# The future of property forecasting

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**This article is a summary of the report by Craig Watkins and Berna Keskin of the University of Sheffield and Michael White of Nottingham Trent University on current forecasting practice adopted in the UK property market and suggestions as to possible improvements that should be considered. This work was funded by the IPF Research Programme and a copy of the full report, published in November 2012, is available to download from the IPF website.**

## Current forecasting practice

Property professionals have long been involved in developing implicit forecasts of market values. Until the1980s, this was based largely on intuition but since the 1990s' market collapse there has been greater emphasis on quantitative methods and formal modelling techniques. The rise of quantification has led to some convergence in views, not least because forecasters tend to use similar models, the same datasets and a standard set of statistical procedures. This means, of course, that most forecasts will be subject to similar sources of systemic bias. These techniques, of course, are not used in isolation. Most property forecasts are generated by combining econometric predictions, with a more subjective market overlay process.

There are a large number of ways that errors might enter the forecasting processes including: the modelling process because the data used are inaccurate; the limited variables included do not cover all of the key drivers of the market; the statistical methods used to estimate relationships are not sufficiently sophisticated to deal with the complexity of the market; and the assumptions made about future trends in key property and economic drivers are erroneous.

Errors might also be introduced through the market overlay process. The research found that IPF Consensus forecasters use this to capture the influence of mood and sentiment in these predictions. They also highlight that mood is difficult to assess and can be inaccurate; and that there is no systematic basis for quantifying the way in which mood has influenced forecasts in the past. This raises the possibility that there might be considerable inconsistency in the way in which qualitative assessments of market conditions might impact on any particular 'house' forecast.

The researchers found that there was a tendency for property models to be a little slow in accommodating new econometric advancements. The survey of forecasters suggests that few of the models used in practice use the very latest methods for capturing cyclical effects and/or structural changes. Given that simpler model forecasts tend to be robust over only very short periods, this may be one of the weaknesses of IPF members' forecasts. The commonalities in modelling approaches used are also a source of forecast convergence.

## Empirical study

It was the view of the project team and the IPF project steering group that exploring how best to forecast the most challenging case is potentially more instructive than focusing on markets driven by a less extreme set of influences. The City market/sub-market presents a particular challenge for forecasters in that it is generally influenced significantly by those investment flows that have been difficult to capture in the past. This means that the market overlay process tends to be quite prominent in shaping views about future prospects. The City market is also highly liquid and transparent and data availability makes it attractive for the purposes of econometric analysis.

### *ARIMA and ECM*

Two different types of econometric models were used in the study: autoregressive integrated moving average (ARIMA); and error correction mechanism (ECM). These have been used to demonstrate the sensitivity of forecasts to changes in model structure, methods of estimation, data used and variables measured. Figure 1 shows the results from the best-fitting ARIMA model, explaining over 93% of the variation in rent. However, when this model was applied in a forecasting context (2010–15), its predictive performance was very poor and within-sample forecasts diverged from actual economic outcomes.

**Figure 1: ARIMA model for City of London**

**Sample (adjusted): 1982-2009**
**Included observations: 28 after adjustments**
**Convergence achieved after 9 iterations**
**MA Backcast: 1981**

| Variable | Coefficient | Std. error | t-statistic | Probability |
|---|---|---|---|---|
| Constant | 4.26 | 0.2219.13 | 0.00 | |
| AR(1) | 1.43 | 0.20 | 6.99 | 0.00 |
| AR(2) | -0.57 | 0.21 | -2.74 | 0.01 |
| MA(1) | 0.61 | 0.19 | 3.26 | 0.00 |

| | | | |
|---|---|---|---|
| R-squared | 0.94 | Mean dependent var | 4.36 |
| Adjusted R-squared | 0.93 | SD dependent var | 0.37 |
| S.E. of regression | 0.10 | Akaike info criterion | -1.72 |
| Sum squared resid | 0.22 | Schwarz criterion | -1.53 |
| Log likelihood | 28.04 | Hannan-Quinn criterion | -1.66 |
| F-statistic | 124.94 | Durbin-Watson stat | 1.89 |
| Prob(F-statistic) | 0.00 | | |

