlying this procedure is that current valuation estimates are only partially based on information from new transactions, also relevant will be the valuation used in the previous period. Formally, this situation is presented as:

$$V^*_t = \alpha V_t + (1-\alpha)V^*_{t-1} \quad \text{(A3.1)}$$

where V^*_t is the current valuation for a property, V_t is the value based purely on current market evidence, and V^*_{t-1} is the valuation from the previous period. The parameter α represents how much weight is placed on current market evidence. The above equation can also be expressed in terms of returns, rather than values, in a straightforward manner, that is:

$$R^*_t = \alpha R_t + (1-\alpha)R^*_{t-1} \quad \text{(A3.2)}$$

where R^*_t is the current (valuation-based) return, and R_t is the return based only on current market evidence. As before, the parameter α represents how much weight is placed on current market evidence. An important requirement is that a model such as this, that is based on evidence from an individual property valuation, can be applied to an aggregate index, such as the IPD index. Bond and Hwang (2007) show what happens if this assumption is not valid. However, for this analysis we will assume the model above holds. If that is indeed the case the model can be solved for the unsmoothed or purely market-based return series, that is

$$R_t = \frac{R^*_t - (1-\alpha)R^*_{t-1}}{\alpha} \quad \text{(A3.3)}$$

The α parameter can be estimated using the ordinary least squares technique in a regression of the IPD return on its past value. In the current study the value of this parameter ranges from 0.34 to 0.38, depending on the sample period chosen.

Note that in order to operationalise the unsmoothing procedure, two important steps were taken. Firstly, the undersmoothing correction is only applied to the capital growth return series, as the income component of returns is not subject to the same valuation smoothing problem. Second, the return series are deflated to allow for inflation (as the historical returns series commences in 1971) before the above procedure is carried out. After the unsmoothed growth series is calculated, the annual inflation rate is then applied to the series in order to create a nominal capital growth data series. It is at this point that the income component of returns is added back to the capital growth series to produce an unsmoothed total return series.

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