IPF Research Programme 2011–2015

REPORT

Reassessing the Accuracy of UK Commercial Property Forecasts

This research was commissioned by the IPF Research Programme 2011–2015

NOVEMBER 2012

This research was funded and commissioned through the IPF Research Programme 2011–2015.

This Programme supports the IPF's wider goals of enhancing the understanding and efficiency of property as an investment. The initiative provides the UK property investment market with the ability to deliver substantial, objective and high-quality analysis on a structured basis. It encourages the whole industry to engage with other financial markets, the wider business community and government on a range of complementary issues.

The Programme is funded by a cross-section of 22 businesses, representing key market participants. The IPF gratefully acknowledges the support of these contributing organisations:

Aberdeen
AVIVA INVESTORS
BERWIN LEIGHTON PAISNER
BNP PARIBAS REAL ESTATE
British Land
CoStar Group Real Estate Information
Deloitte.
GIC
Grosvenor
Hammerson
Hypothekenbank Frankfurt
On the pulse of the property world IPD
Jones Lang LaSalle Real value in a changing world
KAMES CAPITAL
LaSalle Investment Management
Legal & General Investment Management
NABARRO CLARITY MATTERS
PRUPIM
REAL CAPITAL ANALYTICS Transactions. Trends. Tools.
Scottish Widows Investment Partnership
Standard Life Investments
Strutt & Parker

Reassessing the Accuracy of UK Commercial Property Forecasts

Report

IPF Research Programme 2011–2015

November 2012

Research team

George Matysiak, *Henley Business School, University of Reading*
Dimitrios Papastamos, *Henley Business School, University of Reading*
Simon Stevenson, *Henley Business School, University of Reading*

Project Steering Group

Gerald Blundell, *Consultant*
Rob Martin, *Legal & General Investment Management*
Ben Sanderson, *Hermes*
Dr. Edward Trevillion, *SWIP*
Pam Craddock, *IPF*

CONTENTS

Reassessing the Accuracy of UK Commercial Property Forecasts

1. EXECUTIVE SUMMARY

This research assesses the accuracy of UK commercial property forecasts over the period 2000–2011. Utilising IPF UK Consensus Forecast data, a number of aspects in the performance of these forecasts are considered. One of the key findings is that forecasters tend to avoid 'big numbers' in their forecasts. This is particularly evident in 2008. Whilst the finding for 2008 needs to be placed in the context of the large movements in the market that year, more generally, this feature may be attributable to herding and conservatism against providing extreme forecasts. It appears that forecasters tend to overestimate capital growth and total rates of return during periods when the market is performing poorly and vice versa during strong market conditions. The difference in the relative accuracy of capital growth and total return versus rental growth figures is evident in the analysis. Overall, the level of accuracy is highest for rental growth forecasts. This implies that forecasters have greater difficulty in forecasting capital growth and total returns, probably due to the difficulty in accurately gauging and incorporating factors such as investment behaviour and flow of funds and their consequent impact on values and yields.

As would be expected, accuracy varies depending on market conditions. Diminshed accuracy is observed during downturns, although this finding may be unduly influenced by extreme market movements in 2008. In contrast, for the one-year-ahead forecasts for 2011 all consensus error metrics were at their lowest values for 10 years. 2011 was one of the best years on record for commercial real estate forecasters.

Other key findings include:

- There is no consistent or conclusive evidence that the consensus forecasts are better than those using a naïve forecasting rule and, indeed, are often worse. However, these findings are based on the 'average', that is, the consensus. It does not mean that individual forecasters may not be doing a good job;
- On balance, consensus rental growth forecasts tend to be more accurate than naïve-based forecasts;
- For one-year-ahead capital growth and total return forecasts, long-term averages (up to the date of forecast) are relatively more accurate than consensus forecasts some 80% of the time and almost 75% of the time for two-year-ahead forecasts;
- A significantly strong correlation between the one-year-ahead forecast of rental growth and actual rental growth is observed, highlighting the ability of forecasts to capture aspects of the underlying occupier market;
- There is no evidence that forecasts are biased in a systematic sense, continually under or overestimating the outcome. This is the case for both one- and two-year-ahead forecasts for rental growth, capital growth and total return; and
- Overall, the forecast range for capital growth and total return has increased over the last four years.

2. INTRODUCTION

This research updates an earlier study commissioned by the Investment Property Forum and conducted by McAllister, Newell and Matysiak (2006). That research considered the period 1999–2004 whilst this study extends the timescale of analysis, covering the period 1999–2011. The extension of the dataset brings into consideration extreme movements in the market, both during the later stages of the boom and, in particular, during 2008, when considerable negative movements were observed. The extreme movements seen in the post-2004 period therefore make a re-consideration of the accuracy of property forecasters of particular importance. The previous research found strong evidence of consensus amongst forecasters, based upon the forecasts' distribution being normal. It is, therefore, of notable interest whether this degree of agreement was maintained during the more volatile market conditions observed subsequently. This study broadly adopts the same methodological framework as used in the previous work, in order to facilitate comparison, and provides some additional analysis, particularly of the accuracy of two-year-ahead forecasts.

Forecasting methods have become an integral part of the decision-making process for many major financial institutions in relation to their property investment portfolios. Improved data has facilitated the use of forecasts in the context of asset allocation and fund strategy. The potential uses and benefits of effective econometric forecasting are obviously enhanced during periods of uncertainty, which the last five years effectively characterise. Harris and Cundell (1995) were one of the first to note the importance of a robust and scientific approach in the investment process, stating that "the market crash which traumatised the property industry between 1991 and 1994 has led the institutions in particular to seek greater predictive input to their portfolio management and investment decisions" (p.76). However, the ability of forecasters to effectively forecast during periods of market instability is key and the prime motivator behind revisiting this issue.

As with all considerations of real estate markets, the peculiarities of the data analysed need to be taken into account. Undoubtedly, smoothing in commercial real estate indices presents an issue for forecasters. This is especially so in the context of the data considered here, as it is based on the performance, and forecasting, of the indices produced by the IPD.

2.1 Forecast uncertainty and accuracy

There are various studies that have focused on the issues of forecast evaluation and accuracy, including Diebold and Mariano, 1995; Granger and Pesaran, 1999; Pesaran and Skouras, 2000; White, 2000; Stekler, 2007; Lahiri and Sheng 2010a. In order to evaluate whether forecasters make efficient use of available information through minimising systematic errors, a number of evaluation criteria can be employed. The most common methods are error criteria such as the mean forecasting error (MFE), mean absolute error (MAE) and root mean square error (RMSE) (Makridakis et al. 1998).

Although the choice of an appropriate model obviously plays a key role in determining the accuracy of the forecast, Stekler (2007) and Hendry and Clements (2003) note several possible reasons as to why models may fail to provide accurate forecasts. These include model mis-specification, the use of inaccurate data, the characteristics of the individual forecasters and the presence of structural breaks that can affect the deterministic trend. Oller and Barot (2000) show that problems with data can lead to large forecast errors. For example, both Stock and Watson (1993) and Fintzen and Stekler (1999) note that series that had previously managed to capture anticipated economic downturns failed to do so for the early 1990s recession in the United States.

2. INTRODUCTION

The characteristics and behaviour of the individual forecasters are additional features that may affect forecasting performance. Gjaltema (2001) argues that forecasters are distinctive social entities with different individual characteristics that interact in different socio-political contexts. This can, therefore, influence the forecast outcomes. Furthermore, Fintzen and Stekler (1999) argue that the manner in which individuals prepare their forecasts can affect their accuracy. One key behavioural element is that forecasters may deliberately 'bias' their forecasts. There are a number of studies that have argued that forecasters may not necessarily attempt to maximise forecast accuracy and may be motivated by factors such as their reputation when they release their forecasts. (Ehrebeck and Waldmann, 1996; Laster et al. 1999; Pons-Novell, 2003). In line with this idea is the study of Hong and Kubik (2003), where they find that the prospects of promotion inside a firm guide analysts to produce optimistic forecasts (i.e. biased upwards). There is no doubt that optimistic forecasts generate trades, since this attracts investment funds looking to buy shares of profitable companies, for example. The study by Dechow et al. (2000) is consistent with this idea and they find evidence that the forecasts from banks having business relationships with target firms tend to be more optimistic than forecasts from 'de-motivated' forecasters.

Laster et al. (1999) note that the publicity that occurs on a forecast's release may affect the outcome, leading possibly to deliberately biased forecasts. Croushore (1997) argues that "some [survey] respondents might shade their forecasts more towards the consensus (with the purpose to avoid the negative publicity when wrong), whilst others might take unusually bold forecasts to stand out from the crowd." According to 'incentive concavity' theory, the rewards from making an accurate but bold (i.e. different from the consensus) forecast are smaller than the penalties of an inaccurate bold forecast (Batchelor, 2007). Lamont's (2002) study showed that the feature of herding (i.e. forecasts close to the consensus) is less common with less experienced forecasters. However, Pons-Novell (2003) did not find any relationship between the age of forecasters and herding in the long-running US Livingston Survey.[1] Thus, it is not clear that the incentive to be close to the consensus should increase with the age. However, forecasters also try to avoid large adjustments to their releases (Scotese, 1994). Batchelor and Dua (1991) observe that forecasters display conservatism in order to be closer to the consensus. This means that forecasters revise their forecasts by less than is warranted by new information, rather waiting until later revisions of data are available before adjusting their models. However, the overall result may be biased forecasts. In line with this view are the findings of Isiklar et al. (2006) who report that it took forecasters more than five months to incorporate 90% of new information.

Batchelor (2007) notes three possible reasons why forecasters may publish persistently biased forecasts. One is the lack of appropriate skills and forecasters' inability to utilise efficiently new information. In other words, forecasters fail to learn from past forecast errors and, as a result, this guides them to produce biased forecasts. The second reason is that forecasters, because of the insufficient data they are using, fail to explain which of the changes in the target variable are permanent and which are transitory. Put differently, they assign an equal weight to each, resulting in biased forecasts. The third possible reason, as has already been noted, is the financial or reputational incentives that make forecasters produce either pessimistic or optimistic forecasts.

[1] The US Livingston Survey has been running since 1946 and surveys a panel of expert forecasts on the outlook for the United States economy.

2. INTRODUCTION

The relationships of forecasting organisations with governments play a crucial role in the production of biased forecasts. There is no doubt that in each country there are forecasting bodies affiliated with governments who have their reasons for making biased forecasts. Heinemann (2006) showed that official medium-term projections of economic growth in Germany have been persistently optimistic for several decades, and this has allowed the German government to base its spending plans on unrealistically high projections of tax receipts for many years. In line with this finding is the study of Jonung and Larch (2006), who find that the over-optimism is also a distinctive feature in the macroeconomic forecasts for other European countries such as Italy and France, though not in the UK. Additionally, Batchelor (2007) documented the presence of systematic bias in the real GDP forecasts, and, to a lesser extent, in the inflation forecasts of private forecasters in some of the G7 economies (i.e. Japan, Italy, Germany, France, the United States, Canada and the UK). Specifically, he found in countries such as Japan, Italy, Germany and France that, when the trend in real GDP had been falling over the sample period, 1990–2005, forecasters tended to be optimistic (imparting an upward bias). By way of contrast, in other countries such as the United States, Canada and the UK where GDP did not fall, he did not observe the same bias. As Batchelor (2007) noted "forecasters seem to start their forecasting round by adopting a relatively optimistic or pessimistic view of growth. Forecasters who start optimistic one year also start off being optimistic in other years. These biases persist throughout the forecasting cycle, as more information about the target variable, and the forecasts of other forecasters, arrives" (p. 202).

In addition to the Batchelor (2007) study, Ager et al. (2009), by implementing the pooled approach of Clements et al. (2007), analyse the performance of consensus macroeconomic forecasts, published by Consensus Economics, for 12 countries (Germany, Belgium, Canada, France, Italy, Japan, the Netherlands, Spain, Sweden, Switzerland, the United States and the UK) over the period 1996 to 2006, looking at bias and information efficiency. The application of the pooled approach gave them the opportunity to evaluate the rationality in macroeconomic forecasts as the time horizon progresses (i.e. 24 forecasts for every target year). They detected a significant common bias for the GDP growth forecasts for Italy and Germany, this result being in line with the Batchelor (2007) findings. It was argued that the overestimation in GDP forecasts for these countries stemmed from the fact that, given the sharp slowdown in trend growth rates during the period 1990–2005, this made forecasters smooth their GDP forecasts (i.e. upward bias the forecasts). Additionally, it was found that the longer the forecasting horizon, the greater the bias in the macroeconomic forecasts. This finding is also in line with the Isiklar and Lahiri (2007) study, whose survey demonstrated that long-horizon forecasts (i.e. more than 18 months) do not have much value compared to naïve no-change forecasts. Furthermore, regarding the efficiency of GDP forecasts, their results were also consistent with Batchelor (2007). They did not find any evidence in favour of weak efficiency in the 12 countries, an issue that confirms the results of Nordhaus (1987) about the incentives of forecasters to smooth GDP forecasts. However, their results were more encouraging regarding inflation forecasts, where they found that forecasters were weakly efficient in information processing in Belgium and the UK.

Lahiri and Sheng (2010b), in their study on the inflation and GDP forecasts for the G7 countries, concluded that forecasters are more confident in predicting inflation rather than GDP. They noticed that forecasters in these countries: (i) produce more accurate forecasts (i.e. make smaller forecast errors), (ii) disagree to a lesser extent and (iii) revise their inflation forecasts much earlier in comparison with real GDP forecasts. Consistent with these findings is the study of Dovern and Weisser (2011) who examined rationality, that is the level of bias and efficiency in the macroeconomic forecasts, i.e. GDP, GNP, CPI and consumer spending for the G7 countries, using panel analysis. They found that forecasters who managed to predict accurately the real GDP growth are also likely to perform well in forecasting other macroeconomic variables. Furthermore, in terms

2. INTRODUCTION

of the level of bias, they found that forecasters produce unbiased inflation forecasts in comparison with GDP forecasts, which they tend to smooth, contrary to the other macroeconomic forecasts they make. Specifically, they found that forecasters tend to bias their GDP forecasts in periods of structural breaks that cause sudden changes in the trend of the variable. Both of these studies reveal that forecasters feel more comfortable in predicting the movements in macroeconomic variables, such as inflation and consumption, rather than GDP.

A further behavioural characteristic is that forecasters have a tendency to overestimate growth rates when the market underperforms and vice versa (Zarnowitz and Braun, 1993). The source of this behaviour comes from the statistical properties of optimal forecasts, which state that the variance of the forecasts must be less than the variance of the actual values (Mincer and Zarnowitz, 1969; Samuelson, 1976). However, Smyth and Ash (1981) show that this relationship (i.e. greater variance in the actual values than in forecasts) exists for the longer forecasting horizons and not for the shorter ones. This is because, for shorter horizons, forecasters, knowing the actual data, use their judgment to adjust estimates appropriately. Thus, as forecasting is a dynamic procedure, forecasters have to use their judgment during the entire process. McNees (1990) and Donihue (1993) both highlight the importance of judgmental adjustments on the predictive accuracy of econometric models. For example, McNees (1990) found that adjusted Bayesian Vector Autoregression models were more appropriate than unadjusted ones, concluding that judgmentally-adjusted forecasts were more accurate than those generated in a purely statistical/econometric manner. There is further empirical evidence (Lahiri and Sheng, 2010a) that shows how individual judgment can determine forecast uncertainty and in turn the forecast accuracy. According to Lahiri and Sheng (2010a) the individual forecast error (e_{ith}) can be defined as:

Equation 2.1:

$$e_{ith} = A_t - F_{ith}$$

where A_t is the actual value of the variable of interest and F_{ith} represents the forecast value of the variable made by agent *i*, for the target year t and h-quarters ahead to the end of the target year. Following the notation of Lahiri and Sheng (2010a), the individual forecast error (e_{ith}) can be written as the sum of a common component to all forecasters, denoted as λ_{th} and the idiosyncratic errors (e_{ith}):

Equation 2.2:

$$e_{ith} = \lambda_{th} + \varepsilon_{ith}$$

Equation 2.3:

$$\lambda_{th} = \sum_{j=1}^{h} u_{tj}$$

The common component term λ_{th} captures the cumulative effect of all shocks that occurred from *h*-quarter ahead to the end of target year *t*. It can be observed from equation (2.3), that the accumulation of shocks is equal to the sum of each quarterly shock u_{tj} that occurred during the forecasting horizon. Furthermore, the forecast process cannot be perfect, even in the absence of unanticipated shocks, due to reasons such as the individual judgment of forecasters, the availability of sufficient information and the variety of forecasting models that each forecaster elects to use. All these factors, that may lead to forecasts being imperfect, are incorporated in the idiosyncratic error ε_{ith}.

2. INTRODUCTION

Previously, it has been mentioned that each forecaster decides the form of the methodological framework that is going to be implemented in the estimation of their forecasts. All these distinctive characteristics are incorporated into the idiosyncratic errors ε_{ith}. But, as can be observed from equation 2.2, the idiosyncratic errors ε_{ith} are a part of the total forecast error. Therefore, since forecast accuracy is determined by the minimum forecast errors, it can be noted that individual judgement that affects the idiosyncratic errors will also play a crucial role in determining the accuracy. Additionally, Lahiri and Sheng (2010a) define the observed disagreement among forecasters by using equations 2.1 and 2.2 as follows:

Equation 2.4:

$$d_{th} = \frac{1}{N-1}\sum_{i=1}^{N}(F_{ith} - \frac{1}{N}\sum_{j=1}^{N}F_{jth})^2 = \frac{1}{N-1}\sum_{i=1}^{N}(\varepsilon_{ith} - \frac{1}{N}\sum_{j=1}^{N}\varepsilon_{jth})^2$$

This is achieved by making the appropriate assumptions necessary to ensure that the individual forecast error in equation 2.3 is a zero-mean stationary process for any forecasting horizon *h*. This means that it is assumed that the aggregate shocks are uncorrelated over time and horizons, and that there are mutually uncorrelated idiosyncratic errors and uncorrelated common component and idiosyncratic errors. From equation 2.4 it is clear that the observed disagreement among forecasters is equal to the variance of their corresponding forecast errors. Next, by taking the expectations of equation 2.4, the following can be noted:

Equation 2.5:

$$D_{th} = E(d_{th}) = \frac{1}{N-1}\sum_{i=1}^{N}E(\varepsilon_{ith} - \frac{1}{N}\sum_{j=1}^{N}\varepsilon_{jth})^2 = \frac{1}{N}\sum_{i=1}^{N}\sigma^2_{\varepsilon|ith}$$

This leads to a result that the expected disagreement among *N* forecasters will be equal to the average variance of idiosyncratic errors in equation (2.2). Finally, the individual uncertainty can be defined as the variance of the individual forecast errors:

Equation 2.5:

$$U_{ith} = Var(A_t - F_{ith}) = Var(\lambda_{th} + \varepsilon_{ith}) = \sigma^2_{\lambda|th} + \sigma^2_{\varepsilon|ith}$$

where U_{ith} denotes the individual uncertainty. From equation 2.6 it is clear that the forecast uncertainty is the sum of the variance of the accumulated shocks over the forecasting horizons $h(\sigma^2_{\lambda|th})$ plus the variance of the idiosyncratic errors $(\sigma^2_{\varepsilon|ith})$. The methodology of Lahiri and Sheng (2010a) is good example of how the individual judgment of each forecaster can affect the success (i.e. minimum forecast errors) of the total forecasting process.

In conclusion, there is an extensive literature in evaluating forecasting accuracy. Some of the key factors that may affect forecasting performance and some of the techniques that can be utilised in improving forecasting accuracy are presented in this report.

3. DATA AND METHODS

3.1 Background and property forecast data

The data used in this research consists of forecasts for rental growth, capital growth and total return for the UK commercial real estate sector. The data was provided by the Investment Property Forum (IPF) and is quarterly in nature, with up to two-year-out forecast horizons, covering the period 1999–2011. In total, 69 forecasters are included in the dataset, comprising 22 property advisors, 26 fund managers and 21 property equity brokers. However, continuous data for all 69 firms is not available for every period for each of the forecast variables. Therefore, the samples adopted in the report can vary considerably from period to period. For example, for one-year-ahead rental forecasts the number of forecasts in any individual year ranges from 18 to 29. Specifically, it should be noted that the sample for equity brokers is particularly small, especially towards the end of the sample period. Whilst brokerage firms total 21, the sample size in any one year ranges from seven to one.

The descriptive analysis was conducted on the entire sample (i.e. 69 forecasters). However, for the regression analyses undertaken, 30 out of 69 forecasters were used. The criterion employed was that firms should provide a minimum of four forecasts over the entire 12-year sample period. Therefore, the constrained sample in the reported regression results consists of 14 property advisors, 13 fund managers and 3 equity brokers.

For the quarterly IPF consensus survey, contributors are asked to provide forecasts of rental growth, capital growth and total return in respect of seven sectors and for All Property (as defined by the IPD All Property indices). The forecasts include the current year, two years out and the average figure over the next five years. The benchmark reference in each case is the respective IPD annual index. In this study, both the one- and the two-year-ahead forecasts for all property are considered. This expands upon the analysis in McAllister et al. (2008), which looked at the accuracy of one-year-ahead forecasts.