The theoretical benefit of using ECM is that it highlights explicitly the market's role to remove demand and supply imbalances resulting in market equilibrium. The variables used in the rent model for the City of London were the finance and business services (FBS) output to capture demand, and stock to reflect supply. While it is possible to use gross value added (GVA) or local gross domestic product (GDP) as alternative demand side variables, FBS performs better statistically. Figure 2 presents the results for the long-run model. The coefficients have the expected signs a priori the model performs reasonably well in terms of explanatory power. The forecasting performance of this model was better than the ARIMA model. However, the ECM does require forecasts of the future values of the exogenous demand and supply side variables. This was done by using the Hodrick-Prescott filter that separates short- and long-run influences on variables.

**Figure 2: ECM model for City of London office rents**

**Sample (adjusted): 1984-2009**
**Included observations: 26 after adjustments**

| Variable | Coefficient | Std. error | t-statistic | Probability |
|---|---|---|---|---|
| Constant | 49.32 | 5.359.22 | 0.00 | |
| Finance & Business Services Output | 0.40 | 0.16 | 2.47 | 0.02 |
| Stock | -4.54 | 0.62 | -7.33 | 0.00 |

| | | | |
|---|---|---|---|
| R-squared | 0.804 | Mean dependent var | 4.34 |
| Adjusted R-squared | 0.784 | S.D. dependent var | 0.38 |
| S.E. of regression | 0.18 | Akaike info criterion | -0.53 |
| Sum squared resid | 0.71 | Schwarz criterion | -0.38 |
| Log likelihood | 9.89 | Hannan-Quinn criterion | -0.49 |
| F-statistic | 46.24 | Durbin-Watson stat | 0.51 |
| Prob (F-statistic) | 0.00 | | |

## *Scenario forecasting exercise*

The researchers then looked at a more qualitative, judgement-based 'experiment' (scenario forecasting exercise) that invites forecasters to estimate future outcomes under different circumstances.

The scenario exercise serves to illustrate the way in which a market overlay process introduces differences in views about macroeconomic and market-specific prospects, including investment flows. The exercise highlights the potential variation in the scale of overlay and demonstrates the difficulties associated with trying to avoid further distortions being introduced by the ways in which individual views enter the process. The analysis shows, perhaps unsurprisingly given the similarities in inputs and model structures, that most of the variation in forecasts is derived from differences in the overlay process.

## *The overlay process*

The degree to which overlay is taken into account in developing forecasts is rarely a source of reflection or debate and that the precise impact of the overlay process is not well understood. The researchers therefore looked at two issues: in what way and to what extent does the overlay process introduce differences/variations in forecasts; and how might that overlay improve forecasts consistently. This element of the project was based on a short questionnaire to IPF consensus forecasters asking them to share, in confidence, information about how their forecasts are derived, and in-depth interviews with six volunteers from the Consensus forecasting community, who were asked to engage in a scenario exercise.

Participants were asked to provide details of their assumptions about a range of macroeconomic variables and to provide forecasts for City office rents and yields. The data requested covered the next three years. The macroeconomic variables selected by the researchers were not those shown statistically to be the most likely to drive office market models (such as FBS employment). Rather they were national level indicators of the general health of the economy: GDP; unemployment; interest rates; the sterling index; and inflation. The intention was to gauge the respective institution's view of the health of wider UK economy. GDP, unemployment and inflation were seen as standard general indicators of the strength and direction of travel of the economy, while interest rates (specifically the inter-bank lending rate) were included to provide some opportunity to reflect on relative potential of bonds. The sterling index was intended to provide a guide to views about the relative strength of the UK with respect to international markets.

