

# Residential Price Forecasting at National and Regional Levels

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## ABSTRACT

In the UK professional valuers currently assess residential values (Single Family Residences) for sale and loan based on current bid prices. This approach has some merits. The comparative valuation methodology on which it is based is straightforward and there is often sufficient data to form the basis of a judgement. Possibly too, the measure of value, commonly known as 'open market value', despite its transient nature, is understood by consumers.

Such an approach makes no attempt to predict periodic market crises or to produce estimates of longer-term sustainable value. As a result, consumers entertain substantial (hidden) risk. Prices can fall with undesirable personal consequences. The lack of labor mobility engendered leads to disruptive social and economic consequences. In worst case scenarios, generalized synchronous downturns, lenders are also exposed to risk.

European financial institutions and governments have expressed a desire for the development of theory and technique in this area: ideally a measure of value would be evinced capable of expressing an 'underlying' price. The Engineering and Physical Sciences Research Council, supported by the Office of Science & Technology, UK, have funded the research described in this paper. The ultimate aim is to develop a means of providing a more informed objective opinion about how the property market might move and what the consequences would be for a particular consumer.

The research starts from the basic proposition that predicting trends within housing markets may help in the development of a new measure of value that reflects 'economic sustainability'. The inputs for analysis are national and regional economic, social and residential property transaction time-series data. The most direct output is the trend of open market value. Given that the period of greatest risk occurs during the first 3 years of the mortgage,<sup>1</sup> predictions of open market value 12 quarters ahead were thought to be a useful target. Such a series might inform notions of sustainability.

Work has also been undertaken to identify a measure of house price/ affordability that showed no overall trend. Such a representation has two advantages. First is that the measure represents a time independent indicator of the state of the housing market in relation to its underlying average. Second is that it is easier to isolate those factors causing the measure to vary over time, while allowing the removal of the date as an explicit variable in models.

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The tools chosen to undertake the analysis are neural networks for two reasons. First is that neural networks are recognised as powerful and appropriate forecasting tools. Second is that the research team have prior experience of successfully building neural network architectures for the estimation of residential open market values.<sup>2</sup>

Neural networks were trained using as inputs economic data and the previous quarter's measure of house prices. If successful the neural networks should be able to identify subtle and consistent relationships between these factors, enabling them to predict potential future patterns of change. The outputs were measures of the current quarter's house price and a surrogate affordability ratio.

The *Gamma* test, a non-linear analysis and modelling tool, was used to optimise the networks.

At the half-way stage in the research programme (January 2002) results described give confidence that artificial neural networks can be used to forecast national and regional price trends within the housing market under various conditions. The research has identified a number of issues currently the subject of empirical work:

- identifying the limits of Takens' theorem within the domain
- introducing Economic Trend Data
- measuring the level of 'noise' within data and determining an appropriate response
- acquiring appropriate data to migrate from national to regional aggregates.

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<sup>1</sup> Jenkins, D.H. (2000) "Residential Valuation Theory and Practice", (ISBN 1 902375 50 5), Chandos Publishing (Oxford) Ltd.

<sup>2</sup> Lewis, O., Ware, J. A. & Jenkins, D. H., 1997, "A Novel Neural Network Technique for the Valuation of Residential Property." *Journal of Neural Computing and Applications*, Springer Verlag.