3.2 Statistical procedures

In order to compare the performance of forecasters Theil's U2 statistic is used. Two alternative naïve forecasts are assumed as a basis of comparison: naïve Forecast 1 assumes that the following year's outcome is equal to (can be predicted by) the current year's outcome. As an alternative, the second naïve comparison forecast uses the long-term average up to the date of the forecast. For example, for forecasts made in 2002, the long-term average growth rates of the appropriate IPD index up to 2002 are used. This approach avoids the potential bias that subsequent data is incorporated into the average figures utilised. Theil's U2 statistic (see Theil 1966,1971) can be represented as follows:

Equation 3.1:

$$\text{Theil's U2} = \sqrt{\frac{\sum_{t=1}^{n-1}\left(\frac{F_{t+1} - Y_{t+1}}{Y_t}\right)^2}{\sum_{t=1}^{n-1}\left(\frac{Y_{t+1} - Y_t}{Y_t}\right)^2}}$$

where *F* is the forecast and *Y* is the observation. In other words, Theil's U2 statistic can be interpreted as dividing the RMSE (root mean square error) of the given forecast by the RMSE of a naïve forecast. Hence, the statistic provides the basis for comparing alternative forecasts relative to a naïve forecast. If it has a value less than 1, the consensus forecasts are better than those obtained by employing a naïve forecast. If it has a value equal to 1, the forecasts add nothing, as the naïve estimate would have been as just as effective. If the value is greater than 1, the naïve can be interpreted as having out-performed the consensus forecasts.

3. DATA AND METHODS

In order to test for bias in the one- and two-year-ahead forecasts the methodology of Mincer and Zarnowitz (1969) is also applied. This involves the estimation of a simple linear regression model of the following form:

Equation 3.2:

$$Y_t^A = \beta_0 + \beta_1 Y_t^F + \varepsilon_t$$

where Y_t^A is the actual value and Y_t^F is the corresponding forecast. For unbiased forecasts, the requirement is that β_0 and β_1 are equal to zero and unity respectively and that the error term is white noise.

However, as noted by Holden and Peel (1990), $\beta_0=0$ and $\beta_1=1$ is a sufficient, but not necessary, condition for detecting bias. According to Holden and Peel, a more satisfactory test for the presence of bias is to examine the significance of the constant coefficient (i.e. $\tau = 0$) in the following regression:

Equation 3.3:

$$e_{t+1|T} = Y_t^A - Y_t^F = \tau + \varepsilon_{t+1}$$

where e_{t+1} is the forecasting error (i.e. the difference between the actual and the forecast value) conditional on time horizon t. If the coefficient τ is significant then it can be concluded that forecasters make biased forecasts. Thus, in order to confirm these results of unbiased forecasts, this test is also undertaken. The regression analysis for biased forecasts was conducted for the one- and the two-year-ahead November forecasts.

As already mentioned, there are several error criteria that can be used to evaluate accuracy, such as the mean square error (MSE), root mean square error (RMSE) and mean absolute error (MAE) (see, for example, Makridakis et al. 1998, Clements, 2003). In terms of the measurement of forecasting accuracy, the MAE is primarily referred to. Finally, in order to evaluate the forecasting accuracy of the different categories of forecasters (i.e. property advisors, equity brokers and fund managers) the Diebold and Mariano (1995) test is adopted. This test is applied for the one- and two-year-ahead consensus forecasts.

4. EMPIRICAL RESULTS

4.1 Summary statistics

Tables 4.1 to 4.3 show the descriptive statistics of the one- and two-year-ahead forecasts for All Property rental growth, capital growth and total return.

As can be seen from Tables 4.1 to 4.3, the median and the mean forecast tend to be similar, an issue that provides a preliminary indication of normality in the distribution of the one- and the two-year-ahead forecasts. Based on the Jarque–Bera statistics,[2] it is seen that the majority of the one- and the two-year-ahead forecasts for the three variables are normally distributed. However, there are several cases of non-normal distribution of forecasts. For example, the one-year-ahead rental growth forecasts for 2006, 2008 and 2010 are negatively, positively and negatively skewed respectively. This would imply overly optimistic forecasts for 2008 and pessimistic ones for 2006 and 2010. This issue is also confirmed by considering the mean forecast errors (MFEs) for these years. The MFE for 2008 is -3.78%, which means that forecasters tended to overestimate rental growth for this year. In contrast, they underestimated growth for 2006 and 2010, with MFEs of 1.61% and 5.63% found for the respective target years. The two-year-ahead forecasts for the rents are normally distributed (i.e. insignificant Jarque–Bera statistics).

The capital growth and total return forecasts also tend to have similar characteristics. For example, forecasters tend to underestimate one-year-ahead capital growth and total returns for 2005 and 2006 (i.e. positive mean forecast errors reflected in significantly negative skewness). Also observed is the optimistic behaviour of forecasters for the two-year-ahead period for 2001, with negative MFEs (of -4.60% & -4.61% respectively, and significant positive skewness), whereas they are pessimistic about the trend in capital growth and total returns for 2010 (MFE_{CG} equal to 8.99%, MFE_{TR} equal to 8.94% and significant negative skewness). It is possible that, knowing the poor performance of the property market from the Monthly IPD index, forecasters were affected by this and, as a result, underestimated capital growth and total return for 2010. Linden (2003) shows that significant skewness in distributions of forecasts can be a signal of upside and downside risk, depending on the market conditions.

[2] The Jarque–Bera statistic tests for normality by combining measures of skewness and kurtosis.

4. EMPIRICAL RESULTS

Table 4.1: Rental growth forecasts (% p.a.)

One-year-ahead

Target years	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Actual	7.40	3.60	-1.20	-2.00	2.10	2.90	4.00	4.70	-1.20	-7.90	-0.50	0.60
Mean	4.00	4.50	1.30	0.20	-0.60	2.00	2.40	3.50	2.60	-6.30	-6.10	1.04
Median	4.00	4.60	1.60	0.70	-0.30	2.00	2.50	3.50	2.30	-6.50	-5.90	1.00
Max	6.50	7.10	3.50	2.20	0.70	3.10	3.70	5.00	5.30	-2.10	-1.90	3.60
Min	2.00	2.60	-2.00	-2.00	-2.10	0.60	0.60	2.60	1.10	-10.80	-12.80	-0.70
Range	4.50	4.50	5.50	4.20	2.80	2.50	3.10	2.40	4.20	8.70	10.90	4.30
MFE	3.43	-0.91	-2.55	-2.16	2.64	0.87	1.61	1.22	-3.78	-1.55	5.63	-0.44
St. dev.	1.20	1.30	1.60	1.20	0.90	0.60	0.60	0.50	1.00	2.30	2.30	0.87
Skewness	0.70	0.50	-1.00	-0.50	-0.40	-0.10	-0.80	0.50	1.00	-0.30	-0.90	0.74
Kurtosis	3.10	2.50	3.50	2.50	1.80	2.50	4.70	3.80	4.10	2.50	4.50	4.90
Jarque–Bera	2.30	1.50	4.30	1.10	1.90	0.30	6.30	1.90	6.10	0.60	6.20	6.54
Probability	0.30	0.50	0.10	0.60	0.40	0.90	0.00	0.40	0.00	0.70	0.00	0.00
Observations	28	28	25	18	21	27	28	29	29	23	27	27

Two-year-ahead

Target years	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Actual	3.60	-1.20	-2.00	2.10	2.90	4.00	4.70	-1.20	-7.90	-0.50	0.60
Mean	3.90	3.70	2.40	1.80	1.20	2.60	2.70	3.10	2.10	-4.10	-1.00
Median	3.90	3.00	2.40	2.00	1.20	2.50	2.65	3.20	2.00	-3.20	-1.10
Max	7.00	7.00	5.00	4.00	3.00	4.00	3.70	4.50	5.30	0.80	4.40
Min	2.00	1.40	0.00	0.00	-1.00	1.00	1.40	1.50	-0.10	-12.00	-4.30
Range	5.00	5.60	5.00	4.00	4.00	3.00	2.30	3.00	5.40	12.80	8.70
MFE	-0.37	-4.91	-4.36	0.25	1.67	1.41	2.07	-4.31	-9.93	3.64	1.60
St. dev.	1.20	1.40	1.40	1.10	0.90	0.70	0.60	0.80	1.10	3.30	1.52
Skewness	0.80	0.80	-0.20	0.30	-0.40	0.10	-0.10	-0.50	0.60	-1.00	1.25
Kurtosis	3.40	3.00	2.60	2.80	3.70	3.10	2.50	2.90	4.80	4.10	8.94
Jarque–Bera	3.20	2.70	0.30	0.30	0.90	0.10	0.30	1.10	5.90	4.80	46.61
Probability	0.20	0.30	0.90	0.90	0.60	1.00	0.90	0.60	0.10	0.10	0.00
Observations	27	28	25	17	20	26	28	29	29	23	27

4. EMPIRICAL RESULTS

Table 4.2: Capital growth forecasts (% p.a.)

One-year-ahead

Target years	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Actual	3.60	0.10	2.60	3.90	11.40	12.80	12.60	-7.70	-26.32	-3.60	8.30	1.90
Mean	5.00	3.70	0.70	0.50	0.00	2.40	2.80	2.60	-3.78	-11.40	2.40	-1.54
Median	5.00	3.30	1.00	0.60	0.00	2.90	2.80	3.00	-3.90	-11.40	2.30	-0.60
Max	9.50	7.00	3.30	3.50	3.00	5.00	7.20	7.00	3.00	-5.00	11.00	3.53
Min	2.00	1.00	-4.00	-2.00	-2.00	-3.00	-1.00	-1.60	-9.40	-20.60	-7.20	-9.40
Range	7.50	6.00	7.30	5.50	5.00	8.00	8.20	8.60	12.40	15.60	18.20	12.93
MFE	-1.40	-3.61	1.86	3.32	11.40	10.38	9.80	-10.34	-22.54	7.80	5.83	3.44
St. dev.	1.90	1.50	2.00	1.60	1.20	1.60	1.60	2.00	2.90	4.00	3.80	3.30
Skewness	0.60	0.40	-0.90	0.20	0.80	-1.50	-0.70	-0.10	0.50	-0.60	-0.20	-0.92
Kurtosis	2.80	2.90	3.30	2.20	4.10	7.10	5.60	3.30	3.40	3.10	3.80	3.30
Jarque–Bera	1.70	0.70	3.80	0.60	3.20	29.40	10.17	0.20	1.70	1.40	0.80	3.78
Probability	0.40	0.70	0.20	0.70	0.20	0.00	0.00	0.90	0.40	0.50	0.70	0.15
Observations	28	28	25	18	21	27	28	30	30	23	27	26

Two-year-ahead

Target years	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Actual	0.10	2.60	3.90	11.40	12.80	12.60	-7.70	-26.30	-3.60	8.30	1.90
Mean	4.70	3.10	2.50	2.20	0.90	1.70	1.10	-0.15	0.70	-0.74	2.17
Median	4.20	2.50	2.40	2.50	1.00	1.80	1.10	0.05	0.95	-1.00	2.00
Max	10.50	7.00	6.00	5.00	2.80	4.00	4.30	4.60	5.20	5.50	12.80
Min	1.00	0.70	0.00	0.00	-1.20	-1.50	-2.10	-5.00	-5.90	-11.60	-2.60
Range	9.50	6.30	6.00	5.00	4.00	5.50	6.40	9.60	11.10	17.10	15.40
MFE	-4.60	-0.48	1.34	9.21	11.85	10.90	-8.80	-26.18	-4.31	8.99	-0.27
St. dev.	1.84	1.61	1.55	1.34	1.05	1.45	1.54	2.22	2.33	3.67	3.15
Skewness	0.94	0.79	0.23	0.11	-0.15	-0.46	-0.20	-0.60	-0.71	-1.16	1.34
Kurtosis	5.80	2.80	2.80	2.90	2.70	2.80	2.80	3.40	4.10	5.50	6.71
Jarque–Bera	13.10	2.90	0.30	0.00	0.20	1.00	0.20	2.00	4.10	11.20	23.65
Probability	0.00	0.20	0.90	1.00	0.90	0.60	0.90	0.40	0.10	0.00	0.00
Observations	27	28	25	17	20	26	28	30	30	23	27

4. EMPIRICAL RESULTS

Table 4.3: Total return forecasts (% p.a.)

One-year-ahead

Target years	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Actual	10.45	6.79	9.64	10.85	18.33	19.10	18.10	-3.42	-22.10	3.51	15.09	7.80
Mean	11.74	10.70	7.85	7.59	6.89	8.98	8.69	7.59	1.15	-5.20	10.02	5.19
Median	11.00	10.00	8.00	7.90	6.90	9.10	8.55	7.80	1.30	-4.70	10.30	5.95
Max	16.00	14.00	11.00	11.00	9.00	12.00	13.00	12.00	8.00	1.00	19.00	10.35
Min	8.70	8.00	3.50	5.00	5.00	4.00	5.00	3.20	-4.80	-14.30	-0.60	-2.40
Range	7.60	6.00	7.00	5.50	4.40	8.00	7.70	8.80	13.10	14.90	19.60	12.75
MFE	-1.29	-3.91	1.79	3.27	11.44	10.12	9.42	-11.01	-23.25	8.71	5.08	2.61
St. dev.	1.80	1.70	2.00	1.60	1.10	1.60	1.50	1.90	3.10	4.00	4.00	3.27
Skewness	0.80	0.40	-0.60	-0.10	0.40	-1.10	-0.60	-0.10	0.40	-0.60	-0.20	-0.95
Kurtosis	3.20	2.20	2.70	2.20	3.40	6.20	5.40	3.60	3.00	2.80	4.20	3.48
Jarque–Bera	2.70	1.70	1.80	0.60	0.80	17.70	8.25	0.50	0.70	1.20	1.90	4.13
Probability	0.30	0.40	0.40	0.80	0.70	0.00	0.02	0.80	0.70	0.50	0.40	0.13
Observations	28	28	25	18	21	27	28	30	30	23	26	26

Two-year-ahead

Target years	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Actual	6.79	9.64	10.85	18.33	19.10	18.10	-3.42	-22.10	3.51	15.09	7.80
Mean	11.40	10.20	9.80	9.40	7.90	8.20	6.90	4.80	5.90	6.20	9.43
Median	11.00	10.00	9.50	9.30	7.80	8.50	7.20	5.00	6.20	5.70	9.50
Max	16.50	15.00	13.00	12.60	9.70	11.00	10.00	9.00	10.00	12.00	21.10
Min	9.00	7.40	6.70	7.10	5.50	5.00	3.60	0.10	0.10	-4.80	3.50
Range	7.50	7.60	6.30	5.50	4.20	6.00	6.40	8.90	9.90	16.80	17.60
MFE	-4.61	-0.53	1.03	8.95	11.22	9.90	-10.36	-26.94	-2.39	8.94	-1.63
St. dev.	1.59	1.80	1.60	1.50	1.10	1.60	1.50	2.10	2.30	4.00	3.46
Skewness	1.28	0.76	0.19	0.63	-0.43	-0.33	-0.39	-0.64	-0.62	-1.06	1.33
Kurtosis	6.10	3.70	2.50	3.30	2.50	2.50	2.90	3.30	3.42	4.71	7.09
Jarque–Bera	18.10	3.20	0.40	1.20	0.80	0.70	0.70	2.20	2.10	7.10	25.86
Probability	0.00	0.20	0.80	0.60	0.70	0.70	0.70	0.30	0.40	0.00	0.00
Observations	27	28	25	17	20	26	28	30	29	23	26

4. EMPIRICAL RESULTS

4.2 Forecast disagreement profiles

It is possible to expand upon the simple summary statistics by considering the extent to which there is disagreement across forecasts. This is undertaken by looking at the range between the minimum and maximum forecasts and by constructing Box–Whisker plots. Box–Whisker plots display the mean and median of the forecasts for each period together with minimum and maximum values. In addition, the box surrounding the mean denotes the interquartile range from the 25th to 75th percentile. The plots displayed in Figures 4.1 to 4.3 summarise the distribution of the individual forecasts made in the November prior to the indicated year, i.e. effectively one-year-ahead forecasts, and compares them against the outcome.

Figure 4.1: Distribution of annual rental growth, one-year-ahead forecasts

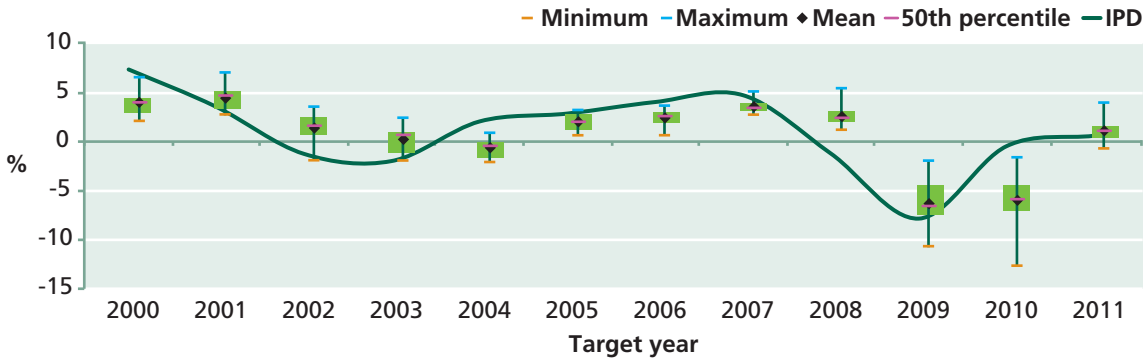
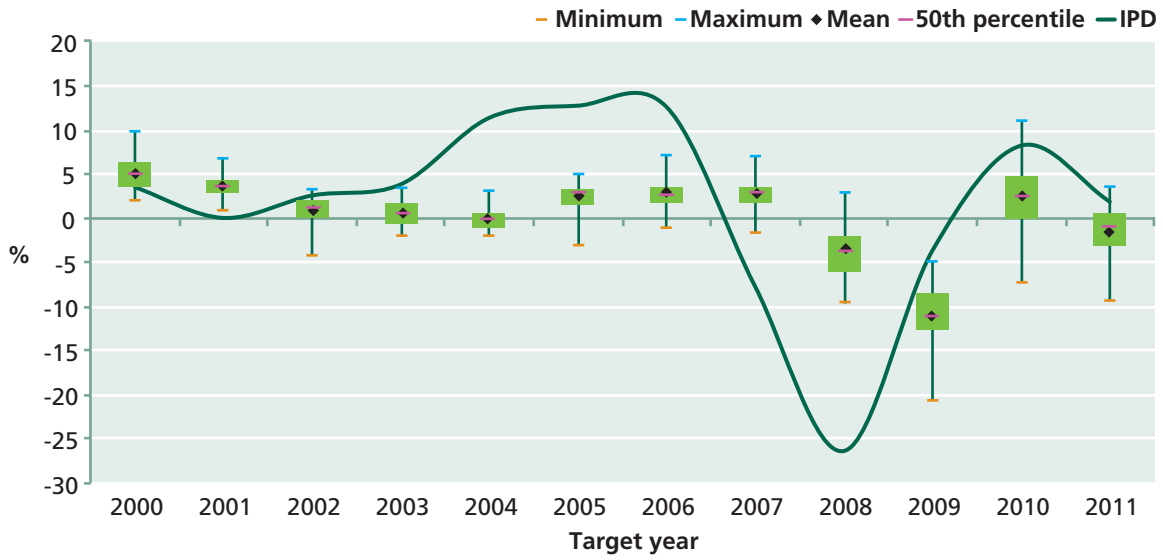
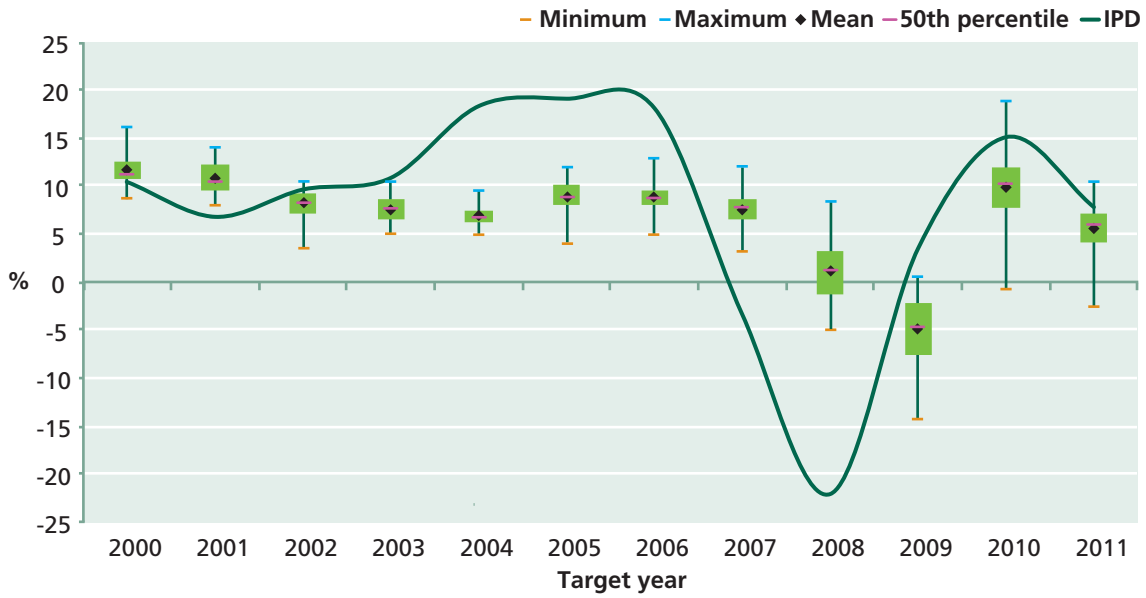


Figure 4.2: Distribution of annual capital growth, one-year-ahead forecasts



4. EMPIRICAL RESULTS

Figure 4.3: Distribution of annual total return, one-year-ahead forecasts



The one-year-ahead forecast figures display the following characteristics:

- In five out of 12 years annual rental growth was outside the forecast range. A turnaround to positive rental growth after three years of negative figures was anticipated in 2011, with a consensus of figure of 1.1% compared with an outcome of 0.6%.
- In eight out of 12 years annual capital growth was outside the forecast range. The consensus figure of -1.5% capital growth for 2011 anticipated a fall-off from the 2010 figure that, in fact undershot the actual of 1.9%.
- In eight out of 12 years annual total returns were outside the forecast range.
- For 2007 and 2008, consensus capital growth and total returns were substantially overestimated, with forecasts for 2009 anticipated to be lower than in 2008, whereas the market had in fact moved in the opposite direction. The consensus total return figure of 5.2% for 2011 anticipated a lower return than in 2010, the outcome being 7.8%.
- For the three forecast variables, simple regression results at the consensus level show that the highest correlation is between actual rental and forecast rental growth.
- The consensus 2010 one-year-ahead forecasts for rental growth, capital growth and total return were considerably closer to the target than those over the last 10 years. In fact, all of the consensus error metrics were at their lowest values for 11 years.
- Overall, the forecast range for capital growth and total returns has increased over the last four years.