Most respondents reported that their economic view was shaped by externally sourced forecasts. When comparing these with each other, and with the overview of economic forecasts provided by the Treasury[1], it was clear that there was considerable convergence (in fact three responses were identical) and that most views were very close on all indicators. As expected, there was rather more variation in the property forecasts (see Figure 3). These results would appear to confirm the sense that the differences enter not from divergence in opinion about wider economic prospects but from slight variations in either the property-specific models (data, model structure or statistical methods) and/or the market overlay process.

The second part of the exercise was designed to explore to what extent the forecasters might adjust their views when faced with a change in economic circumstance. The exercise confronted the participants with circumstances that are either worse (the 'pessimistic scenario') or better (the 'optimistic scenario') than their initial assumptions. It was anticipated that the respondents would all consider both the facts (they were given identical information about general macroeconomic conditions) and the 'mood' in the market (as conveyed by the terms 'optimistic' and 'pessimistic'). The variables chosen allowed reflection on the

**1** HM Treasury (2012) Forecasts for the UK Economy: a Comparison of Independent Forecasts, HM Treasury.

**Figure 3: Scenario forecast change in macroeconomic and City office outcomes**

| | Mean % | Minimum % | Maximum % |
|---|---|---|---|
| **2013** | | | |
| GDP | 1.4 | 1.3 | 1.5 |
| Office rents | 0.7 | -1.0 | 1.6 |
| Office yields | 6.2 | 5.25 | 6.6 |
| **2014** | | | |
| GDP | 2.1 | 2.0 | 2.1 |
| Office rents | 0.5 | -1.5 | 1.6 |
| Office yields | 6.1 | 5.25 | 6.6 |
| **2015** | | | |
| GDP | 2.25 | 2.2 | 2.3 |
| Office rents | 1.2 | 0.5 | 1.6 |
| Office yields | 6.2 | 5.0 | 6.6 |

economic circumstances, the relative position of property versus other assets, and the relative position of the UK economy. The economic scenarios were intended to be plausible and internally consistent. These were based on the most optimistic and pessimistic views reported by the Treasury[2] in its comparison of independent economic forecasts.

This revealed some interesting tendencies. First, the best case is close to the Treasury view but forecasters do not appear to place much faith in the most bullish messages emerging from official sources. Second, the tendency to locate property market outcomes near the bottom, even in moderate circumstances, might be interpreted as an indication that mood or sentiment has led forecasters to tend to downgrade their views and to break the link between economic fundamentals and predicted property market outcomes. The fact that this emerges most strongly for predictions two and three years ahead might imply an innate risk aversion (possibly conditioned heavily by recent experience). This impression is reinforced by the need to upgrade significantly when confronted with rather better economic conditions.

There was more variation revealed in the extent to which adjustments were made under different scenarios than there had been in the analysis of assumptions about the economy or in the initial forecasts of rents and yields provided. This suggests that the sorts of judgement calls that enter the overlay process provide a far greater source of adjustment, and arguably error, than any other input. It is also the largest source of differentiation between forecasts than any other element of current practice.

## 3-year forecasts

As a by-product of the research process, a range of forecasts for the next three years were derived using a variety of techniques. It would have been interesting to have tested all of these on historic data but it is impossible to explore the 'softer' influences of market overlay processes, given that everyone knows what has actually happened during past three years. Figures 4 and 5 summarise the City office rent and yield forecasts for the next three years generated by different methods.

**Figure 4: City office rental growth forecasts 2013-15**

| Forecasting approach | 2013 % pa | 2014 % pa | 2015 % pa |
|---|---|---|---|
| ARIMA | 1.0 | 0.5 | 0.3 |
| ECM | 2.0 | 1.5 | 1.5 |
| Scenario exercise (variable inputs) | 0.7 | 0.5 | 1.2 |
| Pessimistic economic scenario | -2.0 | 0.2 | 1.0 |
| Optimistic economic scenario | 3.8 | 3.9 | 3.8 |