The next set of Box–Whisker charts summarise the distribution of individual forecasts made in each November two years prior to the indicated year, i.e. effectively two-year-ahead forecasts, and compares them against the actual outcome.

4. EMPIRICAL RESULTS

Figure 4.4: Distribution of annual rental growth, two-year-ahead forecasts

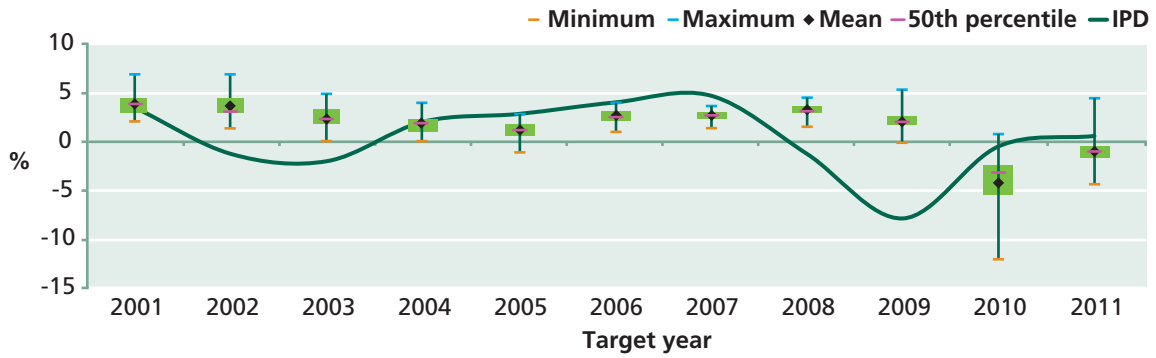
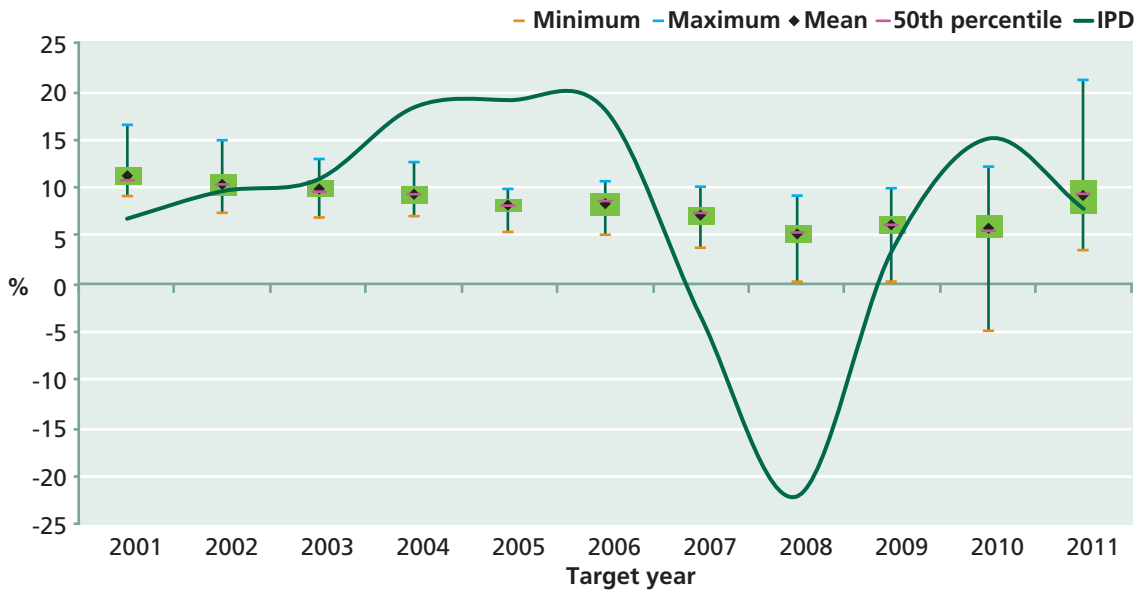


Figure 4.5: Distribution of annual capital growth, two-year-ahead forecasts

Figure 4.6: Distribution of total return, two-year-ahead forecasts



4. EMPIRICAL RESULTS

The two-year-ahead forecast figures show the following characteristics:

- In seven out of 11 years annual rental growth was outside the forecast range. The consensus rental growth forecast of -1.00% for 2011 anticipated an improvement in rental growth, compared with an outcome of 0.60%.
- In seven out of 11 years annual capital growth was outside the forecast range. The consensus forecast for 2011 was the closest in recent experience, being 2.20% compared with an outcome of 1.90%.
- In seven out of 11 years annual total returns were outside the forecast range. The consensus forecast figure of 9.40% for 2011 compared with an actual of 7.80%, represented a considerable improvement over the forecast for 2010.
- Consensus capital growth forecasts for 2007–2010 had 'flat-lined' at almost 0%, whereas this was the most volatile period over the 11 years. Similarly, average annual total return forecasts hovered around 5%–6% per annum.
- The consensus two-year-ahead figures for 2011 for all three variables represented a considerable improvement compared with previous years. Rental growth error metrics were at their lowest value for five years, whilst capital growth and total return (being marginally higher than the 2007 figures) were at their lowest values for 10 years.
- Overall, the forecast range for capital growth and total returns had increased over the last three or four years.

It is seen from the simple Box–Whisker diagrams that, broadly speaking, rental growth forecasts more closely track actual outcomes in comparison to those produced for capital growth and total return. This is especially evident during the 2004 to 2006 period. To some degree this is not particularly surprising, given the strength in capital value growth and that it was predominantly driven by the downward movement in yields during this time. This period of 'yield compression' saw the IPD monthly All Property initial yield series reach a low of 4.57% in both December 2006 and in the summer of 2007. Initial yields had 'compressed' from over 7% in 2002. In contrast, rental growth during this period had been generally quite sluggish, as Figures 4.1 and 4.4 illustrate. Furthermore, if one considers the monthly IPD series, it can be seen that, whereas capital values increased by 48.96% from December 2002 to August 2007, the corresponding increase in the All Property rental value index was only 9.32%. The importance of increased funds entering the UK market during this period is well known and established. However, it is often forgotten that the non-linear nature of the relationship between yields and present value means that as yields come down to low levels, the percentage increase in capital values accelerates. The low level that yields attained is a major element in the high growth rates observed in capital values. Furthermore, the non-linear characteristic also works in reverse; thus when yields rose in 2007 and 2008 from very low levels, the extent of the falls in capital values, and therefore total returns, was extremely high.

Whilst it is acknowledged that forecasting the impact of yields on capital values is difficult due to the nature of investment flows, the heightened sensitivity of capital values to yields in periods of low yields makes the task of accurately forecasting them even more challenging. However, what is of interest is that, despite the above, there are distinct patterns in the forecasts. In the 2004 to 2006 period, capital values rose by more than the highest individual forecast provided. This is true for both one- and two-year-ahead forecasts. In contrast, as capital values fell following the market reversal, capital values fell by more than the most pessimistic forecaster anticipated for both 2007 and 2008. Therefore, it would appear that some behavioural aspects do come to the fore, in that forecasts tended to provide more conservative forecasts in the case of capital growth and, therefore, total returns during the extremes of the last cycle.

4. EMPIRICAL RESULTS

4.3 Accuracy of the one- and two-year-ahead consensus property forecasts

The results thus far have provided an initial indication of the accuracy of the forecasts provided and some of the trends observed. This section of the study expands upon this analysis to more formally consider the forecasting accuracy of the consensus forecasts. There are several ways of measuring forecasting accuracy. The most common methods are the mean forecasting error (MFE), mean absolute error (MAE) and the root mean square error (RMSE). The smallest value on these measures denotes a high degree of forecasting accuracy. At this stage, the focus of the analysis is on the simple absolute differences between the November one- and two-year-ahead forecasts and actual values. Figures 4.4 to 4.6 depict the accuracy of the November one- and two-year-ahead forecasts for the rental and capital growth and the total return series.

It can be seen that forecasters tend to overestimate the three series in underperforming periods of the property market and vice versa. This finding is consistent with the broader forecasting literature (e.g. Zarnowitz and Braun, 1993). According to Zarnowitz and Braun (1993) forecasters have a tendency to make systematic errors, overestimating during downturns and underestimating during periods of economic recovery. It can also be seen that forecasters have a tendency to avoid 'big numbers' in their forecasts. In the broader forecasting literature, Scotese (1994) argues that forecasters seek to avoid sudden and large adjustments in order to try and maintain their reputation and credibility. The result of such behaviour is the phenomenon of so-called 'forecast smoothing'. This result is consistent with the real estate smoothing literature (for example, Gallimore and McAllister, 2005).

With respect to the one-year-ahead forecasts, the largest deviation from the actual outcome is observed in 2007 (i.e. 2008 target year) for capital growth and total return. The mean forecast for capital growth in 2007 was -3.78% with a standard deviation of 2.90% and a maximum of value of 3.00%. The extent of the deviation was -26.32%. Additionally, the mean for the one-year-ahead total return forecasts in 2007 (i.e. 2008 target year) was 1.15% with a standard deviation of 3.10% and a maximum of 8.00%. This results in a high deviation in comparison with the actual value for 2008, which was -22.10%. The failure of forecasters to predict capital growth and total return for 2008 is also confirmed by the MAE. The highest figures observed during the entire sample period are for this year, when MAE_{CG} = 22.54% and MAE_{TR} = 23.25%. It should be noted that, given the substantial fall in capital values and total returns in 2008, forecasters continued to forecast a downward trend for 2009, missing the turning point in that year. Clearly, the preceding year's experience had an influential impact on the forecast for the following year. For rental growth, the largest consensus one-year-ahead forecast deviation is observed for the target year 2010. The mean forecast was -6.10% with a standard deviation of 2.30% and maximum of -1.90%, whereas the actual value recorded was -0.50%. Furthermore, the corresponding value of the MAE was 5.63%, which was the highest observed for the one-year-ahead forecasts during the 12 years covered by the dataset. Again, the worst recorded annual rental growth over the 12 year period, in 2009, had a significant influence on the forecast for 2010, thereby missing the 2010 turning point.

Another characteristic that can be noted from the one-year-ahead analysis is that the forecasts of rental growth seem to have less 'uncertainty' in comparison with the corresponding estimates for capital growth and total return. This can also be seen from considering the simple correlations of the actual values with the consensus November forecasts, as reported in Table 4.4. Specifically, there is a strong correlation (0.74) between the one-year-ahead forecast and actual rental growth. In contrast, there is no significant correlation reported with respect to either capital growth or total return, with the corresponding coefficients being 0.42 and 0.50 respectively. In no cases are significant correlations observed in the two-year-ahead forecasts.

4. EMPIRICAL RESULTS

Table 4.4: Correlations between forecasts and actual values

Variables	Forecast	Correlation coefficient	t-stat	Conclusion
RG	one-year-ahead	0.74	3.48	Significant
	two-year-ahead	0.09	0.28	Insignificant
CG	one-year-ahead	0.42	1.47	Insignificant
	two-year-ahead	0.24	0.75	Insignificant
TR	one-year-ahead	0.50	1.81	Insignificant
	two-year-ahead	0.50	1.73	Insignificant

Note: t-stat greater than 2 indicates significance of the coefficient

Next, the accuracy of the two-year-ahead forecasts is examined. As can be seen in Figure 4.4, the greatest deviation from actual rental growth is observed in the 2007 two-year-ahead forecast (i.e. 2009 target year). The mean two-year-ahead forecast for 2009 was 2.10%, with a standard deviation of 1.10% and a maximum figure of 5.30%. If it is taken into account that the actual value of the rental growth for this year was -7.90%, the corresponding MAE was 9.93%, the highest MAE figure during the 1999–2011 sample period. Furthermore, in Figures 4.5 and 4.6 it can be seen that large errors are observed for capital growth and total return for the target year 2008. The mean two-year-ahead forecast for capital growth in 2008 was -0.15% with a standard deviation of 2.22% and maximum of 4.60%. The actual value for this year was -26.30% resulting in a MAE of 26.18%. Correspondingly for total return, the mean forecast was 4.80%, whilst the actual value for 2008 was -22.10%. The accuracy measures for the one- and the two-year-ahead forecasts appear in Table 4.5. All the error metric criteria point to the same broad findings: forecasters failed to capture the reversal in the two-year downward trend in rents 2009 for both one- and two-year-ahead forecasts. Table 4.5 profiles the various error metrics and Figure 4.7 shows graphically the RMSEs for the one- and two-year-ahead forecasts.

4. EMPIRICAL RESULTS

Table 4.5: Forecast errors

Error metric criteria for one-year-ahead forecast

		Rental growth			Capital growth			Total return		
Forecast	Target	MAE	MSE	RMSE	MAE	MSE	RMSE	MAE	MSE	RMSE
11/1999	2000	3.43	13.13	3.62	1.75	5.32	2.31	1.58	4.79	2.19
11/2000	2001	1.24	2.54	1.59	3.61	15.15	3.89	3.91	18.08	4.25
11/2001	2002	2.73	8.80	2.97	2.00	7.11	2.67	2.02	7.02	2.65
11/2002	2003	2.16	5.99	2.45	3.32	13.49	3.67	3.27	13.06	3.61
11/2003	2004	2.64	7.82	2.80	11.40	131.32	11.46	11.44	132.17	11.50
11/2004	2005	0.91	1.16	1.08	10.38	110.15	10.50	10.12	104.76	10.24
11/2005	2006	1.61	2.96	1.72	9.80	98.44	9.92	9.42	90.92	9.54
11/2006	2007	1.24	1.77	1.33	10.34	110.72	10.52	11.01	124.84	11.17
11/2007	2008	3.78	15.25	3.91	**22.54**	**516.13**	**22.72**	**23.25**	**549.86**	**23.45**
11/2008	2009	2.36	7.60	2.76	7.80	76.24	8.73	8.71	90.85	9.53
11/2009	2010	**5.63**	**36.93**	**6.08**	6.03	47.99	6.93	5.46	41.19	6.42
11/2010	2011	0.73	0.93	0.96	3.64	22.31	4.72	3.04	17.12	4.14

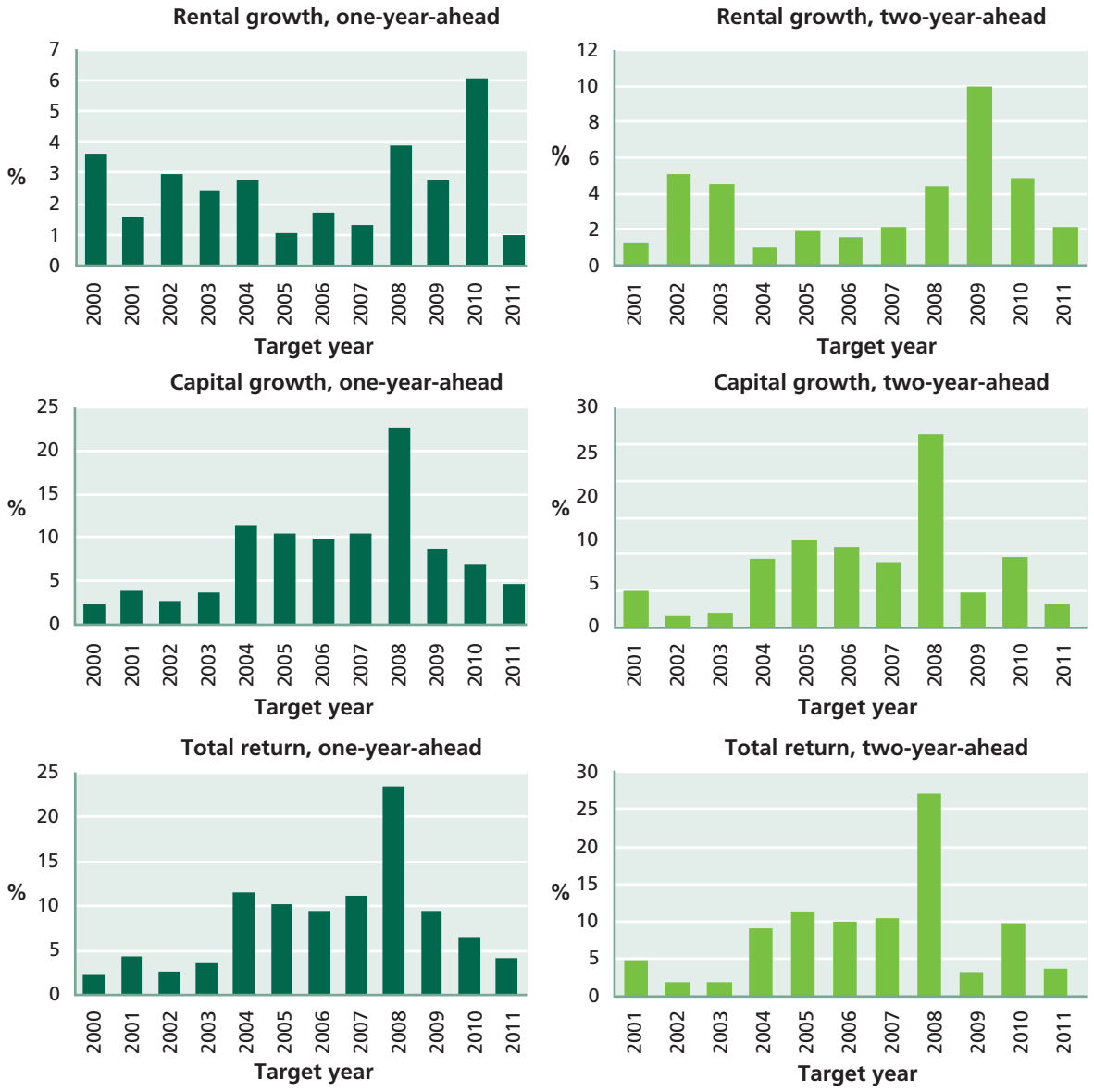
Error metric criteria for two-year-ahead forecasts

		Rental growth			Capital growth			Total return		
Forecast	Target	MAE	MSE	RMSE	MAE	MSE	RMSE	MAE	MSE	RMSE
11/1999	2001	0.95	1.55	1.25	4.59	24.34	4.93	4.63	23.85	4.88
11/2000	2002	4.91	25.99	5.10	1.25	2.72	1.65	1.42	3.31	1.82
11/2001	2003	4.36	20.77	4.56	1.70	4.11	2.03	1.59	3.50	1.87
11/2002	2004	0.84	1.12	1.06	9.21	86.51	9.30	8.95	82.19	9.07
11/2003	2005	1.69	3.58	1.89	11.85	141.56	11.90	11.22	127.03	11.27
11/2004	2006	1.41	2.51	1.59	10.90	120.77	10.99	9.90	100.34	10.02
11/2005	2007	2.07	4.66	2.16	8.80	79.68	8.93	10.36	109.47	10.46
11/2006	2008	4.31	19.16	4.38	**26.18**	**690.05**	**26.27**	**26.94**	**730.04**	**27.02**
11/2007	2009	**9.93**	**99.68**	**9.98**	4.46	23.82	4.88	2.91	10.91	3.30
11/2008	2010	3.84	23.48	4.85	8.99	93.75	9.68	8.94	95.15	9.75
11/2009	2011	1.88	4.80	2.19	2.33	9.64	3.11	2.77	14.15	3.76

Note: MAE, MSE and RMSE are the mean absolute error, mean square error and the root mean square error respectively. The bold figures indicate the year of the highest forecast errors for rental growth, capital growth and total return. For example, in the case of one-year-ahead capital growth forecasts, the MAE of 22.54 is the highest MAE of all one-year-ahead capital growth forecasts, being made in November 2007 for the 2008 target year.

4. EMPIRICAL RESULTS

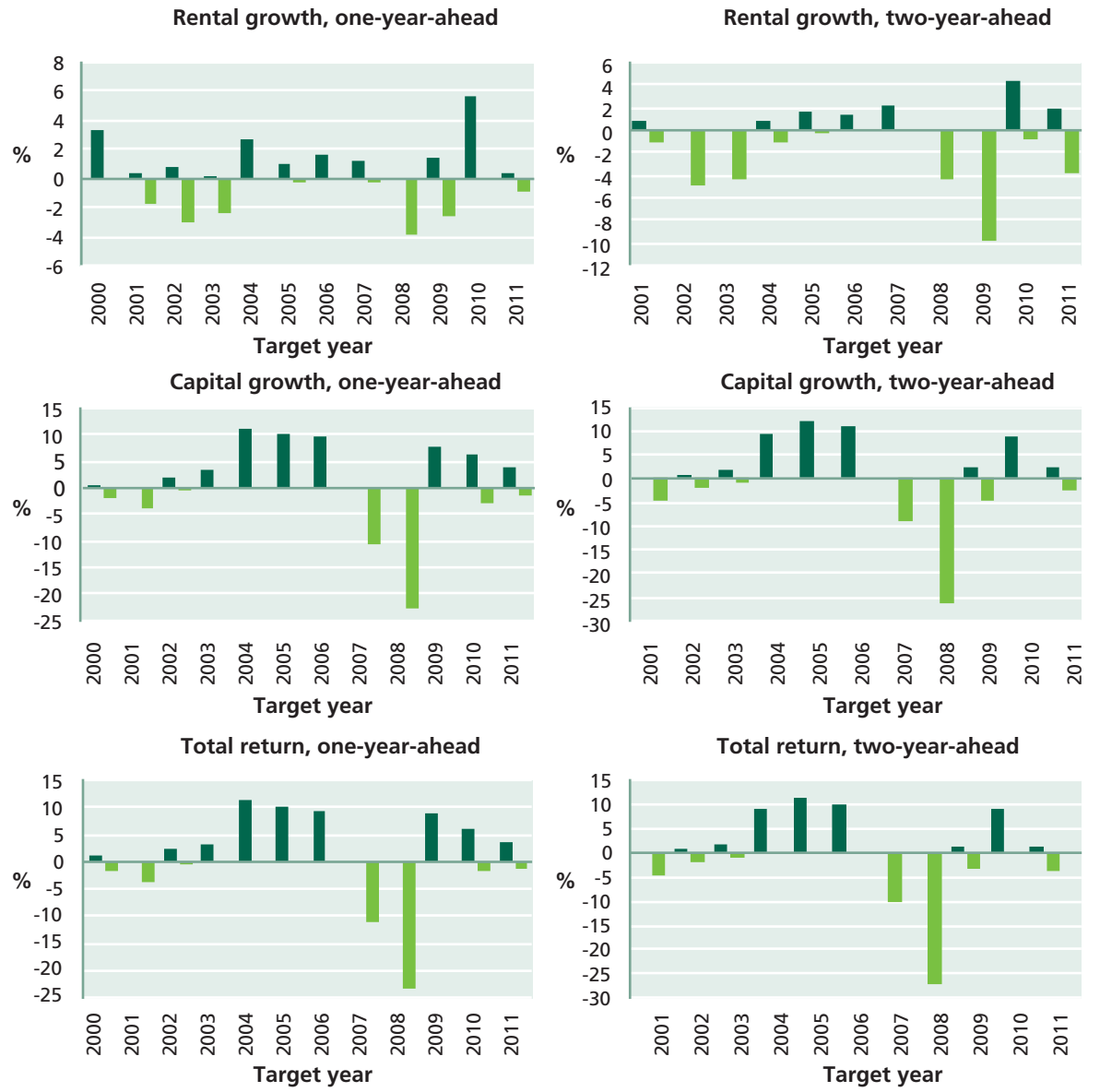
Figure 4.7: Root mean square errors



It is interesting to compare the distribution of forecasters' under and overestimates across the 12 years. In order to examine the behavioural element in the forecasting process, the averages of the positive and negative forecasting errors are taken. This aids in identifying those periods in which forecasters held positive sentiment of the market through the observation of negative forecast errors. Likewise, positive forecast errors can be taken as implying pessimistic sentiment. The analysis is conducted for both the one- and the two-year-ahead November forecasts. Figure 4.8 displays the results, with the target year of the forecasts depicted on the horizontal axis.

4. EMPIRICAL RESULTS

Figure 4.8: Mean positive and negative errors



Looking at the one-year-ahead capital growth and total return figures, it is seen that the distribution of under- and over-forecasts appear to follow a systematic pattern. Four years of under-forecasts, 2003–2006, are followed by two years of over-forecasts, 2007–2008. In fact, over the period 2003–2009 all the forecasts for any given year did not encompass the outcome for that year. The forecasts were wide of the mark in anticipating the exceptionally good performance years of 2004 to 2006.

4. EMPIRICAL RESULTS

The average under-forecasts for one-year ahead capital growth and total return for 2011 were higher in value than the over-forecasts, which were very close to the mark; the pessimists were more wrong than the optimists. The largest recorded absolute forecast errors for capital growth and total return were made in 2008, where property total return was the lowest recorded value in 30 years, being -22.10%. It should be noted that, whilst the spread of forecasts for capital growth and total return for 2008 was greater than in preceding years, demonstrating a wider divergence of views and, therefore, uncertainty, the variation fell well short of the outcome in 2008. For capital growth the negative consensus errors for the one- and two-year forecasts were -22.50% and -26.20% respectively. The corresponding figures for total return are -23.30% and -26.99%. Given the severity of the downturn in the market in 2008, it is not surprising that the forecast errors were of this magnitude.

> **What seems to be clear is the inability of forecasters, on average, to anticipate particularly good or particularly bad years.**

Summarised below are the results of comparing the consensus forecasts against two alternative naïve forecasts, which is facilitated by using Theil's U2 statistic. As noted in Section 3, Theil's U2 statistic can be used to assess the relative performance of forecasts by looking at the ratio of the RMEs. Here the consensus forecast is compared with two alternative naïve forecasts. As indicated earlier, Naïve 1 forecast assumes no change in the previous year's value, at the time the forecast was made. The second naïve forecast, Naïve 2, is based on the long-term average of the respective IPD values, up to the point at which the forecast was made. As the naïve is used as the divisor, a Theil U2 in excess of 1 implies underperformance of the consensus, whilst a statistic less than 1 indicates outperformance of the consensus. The results are displayed in Table 4.6 and can be summarised as follows:

Rental growth

Over the 12 one-year-ahead forecast years 2000–2011, on five out of 12 occasions a naïve forecast, assuming the previous year's outcome as a predictor of the following year's outcome (Naïve Forecast 1), resulted in lower error. A second assessment assumed the long-term average up to the year of forecast as a predictor of the following year's outcome (Naïve Forecast 2). Here, on six of the 12 occasions, the long-term average outperformed the consensus figure. As for the two-year-ahead forecast period, in only two of the 11 years did Naïve Forecast 1 outperform the consensus, whereas the average of the outcomes (Naïve Forecast 2) outperformed on four occasions.

Capital growth

For the one-year-ahead forecasts, on seven occasions Naïve Forecast 1 resulted in lower error compared with the consensus. For the second alternative naïve estimate, Naïve Forecast 2 outperformed the consensus in 10 out of 12 years. The corresponding figures for the two-year-ahead forecast periods are five years of naïve outperformance using Naïve Forecast 1 and eight years in the case of Naïve Forecast 2.

Total return

Finally, for the one-year-ahead forecasts, Naïve Forecast 1 outperformed the consensus figures on six occasions and Naïve Forecast 2 on 10 occasions. For the two-year-ahead forecasts, in four of the 11 years Naïve Forecast 1 outperformed the consensus, whereas Naïve Forecast 2 outperformed on eight occasions. (Tables A1–A6 (Appendix A) report additional statistics.)

4. EMPIRICAL RESULTS

Table 4.6: Theil U2 statistics

Forecast	Target	Naïve 1			Naïve 2		
		Rental growth	Capital value	Total return	Rental growth	Capital value	Total return
Panel A: One-year-ahead forecasts							
1999	2000	1.95	**0.63**	**0.54**	1.35	82.64	17.82
2000	2001	**0.42**	1.12	1.16	1.33	1.05	1.06
2001	2002	**0.62**	1.05	**0.93**	**0.48**	2.30	2.35
2002	2003	3.33	2.92	2.97	**0.36**	13.30	13.07
2003	2004	**0.69**	1.52	1.54	1.12	1.46	1.47
2004	2005	1.34	7.66	13.37	**0.77**	1.14	1.20
2005	2006	1.47	63.68	9.57	12.41	1.14	1.32
2006	2007	1.91	**0.52**	**0.52**	2.19	**0.88**	**0.76**
2007	2008	**0.66**	1.22	1.26	**0.73**	**0.74**	**0.70**
2008	2009	**0.42**	**0.38**	**0.37**	**0.23**	1.13	1.29
2009	2010	**0.82**	**0.58**	**0.55**	1.38	1.32	1.20
2010	2011	**0.90**	**0.74**	**0.57**	**0.33**	5.31	2.40
Panel B: Two-year-ahead forecasts							
1999	2001	**0.63**	**0.69**	**0.63**	1.08	1.40	1.29
2000	2002	**0.59**	1.74	2.23	**0.85**	1.41	1.59
2001	2003	**0.82**	**0.53**	**0.46**	**0.66**	20.25	21.50
2002	2004	**0.32**	1.06	1.04	**0.38**	1.19	1.17
2003	2005	**0.39**	1.34	1.37	1.12	1.29	1.32
2004	2006	**0.80**	9.05	43.44	6.87	1.21	1.33
2005	2007	1.15	**0.44**	**0.46**	3.88	**0.77**	**0.73**
2006	2008	**0.83**	**0.67**	**0.67**	**0.82**	**0.86**	**0.81**
2007	2009	**0.79**	1.19	**0.48**	**0.83**	**0.60**	**0.41**
2008	2010	6.48	**0.28**	**0.26**	1.05	2.33	2.33
2009	2011	**0.26**	**0.56**	**0.88**	**0.65**	2.78	1.94

Note: Bold figures indicate consensus forecasts that were more accurate than naïve forecasts.

The results are consistent with the visual displays shown in the Box–Whisker plots in Figures 4.1 to 4.6.

It is seen that the results differ depending on the choice of naïve forecast, which, in turn, will influence the conclusions regarding the relative accuracy of naïve versus consensus forecasts. No doubt, alternative definitions of 'naïve' would produce further rankings of relative performance.

4. EMPIRICAL RESULTS

The following two tables summarise the bottom line results in Table 4.6. For the one-year-ahead forecasts, Table 4.7 shows the number of years, over 12 forecast periods, in which the naïve forecasts were more accurate than the consensus forecasts.

Table 4.7: Number of years naïve forecasts were more accurate than the consensus

Variable	Naïve forecast 1	Naïve forecast 2
Rental growth	5	6
Capital growth	7	10
Total return	6	10

Table 4.8 shows the corresponding figures for the two-year-ahead forecasts, over 11 forecast years.

Table 4.8: Number of years naïve forecasts were more accurate than the consensus

Variable	Naïve forecast 1	Naïve forecast 2
Rental growth	2	5
Capital growth	5	8
Total return	4	8

Tables 4.7 and 4.8 show the following:

- On balance, consensus rental growth forecasts tend to be more accurate than naïve rental growth forecasts;
- For the one-year-ahead capital growth and total return forecasts, the naïve forecasts tend to outperform the consensus forecasts, overwhelmingly in the case of naïve forecast 2;
- For the two-year-ahead forecast period, there is an improvement in consensus forecasts, in that the naïve forecasts do less well compared to the one-year-ahead forecasts, particularly in the case of rental growth. It may be that, for a two-year rental growth forecast horizon, (conditional) information on the outlook for the property market is more accurately captured;
- However, for one-year-ahead capital growth and total return forecasts, Naïve 2 forecasts do a better job than consensus forecasts 80% of the time and, in the case of two-year-ahead forecasts, almost 75% of the time; and
- In the majority of cases, the Naïve 2 specification, the long-term average figure, tends to do a better job than the Naïve 1 last year's value.

These results are consistent with a number of the macroeconomic results reported earlier, for example the study by Isiklar and Lahiri (2007), where longer-horizon forecasts added little or no value to naïve no-change forecasts.

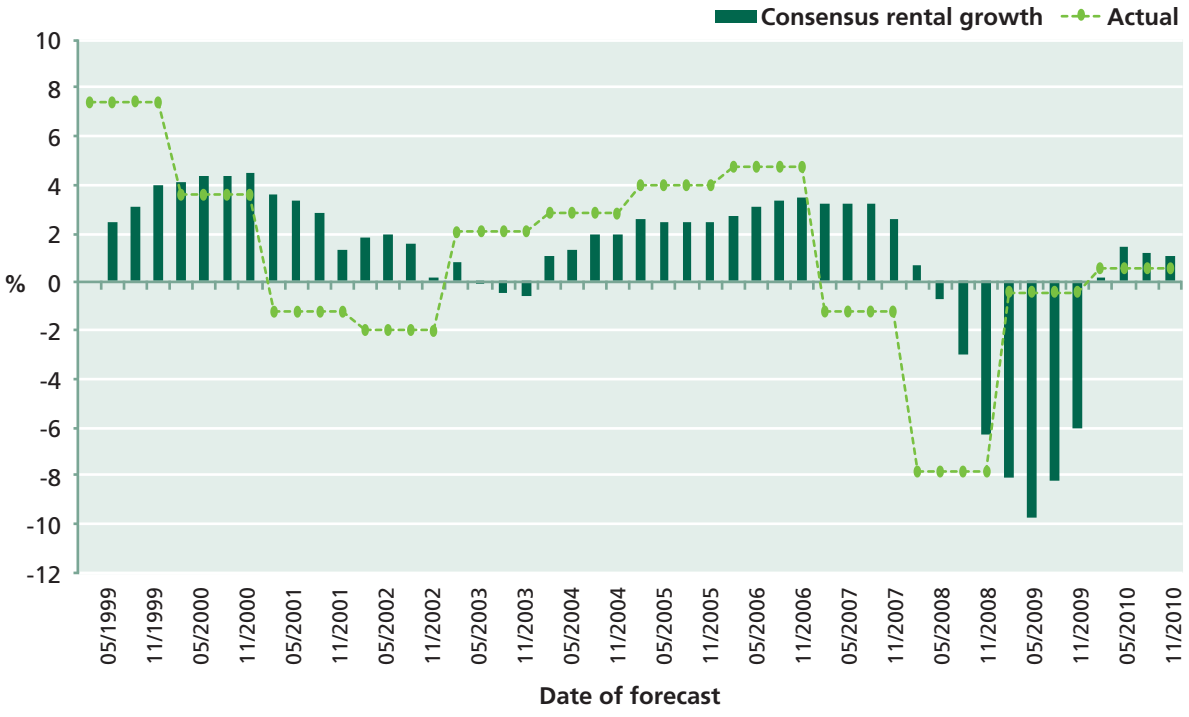
4. EMPIRICAL RESULTS

4.4 Accuracy of the one- and two-year-ahead all quarters: consensus property forecasts

After examining the forecasting accuracy for the November one- and two-year-ahead forecasts, the same methodological framework is applied to quarterly forecasts. Given the nature of the forecasting process, it would be expected that evidence would be found indicating that the forecasts become more accurate as a year progresses. For example, it would be natural to expect that the November forecasts exhibit smaller forecast errors (greater forecast accuracy) in comparison with the February forecasts. As the year progresses, property forecasters will be informed by releases of the IPD Monthly Index together with other market performance information and should, accordingly, adapt their forecasts. Goldfarb et al. (2005) argue that individuals (i.e. forecasters) are heavily influenced by recent events (i.e. current market performance) in making their forecasts. However, it is not clear if and when forecasters effectively incorporate new information from the monthly index in adjusting their forecasts.

Figures 4.9 to 4.11 illustrate the evolving profile of the one-year-ahead consensus figures on a quarterly basis.

Figure 4.9: Consensus annual rental growth forecasts: one-year horizon



4. EMPIRICAL RESULTS

Figure 4.10: Consensus annual capital growth forecasts: one-year horizon

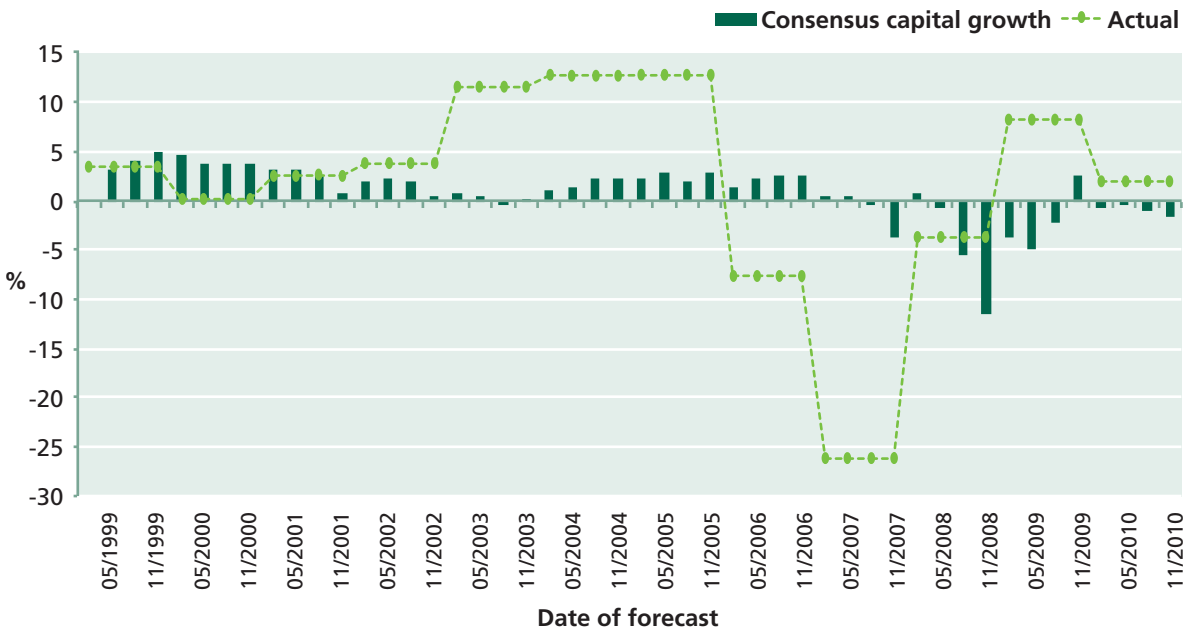
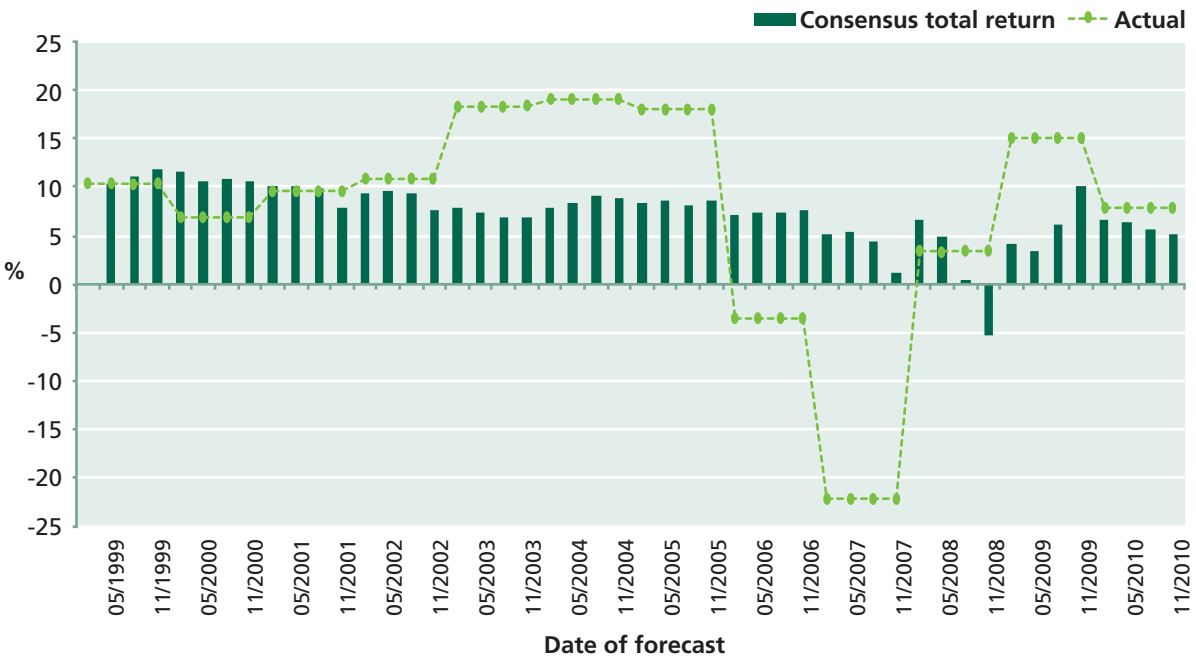


Figure 4.11: Consensus annual total return forecasts: one-year horizon



4. EMPIRICAL RESULTS

As with the November analysis, forecasters have a tendency to overpredict when the market is underperforming and vice versa. The greatest deviation in the one-year-ahead rental growth forecasts is observed during the period February to November 2009. For example, in May 2009 the consensus one-year-ahead forecast for rents was -9.70%, whilst the actual recorded value was -0.46%. In the case of capital growth and total return, the largest deviations observed were during 2008, unsurprising, given the extent of the falls in capital values that year as already noted. Figures 4.12 to 4.14 display the profiles of the two-year-ahead forecasts for the three series in turn. The results are similar to the one-year horizons. Deviations from actual peaked in 2009 for rental growth and in 2008 for capital growth and total return.