**Figure 5: City office yield forecasts 2013-15**

| Forecasting approach | 2013 % | 2014 % | 2015 % |
|---|---|---|---|
| ARIMA | 5.5 | 5.6 | 5.6 |
| ECM | 5.25 | 5.3 | 5.3 |
| Scenario exercise (variable inputs) | 6.2 | 6.1 | 6.2 |
| Pessimistic economic scenario | 6.5 | 6.3 | 6.4 |
| Optimistic economic scenario | 6.0 | 5.9 | 6.0 |

The model-based rental estimates are calibrated using the ARIMA and ECM econometric techniques. The rental ECM forecasts are different from the mean scenario forecasts but are within the optimistic and pessimistic values. The yield model presented here also follows the form of an ECM. In the yield forecasts, the econometric models produce quite different results from those forecasts that accommodate an overlay. There is no evidence of either strong upward or downward yield movements in any of the forecasts.

The scenario-based estimates are based on the arithmetic mean of the survey responses. The model estimates are actually quite close to those produced in practice by the widely-used econometric models. They overlap with some of the final forecasts produced in the scenario exercise. Most forecasters, however, use overlay processes to move away from the central model estimates, citing mood and sentiment as the main reasons

**2** HM Treasury (2012)

for making adjustments. It is interesting to note that, even when presented with optimistic and pessimistic scenarios, there is still considerable clustering in forecast values. It seems that forecasters, perhaps as a result of a strong 'mood' effect, tend to be very conservative. The overlay appears to introduce an 'anchoring' effect which reinforces the tendency towards grouping.

## How might forecasts be improved?

Taken together, the two elements of this project suggest that potential improvements in future forecasts could come from both the qualitative and quantitative elements of the process. Modelling improvements might include:

- adopting more innovative econometric methods, including investing in techniques that better capture structural breaks; and
- exploring new variables that might proxy changes in sentiment and mood in both rental and yield forecasts.

These might be combined with qualitative enhancements by:

- considering developing methods that allow greater appreciation of the different drivers of market overlay processes and provide a more systematic basis to capture the influence of this aspect of this process. The scenario exercise used here is intended to act as a simple exemplar of how this might be done;
- enhancing the feedback between overlay and modelling processes, for example, by using qualitative discussions as a basis to adapt model inputs; and
- using qualitative insights, including 'mood' adjustments as proxy measures for market sentiment, as inputs into formal models. This might help overcome the limitations of some of the existing measures.

There are several other process improvements that might be made. These include:

- engaging in greater reflection about the effectiveness of current practices. Considerable benefits might be gained from recording formal outputs, the size and direction of overlay influences, and final outputs with a view to revisiting these on a regular basis. This would provide a clearer sense of the conditions under which current methods produce the best results and possibly suggest simple changes in approach that would yield improvements in accuracy and/or consistency; and
- moving away from reliance on point estimates and towards the development of forecasts that offer a range of possible outcomes (that may even have probabilities assigned to them).

No compelling evidence was found to suggest that techniques such as neural networks, cellular automata or evolutionary models help overcome the inherent weaknesses of existing methods. The paucity of property data also limits the effectiveness of these approaches, possibly even more than it constrains econometric model development. These techniques have also been constrained by the tendency of the underlying models to be under-specified and therefore unable to capture adequately the complex drivers of the market. In this context, an overlay process seems to be an appropriate response to the challenges associated with capturing difficult-to-quantify behavioural influences on the market.

Undoubtedly, the most appropriate forecasting approach will come from reflective practice and from a mixed-method design that draws together what the models can explain with deep market knowledge that seeks to systematically explore the 'softer', (non-rational) behavioural influences that cannot be statistically modelled. At present, the relative weight different forecasters place on qualitative versus quantitative inputs varies and so do the ways in which they seek to ensure consistency of approach and to minimise errors.

Most forecasters are broadly satisfied with the way in which the approach they use has evolved and feel better equipped, even in a very uncertain market, to take a position than they have been historically. Views vary on whether this reflects a degree of inappropriate complacency or whether it suggests that forecasts play such a limited part in decision-making that these processes do not merit any more investment (in terms of finance, time or research effort) than the current level.