Figure 4.12: Consensus annual rental growth forecasts: two-year horizon

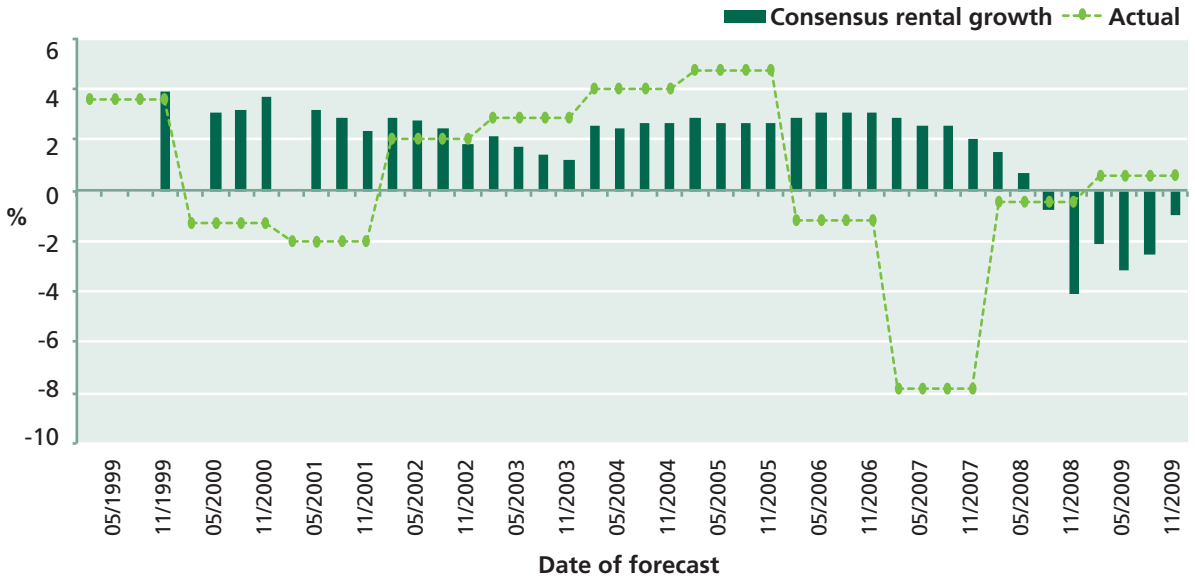
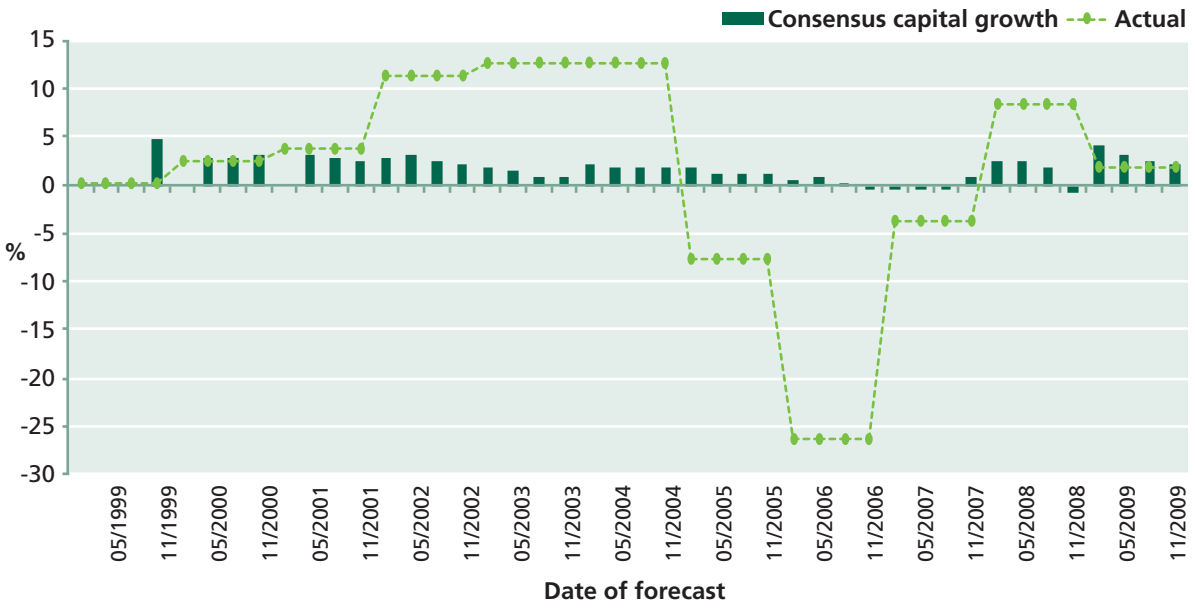
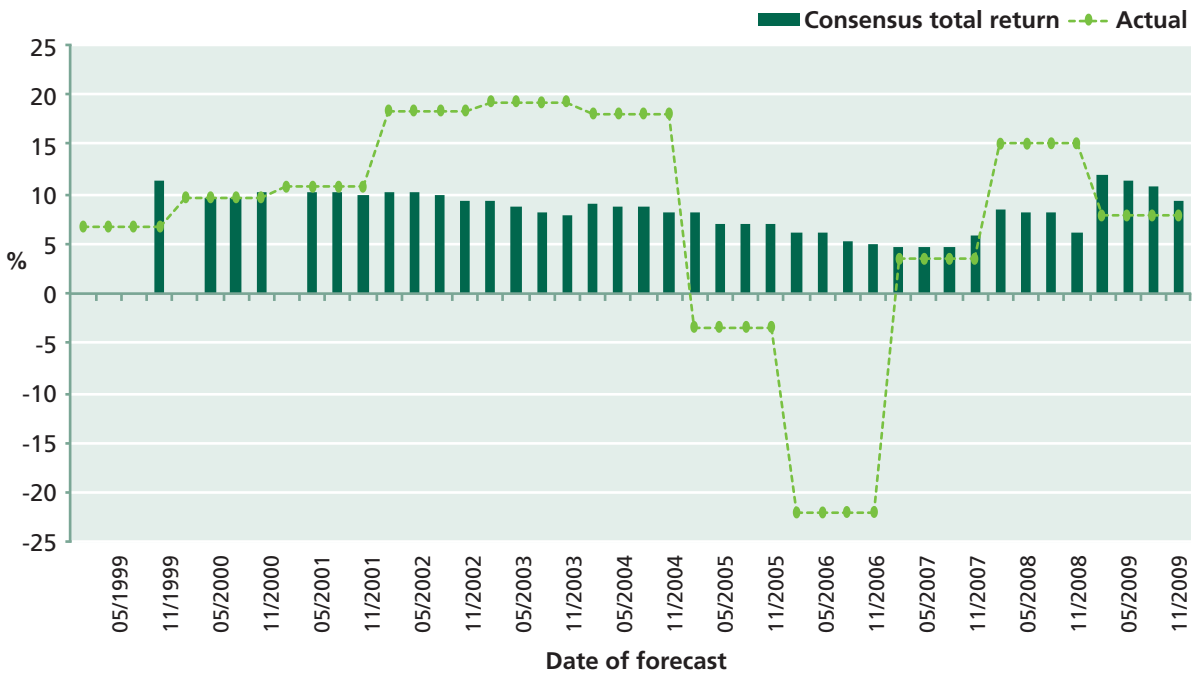


Figure 4.13: Consensus annual capital growth forecasts: two-year horizon



4. EMPIRICAL RESULTS

Figure 4.14: Consensus annual total return forecasts: two-year horizon



Figures B1 to B3, Appendix B display the MAEs resulting from the forecasts shown in Figures 4.9 to 4.11 for the one-year horizon and Figures B4 to B6, Appendix B display the MAEs resulting from the forecasts shown in Figures 4.12 to 4.14 for the two-year horizon.

Table 4.9 reports some summary statistics for those periods associated with the highest forecast errors for the three variables, for both one- and two-year horizons. As can be seen from Table 4.9, the worst forecasting periods for the one-year-ahead forecasts for the rental growth case was for the target year 2010 and for the capital growth and total return the forecasts for the year 2008. It is also noticeable, not surprisingly, that the forecasts produced in February and May tend to display reduced accuracy in comparison to those made in August and November. This suggests that forecasters incorporate new information, including up-to-date performance data from more frequently published indices such as the monthly IPD indices, to update their forecasts.

4. EMPIRICAL RESULTS

Table 4.9: Periods with highest forecast errors

Consensus one-year-ahead forecasts

	Forecast	Target	Actual	Forecast	St. dev.	Max	Min	MAE
RG	02/2009	2010	-0.47	-8.06	2.31	-3.20	-13.90	7.59
	05/2009	2010	-0.47	-9.70	2.92	-2.00	-17.10	9.23
	08/2009	2010	-0.47	-8.16	1.95	-4.90	-12.30	7.69
	11/2009	2010	-0.47	-6.10	2.33	-1.90	-12.80	5.63
CG	02/2007	2008	-26.33	0.38	2.07	4.50	-3.80	26.71
	05/2007	2008	-26.33	0.48	1.91	4.60	-4.40	26.81
	08/2007	2008	-26.33	-0.43	2.56	4.40	-6.60	25.90
	11/2007	2008	-26.33	-3.79	2.89	3.00	-9.40	22.54
TR	02/2007	2008	-22.10	5.21	2.02	10.00	1.00	27.31
	05/2007	2008	-22.10	5.37	1.62	9.30	2.30	27.47
	08/2007	2008	-22.10	4.30	2.81	9.10	-2.50	26.40
	11/2007	2008	-22.10	1.15	3.09	8.30	-4.80	23.25

Consensus two-year-ahead forecasts

	Forecast	Target	Actual	Forecast	St. dev.	Max	Min	MAE
RG	02/2007	2009	-7.85	2.87	1.11	5.60	0.20	10.72
	05/2007	2009	-7.85	2.59	1.01	5.30	0.40	10.44
	08/2007	2009	-7.85	2.55	1.10	5.60	-0.10	10.40
	11/2007	2009	-7.85	2.08	1.09	5.30	-0.10	9.93
CG	02/2006	2008	-26.33	0.68	2.08	3.90	-7.00	27.01
	05/2006	2008	-26.33	0.85	2.06	4.30	-6.00	27.17
	08/2006	2008	-26.33	0.21	2.22	4.80	-4.90	26.53
	11/2006	2008	-26.33	-0.15	2.22	4.60	-5.00	26.18
TR	02/2006	2008	-22.10	6.16	2.06	10.00	-1.00	28.26
	05/2006	2008	-22.10	6.20	1.93	9.20	0.00	28.30
	08/2006	2008	-22.10	5.23	2.16	9.40	0.20	27.33
	11/2006	2008	-22.10	4.84	2.12	9.00	0.10	26.94

Note: Table 4.9 reports the least accurate consensus one- and two-year-ahead forecasts for rental growth (RG), capital growth (CG) and total return (TR) over the period 1999–2011.

4. EMPIRICAL RESULTS

4.5 Comparative accuracy of categories of forecasters

The next feature examined is whether consensus forecasting accuracy differs amongst the different categories of forecasters. For the purpose of this analysis the Diebold and Mariano (1995) test is applied. This is a formal statistical test based upon a null hypothesis of no difference in the accuracy of two competing forecasts. There are 47 one-year-ahead forecasts from May 1999 to November 2010 and 39 two-year-ahead forecasts from November 1999 to November 2009 on which data this test is based. Since the test incorporates a 'loss function' of forecasting errors, it is implemented using both the MAE and the MSE. The results are reported in Table 4.10 and reveal that, according to the MSE, equity brokers outperformed both property advisors and fund managers in the case of one-year forecasts (at a significance level of 10%). In the case of the MAEs, property advisors forecast significantly better than fund managers; however, equity brokers significantly outperform both. For the two-year periods, equity brokers outperform in each case, with the exception of fund managers based on the MSE criterion.

It should be noted, however, that individual forecasters do move between organisations, and new forecasters replace previous forecasters, and, so, the interpretation of these findings needs to viewed in this context. Furthermore, as noted earlier in the report, the sample size with respect to equity brokers is considerably smaller than for the other categories. Additionally, the majority of property advisors and fund managers contribute to the whole sample period (i.e. 1999–2011), while among equity brokers there are few contributors producing one- and two-year-ahead forecasts for the whole period. This means that the results obtained may purely reflect forecasting accuracy relating to a small number of firms. Despite these caveats, it is of interest that, in marked contrast to the rental findings, no single significant result is found with respect to either capital growth or total return forecasts, with no group dominating in terms of accuracy.

4. EMPIRICAL RESULTS

Table 4.10: Diebold and Mariano test results

One-year-ahead consensus forecasts

Mean square errors								
	RG			CG			TR	
Forecasters	DM-stat	p-value	Forecasters	DM-stat	p-value	Forecasters	DM-stat	p-value
PA&FM	-1.23	0.22	PA&FM	-0.57	0.57	PA&FM	-0.43	0.67
PA&EB	2.25	0.05	PA&EB	-0.01	0.99	PA&EB	-0.88	0.38
FM&EB	1.95	0.05	FM&EB	0.27	0.79	FM&EB	-0.47	0.64

Mean absolute errors								
	RG			CG			TR	
Forecasters	DM-stat	p-value	Forecasters	DM-stat	p-value	Forecasters	DM-stat	p-value
PA&FM	-2.11	0.03	PA&FM	-1.30	0.19	PA&FM	-1.30	0.19
PA&EB	2.24	0.02	PA&EB	1.07	0.28	PA&EB	-0.16	0.87
FM&EB	3.00	0.00	FM&EB	1.34	0.18	FM&EB	0.55	0.58

Two-year-ahead consensus forecasts

Mean square errors								
	RG			CG			TR	
Forecasters	DM-stat	p-value	Forecasters	DM-stat	p-value	Forecasters	DM-stat	p-value
PA&FM	0.93	0.35	PA&FM	0.85	0.39	PA&FM	1.19	0.23
PA&EB	3.27	0.00	PA&EB	-0.95	0.34	PA&EB	-1.14	0.25
FM&EB	1.07	0.28	FM&EB	-0.94	0.35	FM&EB	-1.29	0.20

Mean absolute errors								
	RG			CG			TR	
Forecasters	DM-stat	p-value	Forecasters	DM-stat	p-value	Forecasters	DM-stat	p-value
PA&FM	-0.15	0.88	PA&FM	0.69	0.49	PA&FM	1.08	0.28
PA&EB	2.69	0.01	PA&EB	-0.14	0.89	PA&EB	-0.31	0.76
FM&EB	1.99	0.05	FM&EB	-0.46	0.64	FM&EB	-0.80	0.42

Note: The truncation lag used was 3 for the 47 and 39 one- and two-year-ahead forecasts respectively. (See Diebold and Mariano (1995), page 135, for a discussion of the truncation lag.)

4. EMPIRICAL RESULTS

4.6 Analysis of bias in the one- and the two-year-ahead individual forecasts

The final section of the analysis tests for bias using the methodological approach proposed by Mincer and Zarnowitz (1969). This test consists of an approach whereby actual values are regressed on forecast values as shown in the following equation:

Equation 4.1:

$$Y_t^A = \beta_0 + \beta_1 Y_t^F + \varepsilon_t$$

The joint significance of the coefficients β_0 and β_1 is examined. For the forecasts to be unbiased, the requirement is that β_0 and, β_1 are equal to zero and unity respectively. It was noted earlier in the report that, for the purposes of this analysis, only those forecasters for whom there is a minimum of four observations over the course of the sample period are used. The sample is, therefore, reduced to a total of 30 forecasters comprising 14 property advisors, 13 fund managers and three equity brokers. The results are presented in Tables C1 to C6 (Appendix C). It will be seen in the case of rental growth that the majority of the forecasters tend to make unbiased one-year-ahead forecasts, with only seven exceptions. This finding is broadly similar for capital growth and total return, with significant evidence of bias in only five and seven cases respectively. However, what is of interest is that, when the two-year forecasts are considered, a higher number of significant findings are reported, especially in the case of rental growth. In this case, there is evidence that 15 forecasters produce significantly biased rental growth forecasts. This does not, however, carry through to the capital growth and total return forecasts, where only six and seven significant results emerge respectively.

In the case of the one-year-ahead rental growth forecasts, variation in the Beta coefficients is in a range of 0.13% to 2.76%. In comparison, the corresponding values for the capital growth and total return forecasts are in the ranges -1.67% to 5.62% and -1.86% to 5.19% respectively. The range of the Beta coefficients also assists in explaining the lack of accuracy in predicting the variation in capital growth and total return, which can be implied from the significance or otherwise of the Beta. For capital growth and total returns, only 13 significant coefficients are reported. In contrast, 21 such significant findings are reported with respect to rental growth, indicating a higher degree of accuracy in capturing the variation in rents during the period 1999–2011.

This supports previous evidence that forecasters tend to predict more accurately the trend in rental growth rather than in capital growth and total return. Furthermore, by considering the R-squared (R^2) figures this finding is further supported. When one considers the capital growth series, only four out of the 13 forecasters that had significant Betas had R^2 above 40%. For total return, five out of the 13 significant cases had R^2 figures in excess of 40%. For the two-year-ahead forecasts, again the biggest variation of Betas is observed in the capital growth and the total return cases. However, only three, six and six out of 30 forecasters had significant Betas for the rental growth, capital growth and the total return cases respectively. This, again, supports previous findings that forecasting accuracy declines over a longer forecasting horizon. However, it must be noted that, whilst the number of forecasts with significant results was lower, the R^2 values tended to be higher. For rental growth, the three forecasters all had R^2 above 40%, for capital growth all six forecasters had R^2 above 46% and the six forecasters for the total return series reported an R^2 in excess of 60%.

4. EMPIRICAL RESULTS

As discussed previously, Holden and Peel (1990) note that β_0=0 and β_1=1 is a sufficient, but not necessary, condition to test for the presence of bias. They argue that a more satisfactory test for unbiasedness is to examine the significance of the constant (i.e. $\tau = 0$) in the following regression:

Equation 4.2:

$$e_{t+1|T} = Y_t^A - Y_t^F = \tau + \varepsilon_{t+1}$$

After obtaining the forecast errors for the 30 forecasters, the above regression was estimated and the results are shown in Tables D1 and D2 (Appendix D) for both the one- and two-year horizons respectively. It can be seen that all of the p-values are very big (i.e. higher than 10% level of significance) indicating that the hypothesis that $E(\varepsilon_t) = 0$ cannot be rejected. In other words, forecasters tended to make unbiased one- and two-year-ahead forecasts for rental growth, capital growth and total returns during the period 1999–2011.

5. CONCLUSION

This study has investigated the behavioural aspect of property forecasters and the rationality (bias and efficiency) in their one- and two-year forecasts for rental growth, capital growth and total return. It is found that forecasters tend to exhibit optimistic behaviour leading to over-estimation of growth rates during periods of market underperformance. However, this finding needs to be placed in the context of the severity of the 2008 downturn. Regarding the examination of bias, forecasters tend to make unbiased one- and two-year forecasts for the three property variables. Additionally, rental growth forecasts tend to be more accurate in comparison with the corresponding capital growth and total return forecasts, exhibiting smaller forecasting errors for all periods. This is also observed in the small variation in the rental growth Beta coefficients, which indicates that forecasters tend to more accurately predict the movements in rental growth in comparison to capital growth and total returns. Furthermore, based upon Theil's U2 statistics, it appears that consensus forecasts of capital growth and total return are no better and, indeed, worse on some 75% of occasions than a naïve forecasting rule. Finally, by applying the Diebold and Mariano methodology, evidence is found that equity brokers tend to forecast the movements in rents more accurately in the one- and two-year-ahead period. However, there is no difference in the forecasting accuracy for the other two variables.

Judgemental adjustments, that is non-model-based information, are often made to augment pure 'model'-generated forecasts, thus serving to incorporate expert knowledge. Information has value and expert adjustments reflect this. In other words, whilst models attempt to capture the broad systematic influences driving the property variables analysed in the research, a host of other (model-omitted) factors will at any point impact on rental growth, capital growth and total returns. The authors suspect that many 'pure' model-generated property forecasts are adjusted, as is the case with macroeconomic forecasts. As noted in the literature review, Batchelor (2007) provides evidence of adjustments towards optimism in macroeconomic consensus forecasts as new trends emerge. In adjusting their forecasts, forecasters feel 'more in control' and can, therefore, support their underlying 'story' by way of explanation and the adjusted numbers; forecasts need to be rationalised and accounted for. As noted elsewhere (McNees and Perna,1987), "most users need to know not only what will happen, but why it will happen." Of course, information is not available as to which individual forecasts were purely model-generated and which were subject to adjustments. Consequently, when evaluating 'forecast accuracy', the research is unable to discern to what extent the measures employed reflect such subjective adjustments. However, the results of analyses that have evaluated macroeconomic forecasts have not resulted in any clear-cut conclusion as to whether or not subjective adjustments produce more accurate forecasts. Consequently, judgemental adjustments do not necessarily result in value-added by way of more accurate forecasts. Indeed, as noted in the literature review, biases can be (are) introduced, thus rendering forecasts less accurate than may otherwise have been the case. Looking to identify the market environments and conditions where property forecasts are biased is an area for further research.

APPENDIX A - THEIL'S U2 STATISTIC FOR RENTAL GROWTH, CAPITAL GROWTH AND TOTAL RETURN

Table A1: Comparison against Naïve 1 forecasts

Rental growth, one-year-ahead

Forecast	Target	Actual	Naïve	Naïve abs error	MAE	MSE Naïve	MSE	Theil U2
1999	2000	7.39	5.54	1.85	3.43	3.44	13.13	1.95
2000	2001	3.55	7.39	3.84	1.24	14.71	2.54	0.42
2001	2002	-1.25	3.55	4.80	2.73	23.06	8.80	0.62
2002	2003	-1.98	-1.25	0.73	2.16	0.54	5.99	3.33
2003	2004	2.05	-1.98	4.03	2.64	16.27	7.82	0.69
2004	2005	2.86	2.05	0.80	0.91	0.65	1.16	1.34
2005	2006	4.03	2.86	1.18	1.61	1.38	2.96	1.47
2006	2007	4.73	4.03	0.70	1.24	0.48	1.77	1.91
2007	2008	-1.22	4.73	5.94	3.78	35.34	15.25	0.66
2008	2009	-7.85	-1.22	6.63	2.36	44.00	7.60	0.42
2009	2010	-0.47	-7.85	7.38	5.63	54.49	36.93	0.82
2010	2011	0.60	-0.47	1.07	0.73	1.14	0.93	0.90

Rental growth, two-year-ahead

Forecast	Target	Actual	Naïve	Naïve abs error	MAE	MSE Naïve	MSE	Theil U2
1999	2001	3.55	5.54	1.98	0.95	3.92	1.55	0.63
2000	2002	-1.25	7.39	8.64	4.91	74.61	25.99	0.59
2001	2003	-1.98	3.55	5.54	4.36	30.65	20.77	0.82
2002	2004	2.05	-1.25	3.30	0.84	10.89	1.12	0.32
2003	2005	2.86	-1.98	4.84	1.69	23.41	3.58	0.39
2004	2006	4.03	2.05	1.98	1.41	3.92	2.51	0.80
2005	2007	4.73	2.86	1.87	2.07	3.50	4.66	1.15
2006	2008	-1.22	4.03	5.25	4.31	27.55	19.16	0.83
2007	2009	-7.85	4.73	12.58	9.93	158.22	99.68	0.79
2008	2010	-0.47	-1.22	0.75	3.84	0.56	23.48	6.48
2009	2011	0.60	-7.85	8.45	1.88	71.40	4.80	0.26

APPENDIX A - THEIL'S U2 STATISTIC FOR RENTAL GROWTH, CAPITAL GROWTH AND TOTAL RETURN

Table A2: Comparison against Naïve 1 forecasts

Capital growth, one-year-ahead

Forecast	Target	Actual	Naïve	Naïve abs error	MAE	MSE Naïve	MSE	Theil U2
1999	2000	3.55	7.23	3.68	1.75	13.53	5.32	0.63
2000	2001	0.06	3.55	3.49	3.61	12.18	15.15	1.12
2001	2002	2.61	0.06	2.54	2.00	6.47	7.11	1.05
2002	2003	3.86	2.61	1.26	3.32	1.58	13.49	2.92
2003	2004	11.40	3.86	7.54	11.40	56.88	131.32	1.52
2004	2005	12.77	11.40	1.37	10.38	1.88	110.15	7.66
2005	2006	12.62	12.77	0.16	9.80	0.02	98.44	63.68
2006	2007	-7.73	12.62	20.35	10.34	413.99	110.72	0.52
2007	2008	-26.33	-7.73	18.60	22.54	345.89	516.13	1.22
2008	2009	-3.61	-26.33	22.71	7.80	515.91	76.24	0.38
2009	2010	8.25	-3.61	11.87	6.03	140.78	47.99	0.58
2010	2011	1.90	8.25	6.35	3.64	40.35	22.31	0.74

Capital growth, two-year-ahead

Forecast	Target	Actual	Naïve	Naïve abs error	MAE	MSE Naïve	MSE	Theil U2
1999	2001	0.06	7.23	7.17	4.59	51.39	24.34	0.69
2000	2002	2.61	3.55	0.95	1.25	0.90	2.72	1.74
2001	2003	3.86	0.06	3.80	1.70	14.44	4.11	0.53
2002	2004	11.40	2.61	8.80	9.21	77.42	86.51	1.06
2003	2005	12.77	3.86	8.91	11.85	79.42	141.56	1.34
2004	2006	12.62	11.40	1.21	10.90	1.47	120.77	9.05
2005	2007	-7.73	12.77	20.50	8.80	420.36	79.68	0.44
2006	2008	-26.33	12.62	38.94	26.18	1516.70	690.05	0.67
2007	2009	-3.61	-7.73	4.12	4.46	16.94	23.82	1.19
2008	2010	8.25	-26.33	34.58	8.99	1195.71	93.75	0.28
2009	2011	1.90	-3.61	5.51	2.33	30.39	9.64	0.56

APPENDIX A - THEIL'S U2 STATISTIC FOR RENTAL GROWTH, CAPITAL GROWTH AND TOTAL RETURN

Table A3: Comparison against Naïve 1 forecasts

Total return, one-year-ahead

Forecast	Target	Actual	Naïve	Naïve abs error	MAE	MSE Naïve	MSE	Theil U2
1999	2000	10.45	14.50	4.04	1.58	16.33	4.79	0.54
2000	2001	6.79	10.45	3.66	3.91	13.43	18.08	1.16
2001	2002	9.64	6.79	2.85	2.02	8.11	7.02	0.93
2002	2003	10.85	9.64	1.22	3.27	1.48	13.06	2.97
2003	2004	18.33	10.85	7.48	11.44	55.96	132.17	1.54
2004	2005	19.10	18.33	0.77	10.12	0.59	104.76	13.37
2005	2006	18.10	19.10	1.00	9.42	0.99	90.92	9.57
2006	2007	-3.42	18.10	21.53	11.01	463.44	124.84	0.52
2007	2008	-22.10	-3.42	18.68	23.25	348.85	549.86	1.26
2008	2009	3.51	-22.10	25.61	8.71	655.75	90.85	0.37
2009	2010	15.09	3.51	11.59	5.46	134.27	41.19	0.55
2010	2011	7.80	15.09	7.29	3.04	53.20	17.12	0.57

Total return, two-year-ahead

Forecast	Target	Actual	Naïve	Naïve abs error	MAE	MSE Naïve	MSE	Theil U2
1999	2001	6.79	14.50	7.71	4.63	59.37	23.85	0.63
2000	2002	9.64	10.45	0.82	1.42	0.67	3.31	2.23
2001	2003	10.85	6.79	4.06	1.59	16.51	3.50	0.46
2002	2004	18.33	9.64	8.70	8.95	75.64	82.19	1.04
2003	2005	19.10	10.85	8.25	11.22	68.00	127.03	1.37
2004	2006	18.10	18.33	0.23	9.90	0.05	100.34	43.44
2005	2007	-3.42	19.10	22.52	10.36	507.33	109.47	0.46
2006	2008	-22.10	18.10	40.21	26.94	1616.46	730.04	0.67
2007	2009	3.51	-3.42	6.93	2.91	48.03	10.91	0.48
2008	2010	15.09	-22.10	37.20	8.94	1383.47	95.15	0.26
2009	2011	7.80	3.51	4.29	2.77	18.44	14.15	0.88

APPENDIX A - THEIL'S U2 STATISTIC FOR RENTAL GROWTH, CAPITAL GROWTH AND TOTAL RETURN

Table A4: Comparison against Naïve 2 forecasts

Rental growth, one-year-ahead

Forecast	Target	Actual	Naïve	Naïve abs error	MAE	MSE Naïve	MSE	Theil U2
1999	2000	7.39	4.71	2.68	3.43	7.18	13.13	1.35
2000	2001	3.55	4.75	1.20	1.24	1.44	2.54	1.33
2001	2002	-1.25	4.89	6.13	2.73	37.62	8.80	0.48
2002	2003	-1.98	4.82	6.80	2.16	46.30	5.99	0.36
2003	2004	2.05	4.55	2.49	2.64	6.22	7.82	1.12
2004	2005	2.86	4.26	1.41	0.91	1.98	1.16	0.77
2005	2006	4.03	4.17	0.14	1.61	0.02	2.96	12.41
2006	2007	4.73	4.12	0.61	1.24	0.37	1.77	2.19
2007	2008	-1.22	4.11	5.33	3.78	28.43	15.25	0.73
2008	2009	-7.85	4.14	11.99	2.36	143.72	7.60	0.23
2009	2010	-0.47	3.95	4.42	5.63	19.49	36.93	1.38
2010	2011	0.60	3.54	2.94	0.73	8.64	0.93	0.33

Rental growth, two-year-ahead

Forecast	Target	Actual	Naïve	Naïve abs error	MAE	MSE Naïve	MSE	Theil U2
1999	2001	3.55	4.71	1.16	0.95	1.34	1.55	1.08
2000	2002	-1.25	4.75	6.00	4.91	36.02	25.99	0.85
2001	2003	-1.98	4.89	6.87	4.36	47.17	20.77	0.66
2002	2004	2.05	4.82	2.77	0.84	7.67	1.12	0.38
2003	2005	2.86	4.55	1.69	1.69	2.86	3.58	1.12
2004	2006	4.03	4.26	0.23	1.41	0.05	2.51	6.87
2005	2007	4.73	4.17	0.56	2.07	0.31	4.66	3.88
2006	2008	-1.22	4.12	5.34	4.31	28.47	19.16	0.82
2007	2009	-7.85	4.11	11.97	9.93	143.17	99.68	0.83
2008	2010	-0.47	4.14	4.61	3.84	21.22	23.48	1.05
2009	2011	0.60	3.95	3.35	1.88	11.20	4.80	0.65

APPENDIX A - THEIL'S U2 STATISTIC FOR RENTAL GROWTH, CAPITAL GROWTH AND TOTAL RETURN

Table A5: Comparison against Naïve 2 forecasts

Capital growth, one-year-ahead

Forecast	Target	Actual	Naïve	Naïve abs error	MAE	MSE Naïve	MSE	Theil U2
1999	2000	3.55	3.58	0.03	1.75	0.00	5.32	82.64
2000	2001	0.06	3.77	3.71	3.61	13.77	15.15	1.05
2001	2002	2.61	3.76	1.16	2.00	1.34	7.11	2.30
2002	2003	3.86	3.59	0.28	3.32	0.08	13.49	13.30
2003	2004	11.40	3.54	7.86	11.40	61.82	131.32	1.46
2004	2005	12.77	3.56	9.22	10.38	84.98	110.15	1.14
2005	2006	12.62	3.88	8.74	9.80	76.31	98.44	1.14
2006	2007	-7.73	4.24	11.97	10.34	143.20	110.72	0.88
2007	2008	-26.33	4.56	30.89	22.54	954.01	516.13	0.74
2008	2009	-3.61	4.11	7.72	7.80	59.57	76.24	1.13
2009	2010	8.25	3.02	5.23	6.03	27.39	47.99	1.32
2010	2011	1.90	2.79	0.89	3.64	0.79	22.31	5.31

Capital growth, two-year-ahead

Forecast	Target	Actual	Naïve	Naïve abs error	MAE	MSE Naïve	MSE	Theil U2
1999	2001	0.06	3.58	3.52	4.59	12.38	24.34	1.40
2000	2002	2.61	3.77	1.17	1.25	1.36	2.72	1.41
2001	2003	3.86	3.76	0.10	1.70	0.01	4.11	20.25
2002	2004	11.40	3.59	7.82	9.21	61.12	86.51	1.19
2003	2005	12.77	3.54	9.23	11.85	85.24	141.56	1.29
2004	2006	12.62	3.56	9.06	10.90	82.13	120.77	1.21
2005	2007	-7.73	3.88	11.61	8.80	134.82	79.68	0.77
2006	2008	-26.33	4.24	30.56	26.18	934.20	690.05	0.86
2007	2009	-3.61	4.56	8.17	4.46	66.80	23.82	0.60
2008	2010	8.25	4.11	4.15	8.99	17.20	93.75	2.33
2009	2011	1.90	3.02	1.12	2.33	1.25	9.64	2.78

APPENDIX A - THEIL'S U2 STATISTIC FOR RENTAL GROWTH, CAPITAL GROWTH AND TOTAL RETURN

Table A6: Comparison against Naïve 2 forecasts

Total return, one-year-ahead

Forecast	Target	Actual	Naïve	Naïve abs error	MAE	MSE Naïve	MSE	Theil U2
1999	2000	10.45	10.58	0.12	1.58	0.02	4.79	17.82
2000	2001	6.79	10.78	3.99	3.91	15.95	18.08	1.06
2001	2002	9.64	10.77	1.13	2.02	1.28	7.02	2.35
2002	2003	10.85	10.58	0.28	3.27	0.08	13.06	13.07
2003	2004	18.33	10.53	7.80	11.44	60.84	132.17	1.47
2004	2005	19.10	10.55	8.55	10.12	73.13	104.76	1.20
2005	2006	18.10	10.87	7.23	9.42	52.29	90.92	1.32
2006	2007	-3.42	11.20	14.63	11.01	213.92	124.84	0.76
2007	2008	-22.10	11.47	33.57	23.25	1126.87	549.86	0.70
2008	2009	3.51	10.92	7.41	8.71	54.90	90.85	1.29
2009	2010	15.09	9.74	5.36	5.46	28.70	41.19	1.20
2010	2011	7.80	9.52	1.72	3.04	2.97	17.12	2.40

Total return, two-year-ahead

Forecast	Target	Actual	Naïve	Naïve abs error	MAE	MSE Naïve	MSE	Theil U2
1999	2001	6.79	10.58	3.79	4.63	14.34	23.85	1.29
2000	2002	9.64	10.78	1.15	1.42	1.31	3.31	1.59
2001	2003	10.85	10.77	0.09	1.59	0.01	3.50	21.50
2002	2004	18.33	10.58	7.76	8.95	60.17	82.19	1.17
2003	2005	19.10	10.53	8.57	11.22	73.37	127.03	1.32
2004	2006	18.10	10.55	7.56	9.90	57.08	100.34	1.33
2005	2007	-3.42	10.87	14.30	10.36	204.40	109.47	0.73
2006	2008	-22.10	11.20	33.30	26.94	1109.12	730.04	0.81
2007	2009	3.51	11.47	7.96	2.91	63.38	10.91	0.41
2008	2010	15.09	10.92	4.18	8.94	17.45	95.15	2.33
2009	2011	7.80	9.74	1.94	2.77	3.75	14.15	1.94

APPENDIX B - MEAN ABSOLUTE ERRORS IN ONE- AND TWO-YEAR HORIZONS FOR RENTAL GROWTH, CAPITAL GROWTH AND TOTAL RETURN

Figure B1: Mean absolute errors for consensus rental growth forecast: one-year horizon

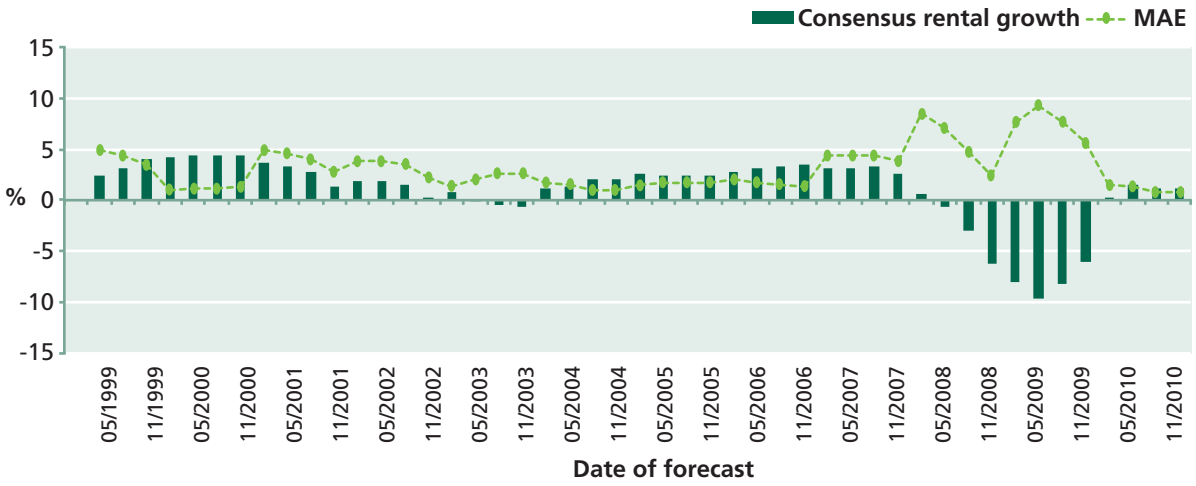
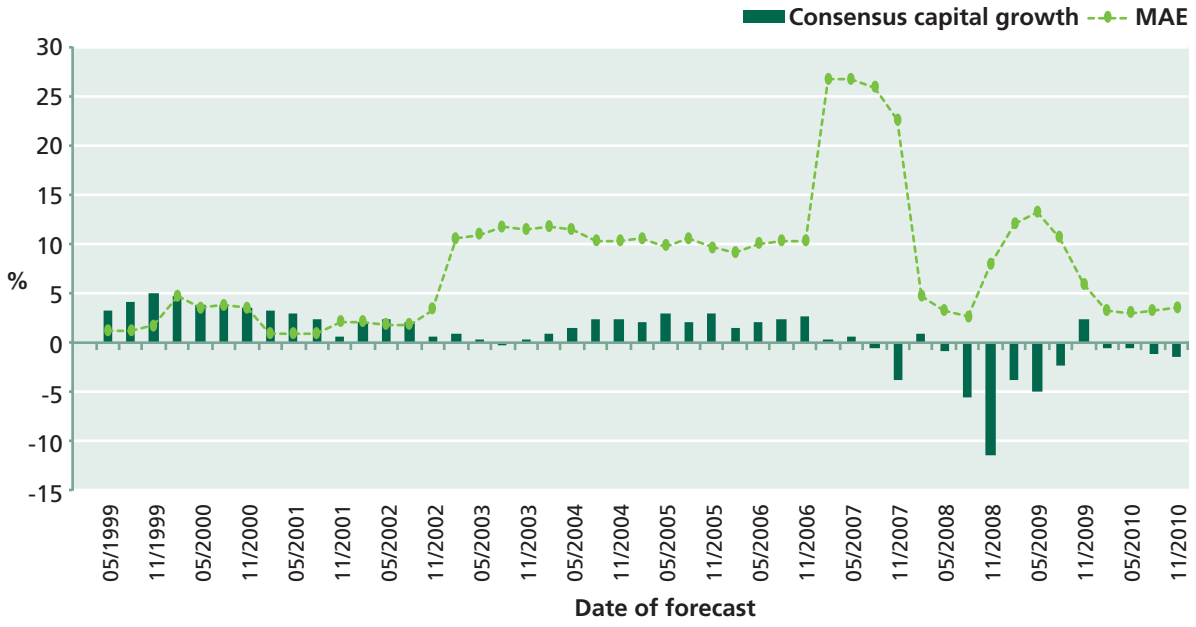


Figure B2: Mean absolute errors for consensus capital growth forecasts: one-year horizon



APPENDIX B - MEAN ABSOLUTE ERRORS IN ONE- AND TWO-YEAR HORIZONS FOR RENTAL GROWTH, CAPITAL GROWTH AND TOTAL RETURN

Figure B3: Mean absolute errors for consensus total return forecasts: one-year horizon

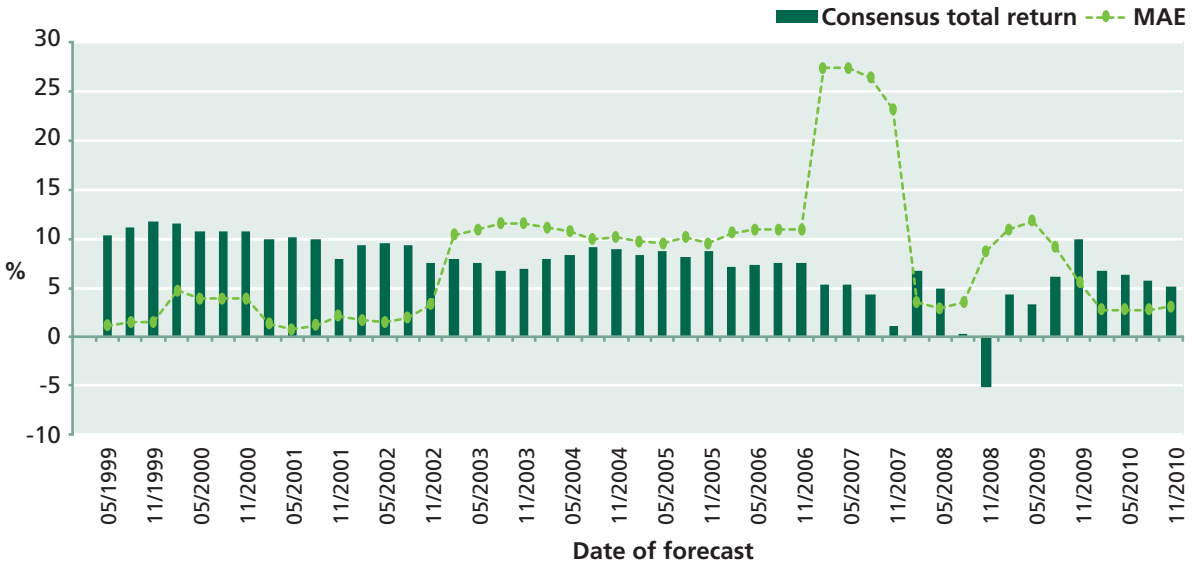
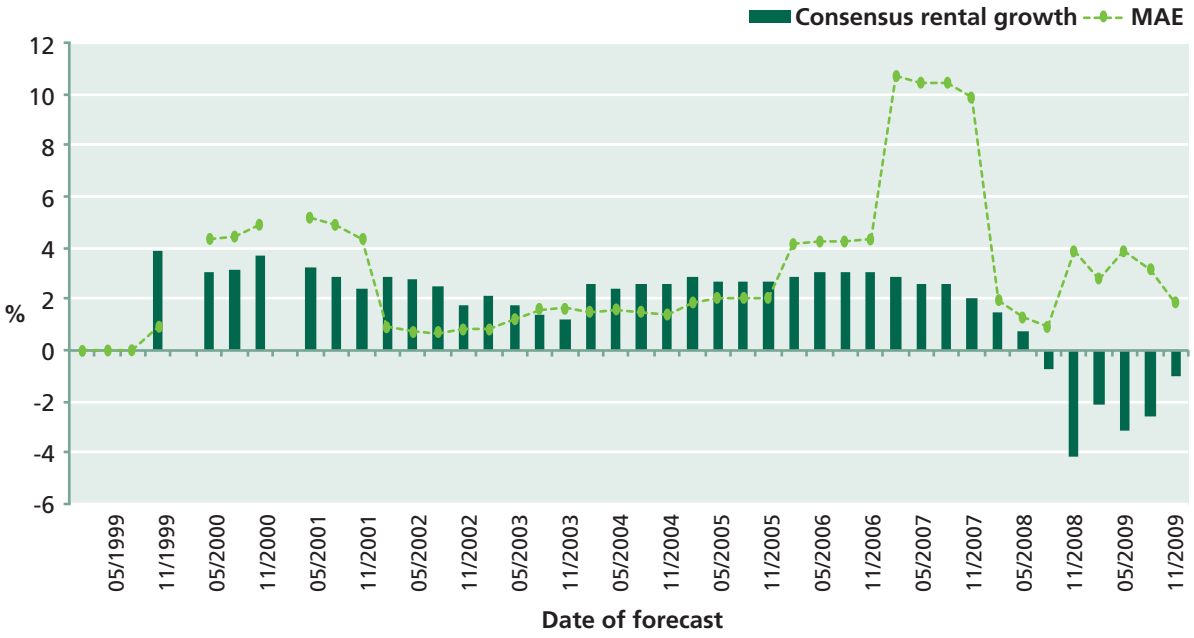


Figure B4: Mean absolute errors for consensus rental growth forecasts: two-year horizon



APPENDIX B - MEAN ABSOLUTE ERRORS IN ONE- AND TWO-YEAR HORIZONS FOR RENTAL GROWTH, CAPITAL GROWTH AND TOTAL RETURN

Figure B5: Mean absolute errors for consensus capital growth forecasts: two-year horizon

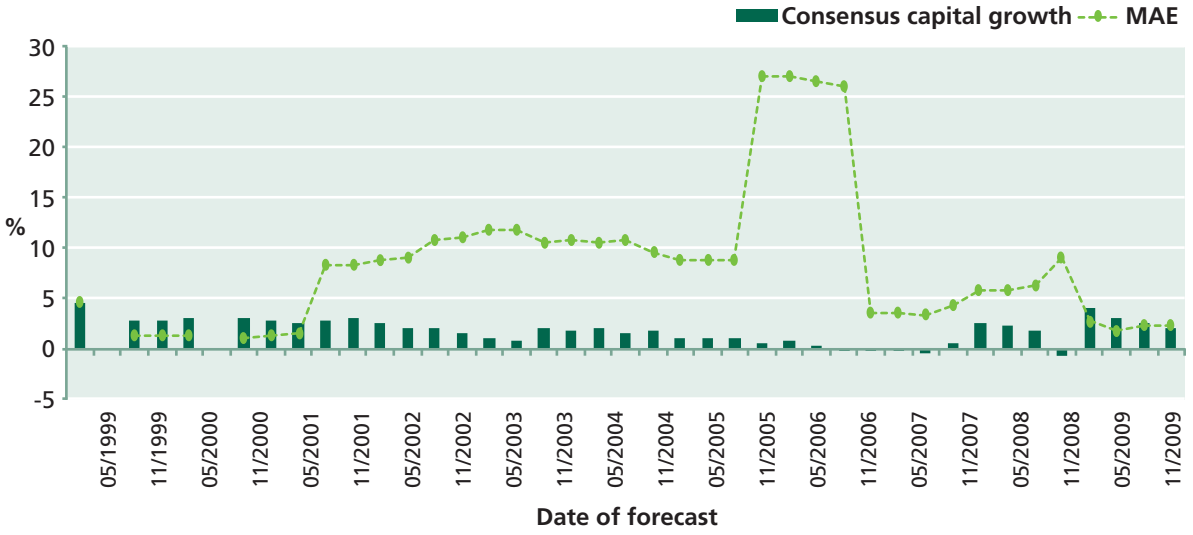
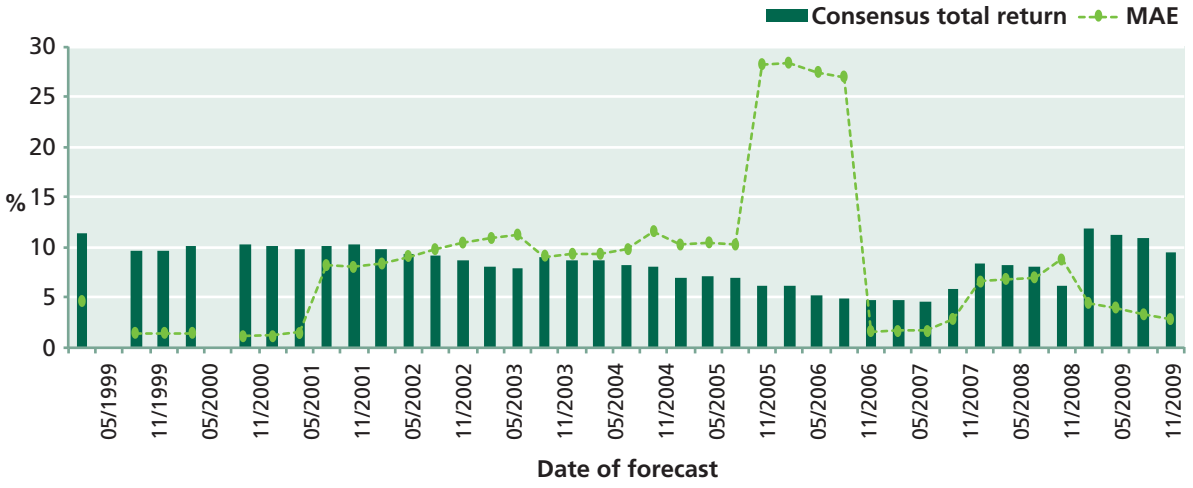


Figure B6: Mean absolute errors for consensus total return forecasts: two-year horizon



APPENDIX C - EXAMINATION OF BIAS IN ONE- AND TWO-YEAR-AHEAD FORECASTS FOR THE PERIOD 1999–2011

Table C1

Rental growth, one-year-ahead: 1999–2011

	Coefficients				Bias		
Forecasters	α	β	S.E.(β)	R^2	F-stat	F-prob	Obs.
PA2	0.10	0.83***	0.19	0.59	0.43	0.66	12
PA3	-0.08	1.05	0.48	0.39	0.01	0.99	6
PA4	0.96	0.56**	0.23	0.44	1.97	0.19	11
PA5	-0.13	0.80	0.49	0.36	0.49	0.65	5
PA6	1.13	0.62**	0.24	0.19	2.25	0.18	8
PA7	0.98	0.95***	0.11	0.76	1.94	0.22	8
PA9	0.79	0.59***	0.15	0.49	4.71	0.04	11
PA12	-0.17	1.06***	0.26	0.53	0.04	0.96	12
PA13	-0.51	0.81***	0.24	0.43	0.69	0.52	11
PA14	2.17	0.15	1.04	0.002	0.61	0.62	4
PA15	-0.55	0.84***	0.15	0.63	0.50	0.64	6
PA16	0.22	1.09***	0.23	0.70	0.22	0.81	7
PA17	-0.42	0.59	0.26	0.37	1.14	0.42	5
PA18	0.17	0.94***	0.16	0.73	0.08	0.92	6
FM2	2.28	0.53	0.21	0.21	3.63	0.12	6
FM4	1.41	0.55**	0.17	0.44	3.90	0.07	9
FM5	0.29	0.77	0.33	0.30	0.23	0.80	9
FM7	-0.17	1.22**	0.44	0.43	0.27	0.76	9
FM8	1.73	0.26**	0.09	0.19	47.57	0.00	11
FM9	0.61	1.01*	0.28	0.54	0.35	0.71	9
FM10	0.22	0.86*	0.27	0.45	0.13	0.87	10
FM13	1.32	0.46	0.40	0.07	1.16	0.37	8
FM14	0.82	0.97***	0.19	0.69	1.43	0.28	12
FM15	1.01	0.22	0.12	0.12	24.87	0.00	9
FM17	0.51	0.13	0.18	0.02	50.83	0.00	8
FM18	1.26	0.98**	0.34	0.59	2.88	0.16	6
FM19	1.38	0.33**	0.16	0.25	180.81	0.00	6
EB1	-2.31	2.76**	0.71	0.66	4.42	0.13	5
EB4	0.43	1.07***	0.15	0.75	0.45	0.65	9
EB6	-1.32	1.70***	0.35	0.34	6.83	0.06	6

Note: * and ** and ***indicate significance at 10%, 5% and 1% respectively. Standard errors are corrected for heteroskedasticity and autocorrelation using the Newey–West HAC S.E.

APPENDIX C - EXAMINATION OF BIAS IN ONE- AND TWO-YEAR-AHEAD FORECASTS FOR THE PERIOD 1999–2011

Table C2

Capital growth, one-year-ahead: 1999–2011

	Coefficients				Bias		
Forecasters	α	β	S.E.(β)	R^2	F-stat	F-prob	Obs.
PA2	0.77	0.56**	0.22	0.05	2.12	0.17	12
PA3	8.62**	-1.67*	0.62	0.25	9.19	0.03	6
PA4	0.76	1.10	0.86	0.15	0.11	0.89	11
PA5	10.07	-1.09*	0.41	0.29	29.76	0.01	5
PA6	1.28	1.48	2.20	0.05	0.21	0.81	8
PA7	-2.06	1.04*	0.53	0.28	0.27	0.77	8
PA9	0.68	-0.15	0.35	0.00	10.09	0.01	11
PA12	0.76	1.78***	0.54	0.43	1.37	0.30	11
PA13	-0.31	1.71**	0.57	0.37	0.86	0.45	11
PA14	-8.64	4.89	1.69	0.54	5.40	0.15	4
PA15	-1.74	0.30	0.87	0.01	3.70	0.12	6
PA16	-0.66	1.00**	0.46	0.12	0.01	0.99	7
PA17	4.94	2.03*	0.65	0.63	7.76	0.07	5
PA18	-0.49	1.03	0.75	0.13	0.01	0.99	6
FM2	6.03	-0.92	1.31	0.05	1.08	0.42	6
FM4	0.72	0.60**	0.25	0.13	1.36	0.31	9
FM5	4.34	0.40	1.15	0.01	0.77	0.50	9
FM7	-2.91	2.05	1.75	0.22	0.20	0.82	9
FM8	0.59	1.60	1.03	0.23	0.33	0.72	11
FM9	2.59	0.56	0.30	0.09	3.92	0.07	9
FM10	2.11	1.06**	0.41	0.14	0.32	0.73	11
FM13	4.94	1.38	1.12	0.30	0.69	0.53	8
FM14	2.33	0.85**	0.33	0.20	0.43	0.66	12
FM15	0.48	0.89	0.80	0.11	0.05	0.94	9
FM17	1.36	1.90	1.40	0.25	0.59	0.58	8
FM18	6.34*	1.72**	0.46	0.41	2.91	0.16	6
FM19	-8.51	5.62*	2.63	0.52	1.90	0.26	6
EB1	1.90	0.82	0.51	0.04	0.31	0.75	5
EB4	-1.07	1.30	0.77	0.25	0.08	0.92	9
EB6	5.23	0.20	1.31	0.00	0.84	0.49	6

Note: * and ** and ***indicate significance at 10%, 5% and 1% respectively. Standard errors are corrected for heteroskedasticity and autocorrelation using the Newey–West HAC S.E.

APPENDIX C - EXAMINATION OF BIAS IN ONE- AND TWO-YEAR-AHEAD FORECASTS FOR THE PERIOD 1999–2011

Table C3

Total return, one-year-ahead: 1999–2011

	Coefficients				Bias		
Forecasters	α	β	S.E.(β)	R^2	F-stat	F-prob	Obs.
PA2	2.29	0.71**	0.31	0.09	0.48	0.63	12
PA3	28.62**	-1.86**	0.62	0.37	11.48	0.02	6
PA4	-1.87	1.30	0.86	0.23	0.17	0.84	11
PA5	25.62**	-1.22	0.38	0.37	38.41	0.01	5
PA6	-12.27	2.83	2.85	0.23	0.39	0.68	8
PA7	-3.46	1.16*	0.55	0.34	0.34	0.71	8
PA9	5.23	0.23	0.22	0.01	10.43	0.00	11
PA12	-4.86	1.84**	0.55	0.51	1.52	0.27	12
PA13	-5.65	1.82**	0.62	0.43	0.99	0.40	11
PA14	-31.58***	4.82**	1.08	0.69	127.80	0.01	4
PA15	1.86	0.34	0.90	0.01	0.91	0.47	6
PA16	-3.05	1.26	0.59	0.17	0.15	0.86	7
PA17	-1.80	1.96*	0.70	0.63	2.89	0.19	5
PA18	-2.48	1.32	0.85	0.20	0.08	0.92	6
FM2	7.32	0.29	2.48	0.01	0.05	0.94	6
FM4	2.46	0.68*	0.30	0.16	0.58	0.58	9
FM5	2.96	1.00	2.17	0.05	1.02	0.40	9
FM7	-15.89	2.72	1.96	0.36	0.38	0.69	9
FM8	-4.79	1.70	0.93	0.32	0.42	0.66	10
FM9	4.53***	0.65**	0.19	0.14	13.52	0.00	9
FM10	-0.30	1.33**	0.53	0.20	0.58	0.57	11
FM13	1.00	1.64	1.02	0.43	0.78	0.50	8
FM14	2.97	0.94**	0.38	0.26	0.36	0.70	11
FM15	-2.70	1.19	1.01	0.21	0.03	0.96	9
FM17	-6.80	2.10	1.35	0.35	0.53	0.61	8
FM18	-0.37	2.02	0.62	0.50	6.10	0.06	6
FM19	-34.98*	5.19**	1.76	0.73	2.84	0.17	6
EB1	9.94	0.13	0.61	0.00	1.15	0.42	5
EB4	-5.72	1.57*	0.80	0.33	0.26	0.77	9
EB6	29.09	-1.66	1.11	0.20	5.20	0.08	6

Note: * and ** and ***indicate significance at 10%, 5% and 1% respectively. Standard errors are corrected for heteroskedasticity and autocorrelation using the Newey–West HAC S.E.

APPENDIX C - EXAMINATION OF BIAS IN ONE- AND TWO-YEAR-AHEAD FORECASTS FOR THE PERIOD 1999–2011

Table C4

Rental growth, two-year-ahead: 1999–2011

	Coefficients				Bias		
Forecasters	α	β	S.E.(β)	R^2	F-stat	F-prob	Obs.
PA2	-0.24	0.27	0.23	0.02	5.11	0.03	11
PA3	2.05	-0.22	0.66	0.01	1.73	0.28	6
PA4	-0.57	0.43	0.33	0.03	2.46	0.15	10
PA5	5.30**	-0.94	0.47	0.32	9.21	0.06	5
PA6	0.85	-0.05	0.86	0.00	0.72	0.52	8
PA7	0.24	-0.23	0.33	0.00	45.64	0.00	7
PA9	-1.79	-0.20	0.12	0.10	58.74	0.00	6
PA12	0.14	0.17	0.37	0.01	3.07	0.10	11
PA13	0.35	-0.12	0.15	0.01	34.74	0.00	10
PA14	10.80	-3.85	2.56	0.12	3.58	0.21	4
PA15	1.58	-0.56	0.60	0.07	3.38	0.17	5
PA16	-0.12	0.19	0.34	0.01	10.91	0.02	6
PA17	0.00	0.16	0.55	0.01	27.50	0.01	5
PA18	-0.89	0.05	0.55	0.00	1.60	0.34	5
FM2	1.81	-0.30	1.06	0.01	1.42	0.34	6
FM4	-0.01	0.19	0.15	0.02	15.24	0.00	8
FM5	1.15	0.21	0.31	0.02	5.77	0.04	8
FM7	-3.01	1.74***	0.47	0.14	1.33	0.32	9
FM8	0.65	-0.07	0.15	0.00	29.24	0.00	10
FM9	0.78	0.14	0.18	0.01	27.18	0.00	8
FM10	0.03	0.12	0.26	0.00	10.67	0.01	10
FM13	-1.13	0.75	1.00	0.03	0.74	0.52	7
FM14	-0.09	0.41	0.39	0.06	1.39	0.30	11
FM15	1.70	-0.77*	0.40	0.15	10.20	0.01	8
FM17	0.45	0.11	0.59	0.00	1.25	0.36	7
FM18	1.47	0.43	0.23	0.23	92.84	0.00	5
FM19	-0.73	0.42	0.74	0.02	0.39	0.70	5
EB1	-14.13***	5.62***	0.61	0.63	85.89	0.00	5
EB4	-3.30	1.85	1.01	0.30	0.68	0.53	9
EB6	-2.75	-1.47	1.02	0.23	0.69	0.55	6

Note: * and ** and ***indicate significance at 10%, 5% and 1% respectively. Standard errors are corrected for heteroskedasticity and autocorrelation using the Newey–West HAC S.E.

APPENDIX C - EXAMINATION OF BIAS IN ONE- AND TWO-YEAR-AHEAD FORECASTS FOR THE PERIOD 1999–2011

Table C5

Capital growth, two-year-ahead: 1999–2011

	Coefficients				Bias		
Forecasters	α	β	S.E.(β)	R^2	F-stat	F-prob	Obs.
PA2	-3.38	2.57	2.46	0.16	0.22	0.80	11
PA3	10.02***	-3.23***	0.19	0.95	610.70	0.00	6
PA4	-5.63	2.35	2.80	0.10	0.12	0.88	10
PA5	15.69**	-2.32*	0.50	0.71	187.10	0.00	5
PA6	8.00	-1.95	1.37	0.11	3.24	0.12	8
PA7	-5.68	0.77	2.40	0.01	4.03	0.10	7
PA9	-6.61	1.41	2.13	0.09	1.11	0.41	6
PA12	-1.79	1.67	2.03	0.10	0.05	0.95	11
PA13	-1.29	2.18	2.96	0.08	0.11	0.89	10
PA14	-12.13	12.36*	3.18	0.60	11.90	0.08	4
PA15	-4.91	3.88**	0.91	0.62	15.85	0.03	5
PA16	-2.72	0.50	1.20	0.01	0.33	0.73	6
PA17	3.03	-0.15	0.36	0.01	17.22	0.02	5
PA18	-2.15	-2.23	1.86	0.13	1.54	0.35	5
FM2	-4.01	4.05**	1.43	0.56	2.34	0.21	6
FM4	-1.42	-0.27	1.32	0.00	0.80	0.50	8
FM5	-2.67	2.77	2.88	0.24	0.18	0.83	8
FM7	-1.16	1.07	2.27	0.02	0.04	0.96	9
FM8	-0.99	1.20	1.38	0.14	0.03	0.98	10
FM9	-2.61	1.38	2.31	0.05	0.39	0.70	8
FM10	-0.49	3.44**	1.28	0.46	2.53	0.14	10
FM13	2.75	0.12	1.70	0.00	0.15	0.85	7
FM14	-1.14	2.01	1.57	0.16	0.27	0.77	11
FM15	5.11	-1.94	3.60	0.04	0.34	0.72	8
FM17	4.52	-0.04	0.78	0.00	1.35	0.33	7
FM18	-1.10	5.47*	1.73	0.46	28.00	0.01	5
FM19	-8.65	2.31	0.99	0.15	0.87	0.50	5
EB1	12.78	-2.42	1.59	0.32	4.41	0.13	5
EB4	-0.36	0.55	0.32	0.02	0.98	0.42	9
EB6	0.60	0.92	1.66	0.02	0.01	0.98	6

Note: * and ** and ***indicate significance at 10%, 5% and 1% respectively. Standard errors are corrected for heteroskedasticity and autocorrelation using the Newey–West HAC S.E.

APPENDIX C - EXAMINATION OF BIAS IN ONE- AND TWO-YEAR-AHEAD FORECASTS FOR THE PERIOD 1999–2011

Table C6

Total return, two-year-ahead: 1999–2011

	Coefficients				Bias		
Forecasters	α	β	S.E.(β)	R^2	F-stat	F-prob	Obs.
PA2	-17.42	3.08	1.79	0.34	0.67	0.53	11
PA3	33.82***	-2.57***	0.20	0.92	183.50	0.00	6
PA4	-21.30	2.98	1.83	0.31	0.73	0.51	10
PA5	36.08*	-2.17	0.73	0.67	9.39	0.06	5
PA6	0.50	1.12	2.23	0.02	0.12	0.88	8
PA7	-31.44	3.63	1.91	0.37	3.16	0.13	7
PA9	-36.21	4.11	2.21	0.56	1.06	0.42	6
PA12	-14.15	2.60	2.11	0.24	0.28	0.75	11
PA13	-17.65	3.32	3.01	0.25	0.34	0.72	10
PA14	-42.74	6.52	2.41	0.43	2.99	0.25	4
PA15	-23.04***	4.11***	0.59	0.78	192.70	0.00	5
PA16	-3.71	1.03	1.45	0.03	0.42	0.68	6
PA17	8.14	0.01	8.18	0.00	21.02	0.01	5
PA18	-0.77	0.11	1.14	0.00	0.97	0.47	5
FM2	-22.37**	3.67***	0.79	0.68	6.54	0.06	6
FM4	-7.99	1.83	1.66	0.12	0.15	0.86	8
FM5	-21.96	3.69	2.11	0.50	0.94	0.44	8
FM7	-16.04	2.80	2.03	0.24	0.45	0.65	8
FM8	-4.72	1.56	1.48	0.21	0.07	0.93	9
FM9	-14.99	2.50	2.28	0.20	0.36	0.70	8
FM10	-13.43*	2.85**	0.86	0.53	2.38	0.15	10
FM13	3.52	1.61	1.45	0.12	0.32	0.74	7
FM14	-5.49	1.81	1.04	0.25	0.38	0.69	11
FM15	-19.21	2.59*	1.26	0.19	0.97	0.43	8
FM17	0.62	1.19	0.59	0.09	0.54	0.61	7
FM18	-33.74**	5.75**	1.09	0.75	46.67	0.00	5
FM19	-28.35	3.66	2.07	0.41	2.50	0.22	5
EB1	33.67**	-2.17	0.92	0.30	7.64	0.06	5
EB4	-2.14	1.08	0.63	0.08	0.05	0.95	9
EB6	-9.98	1.99	1.47	0.13	0.23	0.80	6

Note: * and ** and ***indicate significance at 10%, 5% and 1% respectively. Standard errors are corrected for heteroskedasticity and autocorrelation using the Newey–West HAC S.E.

APPENDIX D - EXAMINATION OF BIAS IN ONE- AND TWO-YEAR-AHEAD FORECASTS FOR THE PERIOD 1999–2011 (HOLDEN AND PEEL, 1990)

Table D1

'Unbiasedness' test: H_0: E(εt)=0

Dependent variable: Individual one-year-ahead forecast error										
	Rental growth			Capital growth			Total return			
Forecasters	α	S.E.(α)	p-value	α	S.E.(α)	p-value	α	S.E.(α)	p-value	Obs.
PA2	-0.08	0.63	**0.89**	0.11	3.11	**0.97**	0.10	3.14	**0.97**	11
PA3	0.04	0.95	**0.97**	3.95	3.26	**0.27**	3.91	3.29	**0.28**	6
PA4	0.25	0.61	**0.69**	0.88	3.68	**0.81**	0.46	3.75	**0.90**	11
PA5	-0.89	0.99	**0.41**	2.41	4.38	**0.61**	2.42	4.35	**0.60**	5
PA6	0.65	0.90	**0.49**	1.70	4.71	**0.72**	1.42	4.72	**0.77**	8
PA7	0.96	0.61	**0.16**	-2.03	2.85	**0.50**	-2.35	2.79	**0.42**	7
PA9	0.82	0.99	**0.43**	0.17	3.74	**0.96**	-0.23	3.73	**0.95**	11
PA12	-0.10	0.65	**0.88**	1.13	2.71	**0.68**	0.95	2.76	**0.73**	12
PA13	-0.74	0.79	**0.37**	0.41	2.99	**0.89**	0.24	3.09	**0.93**	11
PA14	-0.10	1.30	**0.94**	-3.49	9.47	**0.73**	-4.23	9.58	**0.68**	4
PA15	-0.76	1.02	**0.49**	-1.76	5.30	**0.75**	-1.94	5.43	**0.73**	6
PA16	0.24	0.69	**0.74**	-0.66	4.51	**0.88**	-1.27	4.56	**0.78**	7
PA17	-0.35	1.49	**0.82**	2.58	4.52	**0.59**	2.38	4.60	**0.63**	5
PA18	0.19	0.59	**0.77**	-0.56	4.05	**0.89**	-1.08	4.08	**0.80**	6
FM2	1.30	1.11	**0.30**	1.28	3.12	**0.69**	1.04	3.08	**0.74**	6
FM4	1.40	0.88	**0.15**	1.19	3.50	**0.74**	0.81	3.52	**0.82**	9
FM5	-0.21	0.88	**0.81**	2.68	2.26	**0.27**	3.00	2.14	**0.20**	9
FM7	0.26	0.65	**0.70**	-0.68	4.49	**0.88**	-1.06	4.60	**0.82**	9
FM8	1.39	1.20	**0.27**	1.15	3.48	**0.74**	0.31	4.09	**0.94**	10
FM9	0.63	0.71	**0.40**	1.98	1.84	**0.31**	1.79	1.73	**0.33**	9
FM10	0.11	0.91	**0.90**	2.02	2.72	**0.48**	1.50	2.82	**0.60**	11
FM13	0.23	0.92	**0.81**	4.22	4.30	**0.35**	3.93	4.18	**0.38**	8
FM14	0.81	0.45	**0.11**	2.46	2.77	**0.40**	2.67	2.70	**0.34**	12
FM15	0.36	1.13	**0.76**	-0.65	4.04	**0.87**	-1.16	4.02	**0.78**	9
FM17	0.06	0.97	**0.95**	2.32	4.47	**0.62**	1.80	4.56	**0.70**	8
FM18	1.27	0.65	**0.11**	5.36	2.70	**0.10**	4.88	2.45	**0.11**	6
FM19	0.64	0.95	**0.53**	-1.30	5.68	**0.83**	-2.08	5.70	**0.73**	6
EB1	0.41	1.27	**0.76**	1.39	1.90	**0.50**	1.57	2.0	**0.47**	5
EB4	0.56	0.54	**0.33**	-0.49	4.39	**0.91**	-0.89	4.52	**0.84**	9
EB6	0.23	1.20	**0.85**	2.60	2.99	**0.42**	2.54	3.08	**0.44**	6

Note: Standard errors are corrected for heteroskedasticity and autocorrelation using the Newey–West HAC S.E.

APPENDIX D - EXAMINATION OF BIAS IN ONE- AND TWO-YEAR-AHEAD FORECASTS FOR THE PERIOD 1999–2011 (HOLDEN AND PEEL, 1990)

Table D2

'Unbiasedness' test: H_0: E(εt)=0

Dependent variable: Individual two-year-ahead forecast error										
	Rental growth			Capital growth			Total return			
Forecasters	α	S.E.(α)	p-value	α	S.E.(α)	p-value	α	S.E.(α)	p-value	Obs.
PA2	-2.12	1.18	**0.11**	-0.44	3.68	**0.90**	-0.50	3.62	**0.89**	11
PA3	-0.72	1.35	**0.61**	6.35	3.99	**0.18**	6.04	3.90	**0.18**	6
PA4	-2.08	1.27	**0.13**	-1.95	4.40	**0.67**	-2.57	4.25	**0.55**	10
PA5	-2.66	2.16	**0.28**	2.38	4.53	**0.62**	2.24	4.19	**0.61**	5
PA6	-1.14	1.61	**0.50**	1.95	3.27	**0.57**	1.58	3.03	**0.52**	8
PA7	-2.47	1.28	**0.11**	-6.30	4.24	**0.19**	-6.87	4.09	**0.15**	7
PA9	-3.16	2.19	**0.21**	-5.32	4.94	**0.33**	-5.66	4.62	**0.27**	6
PA12	-1.32	1.07	**0.25**	-0.49	3.63	**0.90**	-0.73	3.64	**0.84**	11
PA13	-1.60	1.33	**0.26**	0.26	4.09	**0.94**	0.06	4.13	**0.98**	10
PA14	-2.90	3.38	**0.45**	-6.74	7.31	**0.42**	-7.38	7.25	**0.38**	4
PA15	-3.22	2.22	**0.22**	-3.76	4.65	**0.46**	-3.90	4.65	**0.44**	5
PA16	-0.53	1.71	**0.77**	-2.97	4.48	**0.54**	-3.50	4.63	**0.48**	6
PA17	-1.07	1.65	**0.55**	-2.57	2.71	**0.40**	-3.06	2.73	**0.32**	5
PA18	-2.04	1.58	**0.27**	-7.00	6.11	**0.31**	-7.88	6.10	**0.27**	5
FM2	-1.13	1.34	**0.43**	-2.84	5.26	**0.61**	-3.56	5.45	**0.54**	6
FM4	-0.46	1.35	**0.74**	-1.79	4.30	**0.68**	-2.28	4.24	**0.60**	8
FM5	-1.37	1.12	**0.26**	-0.27	4.99	**0.96**	-0.88	5.05	**0.87**	8
FM7	-1.50	1.39	**0.31**	-1.04	4.94	**0.83**	-1.10	5.16	**0.83**	8
FM8	-0.76	1.65	**0.65**	-0.69	4.32	**0.87**	-0.61	4.85	**0.90**	9
FM9	-0.55	1.27	**0.68**	-2.05	3.45	**0.57**	-2.79	3.59	**0.46**	8
FM10	-1.38	1.03	**0.21**	0.07	3.08	**0.98**	-0.50	3.11	**0.87**	10
FM13	-1.69	1.77	**0.37**	1.51	2.84	**0.61**	1.35	2.53	**0.61**	7
FM14	-0.86	1.01	**0.41**	0.15	3.41	**0.96**	0.37	3.33	**0.91**	11
FM15	-2.43	1.76	**0.20**	-3.62	4.77	**0.47**	-4.13	4.46	**0.38**	8
FM17	-1.06	1.61	**0.53**	2.97	3.19	**0.38**	2.23	2.97	**0.47**	7
FM18	1.40	0.98	**0.23**	-2.04	5.47	**0.73**	-3.30	5.39	**0.57**	5
FM19	-1.80	2.12	**0.44**	-6.37	4.95	**0.27**	-7.16	4.62	**0.19**	5
EB1	-1.65	0.78	**0.11**	3.40	3.35	**0.36**	3.42	3.29	**0.35**	5
EB4	-1.53	1.27	**0.26**	-1.16	4.59	**0.80**	-1.48	4.62	**0.75**	9
EB6	-1.26	1.05	**0.28**	0.35	2.46	**0.89**	0.02	2.53	**0.99**	6

Note: Standard errors are corrected for heteroskedasticity and autocorrelation using the Newey–West HAC S.E.

REFERENCES

Ager P., Kappler M. and Osterloh S. (2009). **The accuracy and efficiency of the consensus forecasts: A further application and extension of the pooled approach,** International Journal of Forecasting, vol. 25(1), pp. 167–181.

Batchelor R. (2007). **Bias in macroeconomic forecasts,** International Journal of Forecasting, vol. 23(2), pp. 189–203.

Batchelor R. and Dua P. (1991). **Blue chip rationality tests,** Journal of Money Credit and Banking, vol. 23, pp. 692–705.

Clements M. (2003). **Some possible directions for future research,** International Journal of Forecasting, vol. 19, pp. 1–3.

Clements M., Joutz F. and Stekler H.O. (2007). **An evaluation of the forecasts of the Federal Reserve: A pooled approach,** Journal of Applied Econometrics, vol. 22, pp. 121–136.

Croushore D. (1997). **The Livingston Survey: still useful after all these years,** Business Review, Federal Reserve Bank of Philadelphia, March, pp. 15–27.

Dechow P.M., Hutton A.P. and Sloan R.G. (2000). **The relation between analyst forecasts of long term earnings growth and stock price performance following equity offerings,** Contemporary Accounting Research, vol. 17, pp. 1–32.

Diebold F. and Mariano R. (1995). **Comparing Predictive Accuracy,** Journal of Business and Economic Statistics, vol. 13(3), pp.135–144.

Donihue M.R. (1993). **Evaluating the role judgment plays in forecast accuracy,** Journal of Forecasting, vol. 12, pp. 81–92.

Dovern J. and Weisser J. (2011). **Accuracy, unbiasedness and efficiency of professional macroeconomic forecasts: An empirical comparison for the G7,** International Journal of Forecasting, vol. 27(2), pp. 452–465.

Ehrbeck T. and Waldmann R. (1996). **Why are professional forecasts biased? Agency versus behavioural explanations,** Quarterly Journal of Economics, vol. (111), pp. 21–40.

Fintzen D. and Stekler H.O. (1999). **Why did forecasters fail to predict the 1990 recession?** International Journal of Forecasting, vol. 15, pp. 309–323.

Gallimore P. and McAllister P. (2005). **Expert judgment in the processes of commercial property market forecasting,** Journal of Property Research, vol. 21(4), pp. 337–360.

Gjaltema A. (2001). **Judgment in (population) forecasting,** Paper presented at European Population Conference, Helsinki 2001.

Goldfarb R., Stekler H.O., David J. (2005). **Methodological issues in forecasting: Insights from the egregious business forecast errors of late 1930,** Journal of Economic Methodology, vol.12, pp. 517–542.

Granger C. and Pesaran H. (1999). **Economic and statistical measures of forecast accuracy,** Journal of Forecasting, vol. 19(7), pp. 537–560.

Harris R. and Cundell I. (1995). **Changing the property mindset by making research relevant,** Journal of Property Research, vol. 12, pp. 75–78.

Heinemann F. (2006). **Planning or propaganda? An evaluation of Germany's medium-term budgetary planning,** Public Finance Analysis, vol. 62(4), pp. 551–578.

REFERENCES

Hendry D. and Clements M. (2003). **Economic forecasting: Some lessons from recent research,** Economic Modeling, vol. 20, pp. 301–329.

Holden K. and Peel D.A. (1990). **On testing for unbiasedness and efficiency of forecasts,** The Manchester School, vol. 58(2), pp. 120–127.

Hong H. and Kubik J.D. (2003). **Analyzing the analysts: career concerns and biased earnings forecasts,** Journal of Finance, vol. 58, pp. 313–351.

Isiklar G., Lahiri K. and Loungani P. (2006). **How quickly do forecasters incorporate news? Evidence from cross-country surveys,** Journal of Applied Econometrics, vol. 21(6), pp. 703–725.

Isiklar G. and Lahiri K. (2007). **How far ahead can we forecast? Evidence from cross-country surveys,** International Journal of Forecasting, vol. 23, pp. 167–187.

Jonung L. and Larch M. (2006). **Improving fiscal policy in the EU. The case for independent forecasts,** Economic Policy, vol. (21), pp. 491–534.

Lahiri K. and Sheng X. (2010a). **Measuring forecast uncertainty by disagreement: The missing link,** Journal of Applied Econometrics, forthcoming.

Lahiri K. and Sheng X. (2010b). **Learning and heterogeneity in GDP and inflation forecasts,** International Journal of Forecasting, vol. 26, pp. 265–292.

Lamont O. (2002). **Macroeconomic forecasts and microeconomic forecasters,** Journal of Economic Behavior and Organization, vol. 48, pp. 265–280.

Laster D., Bennett P. and Geoum I. (1999). **Rational bias in macroeconomic forecasts,** The Quarterly Journal of Economics, vol. 114, pp. 293–318.

Linden S. (2003). **Assessment of GDP forecasts uncertainty,** European Commission Economic Papers.

Makridakis S., Wheelwright S. and Hyndman R. (1998). **Forecasting methods and applications,** Wiley, New York.

McAllister P., Newell G. and Matysiak G. (2006). **Disagreement and uncertainty in UK property market forecasts,** Investment Property Forum.

McAllister P., Newell G. and Matysiak G. (2008). **Agreement and accuracy in consensus forecasts of the UK commercial property market,** Journal of Property Research, vol. 25, pp. 1–22.

McNees S.K. (1990). **The role of judgment in macroeconomic forecasting accuracy,** International Journal of Forecasting, vol. 6, pp. 287–299.

McNees, S.K. and Perna. N.S. (1987). **Forecasting macroeconomic variables: an eclectic approach.** In Makridakis S. and S.C. Wheelwright (eds.), The Handbook of Forecasting, 2nd edn. Wiley, New York, 349–372.

Mincer J. and Zarnowitz V. (1969). **The evaluation of economic forecasts.** In: Mincer J., ed., Economic Forecasts and Expectations, National Bureau of Economic Research, New York.

Nordhaus W.D. (1987). **Forecasting efficiency: Concepts and applications,** The Review of Economics and Statistics, vol. (69), pp. 667–674.

Oller E. and Barot B. (2000). **The accuracy of European growth and inflation forecasts,** International Journal of Forecasting, vol. 16, pp. 293–315.

REFERENCES

Pesaran H. and Skouras S. (2000). **Decision-based methods for forecast evaluation.** In: A companion to economic forecasting, chapter 11.

Pons-Novell J. (2003). **Strategic bias, herding behavior and economic forecasts,** Journal of Forecasting, vol. 22(1), pp. 67–77.

Samuelson P. (1976). **Optimality of sluggish predictors under ergodic probabilities,** International Economic Review, vol. 17, pp. 1–17.

Scotese C.A. (1994). **Forecast smoothing and the optimal underutilization of information at the Federal Reserve,** Journal of Macroeconomics, vol. 16, pp. 653–670.

Smyth D. and Ash J. C. K. (1981). **The underestimation of forecasts and the variability of predictions and outcomes,** Bulletin of Economic Research, vol. 33, pp. 37–44.

Stekler H.O. (2007). **The future of macroeconomic forecasting: Understanding the forecasting process,** International Journal of Forecasting, vol. 23(2), pp. 237–248.

Stock J. and Watson M. (1993). **A procedure for predicting recessions with leading indicators: econometric issues and recent experience.** In Stock J. and Watson M., Business cycles, indicators and forecasting, National Bureau of Economic Research Studies in Business Cycles, vol. 28, University of Chicago Press, pp. 95–156.

Theil H. (1966). **Applied economic forecasting,** North Holland, Amsterdam.

Theil H. (1971). **Principles of econometrics,** North Holland, Amsterdam.

White H. (2000). **A reality check for data snooping,** Econometrica, vol. 68(5), pp. 1097–1126.

Zarnowitz V. and Braun P. (1993). **Twenty two years of the NBER-ASA Quarterly Outlook Surveys: Aspects and comparisons of forecasting performance,** University of Chicago Press, pp. 11–94.

NOTES

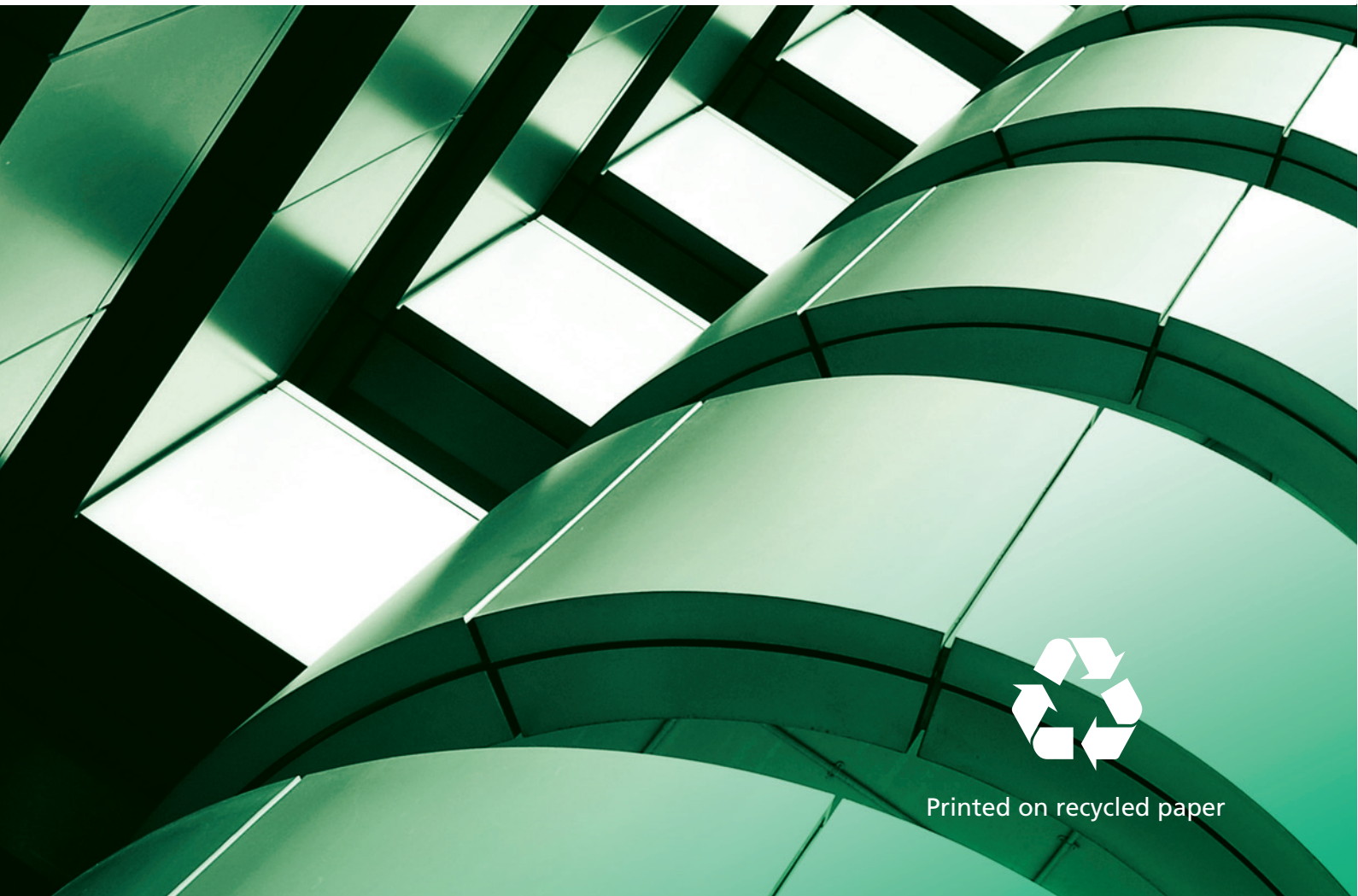
NOTES

NOTES

IPF Research Programme 2011–2015

Investment Property Forum
New Broad Street House
35 New Broad Street
London EC2M 1NH

Telephone: 020 7194 7920
Fax: 020 7194 7921
Email: ipfoffice@ipf.org.uk
Web: www.ipf.org.uk



Printed on recycled paper