Is it possible to identify housing sub-markets? Testing a new approach

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Sixty second summary

The 2004 Barker Review of Housing Supply carried out by the UK government highlighted the need to improve our measurement and understanding of sub-regional housing markets. An obstacle to evidence-based housing policy is the sheer complexity of local house prices in terms of their variation over both time and space. How can we make sense of such a baffling degree of intricacy and volatility in the pattern of property transactions?

The theory of sub-markets – the notion that sub-regional housing systems are not comprised of a single market but a whole patchwork of inter-connected micro-markets – lends meaning to the complex system we see in the housing market data.

Existing techniques are of limited practical use in assisting policy makers and market investors. This project, carried out by Gwilym Pryce and Gareth Evans of the University of Glasgow, with funding from the Department of Communities and Local Government and the RICS Education Trust, sought to develop a method of defining sub-markets that was both theoretically sound and capable of being applied to most areas of the United Kingdom.

To meet these objectives, the authors have developed a method based on estimating house price inflation for every point in geographical space. On the basis that houses in the same submarket will appreciate at similar rates, the researchers then clustered dwellings according to their proximity to each other and their estimated rate of constant quality inflation to derive a series of sub-markets.

This technique was applied to Kent and East Sussex, using Nationwide house price information for the period 1996 to 2004, and one of the advantages to emerge is that the intermediate steps are potentially of use in themselves in making it easier to visualise and understand the structure of housing sub-markets and providing a detailed picture of the land prices of each point in geographical space. The case study appears to confirm the usefulness of the approach in defining sub-markets. The technique also has the potential to be applied in other ways, such as assessing the impact of regeneration initiatives, and gauging the spatial patterns in housing wealth inequality. It could also be used to simulate the house price effect of a range of flood risk and climate change scenarios.

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> ## Sub-markets potentially provide us with the organising principle we seek
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Introduction

While there is much talk of 'the housing market' it's evident that there is not one market for houses, just as there is not one market for cars or wine. Different houses in different locations behave in different ways. But a key question is how can we reliably determine the boundaries of housing sub-markets. Do we find uniformity or variety in the pace of change of house prices across different areas, and if so, what does this tell us about the boundaries of sub-markets?

Following the Barker Review in 2004 and 2005, there has been renewed interest in improving the quality and usefulness of house price information provided to planners, developers and policy makers, and the question of defining sub-markets has emerged as central to that. This is because more detailed examination of housing data reveals spectacular variations across space, both at the regional and sub-regional level. The headline figures mask these enormous variations, but they are there and, if we could find a way of making use of it, the benefits could be substantial. Sub-markets potentially provide us with the organising principle we seek.

This new research by Gwilym Pryce and Gareth Evans of the University of Glasgow puts forward and tests an approach to defining housing sub-markets. Understanding sub-markets is important because:

- The impact of new supply on existing house prices will be driven by the inter-relationship between housing sub-markets;

- House prices and supply do not respond uniformly to changes in demography, policy, and unanticipated shocks;

- Long-term differences in house price appreciation across housing sub-markets have implications for patterns of wealth accumulation;

- The distribution of ethnic groups, skill and income categories is spatially dependent so different sets of people will be affected by the asymmetric responses across sub-markets.

So why has the analysis of housing sub-markets not become mainstream? A number of key challenges have hindered the useful application of the concept:

- **Data:** almost by definition, there is a need for rigorous and detailed data and this is only now becoming available.

- **Methods:** there has been no agreed way to identify or describe sub-markets.

- **Administrative boundaries:** housing sub-markets do not respect administrative boundaries, yet it is at this level that much data is collected and analysis undertaken. We need to separate the two.

- **Spatial scale:** sub-markets can exist at any scale

The aim of this research was to:

- Investigate the relative suitability of existing data sources (CML Survey of Mortgage Lenders data, Land Registry data, and Nationwide data) for delineating housing submarket boundaries in English regions;

- Investigate the development of a methodology that could produce useable outputs on a single English region (such as the South East) within a relatively short timeframe, and which could be reproduced for other regions in future without excessive cost or difficulty.

- Investigate whether measures of submarket variation could be achieved at varying spatial scales, and to investigate how easy it would be to map that information using standard software, and to summarise it for standard administrative areas.

- Offer suggestions on possible applications of the model used to derive these boundaries to research questions of interest to policy makers.

" A fundamental problem of housing is, of course, that no two houses are the same "

Defining sub-markets

What are housing sub-markets? There have been two approaches to identifying sub-markets. The first is non-spatial – two houses that have similar attributes and characteristics can be thought of as being in the same sub-market even if they are in different parts of a city or region. Potential buyers would regard them as substitutes for each other, so they are in the same sub-market. There are two main difficulties with this approach. Firstly, it holds little prospect of being of any value for policy analysis. This is because the political and administrative processes in the UK – Parliamentary constituencies, local authority boundaries, etc – are fundamentally spatial. Secondly, there is a degree to which this approach places the researcher rather than the market in the position of defining the sub-market. Deciding which types of property buyers would consider to be close substitutes should really be done by price rather than by its characteristics – a three bedroom modern house in London is unlikely to be in the same housing sub-market as an identical property in the Outer Hebrides.

So, the alternative approach is to think of sub-markets in purely spatial terms. This approach groups properties by area and then tests for differences in the prices of the property attributes across these areas – do three bedroom houses with garages all sell for the same price, or do they vary across the region? To date, this approach has been hampered by being implemented at the level of the standard administrative boundary, which has been too coarse and arbitrary to produce meaningful results – the results that you get depend largely on how you define your boundaries.

So, ideally what is needed is some approach that can capture both the property-specific and the locational aspects of housing markets – this, of course, increases the complexity of the technique. And there are other problems which need to be overcome:

- **Separating quality from quantity:** price differences only reliably indicate separate sub-markets if they relate to identical units of quality. A fundamental problem of housing is, of course, that no two houses are the same. This is so important that it needs to be woven into the methodology from the beginning.

- **The persistence of price changes:** there are many reasons why – particularly in an imperfect market like housing – there will be temporary differences and variations in unit prices. This may not indicate the existence of a genuine sub-market, however, just a random outcome of temporary market frictions. Persistent price differences or similarities, however, may well indicate the existence of a sub-markets.

So, the approach that Gwilym Pryce and Gareth Evans have developed is an attempt to meet the criterion set out in the introduction while avoiding the methodological pitfalls listed above. It plots surfaces in geographical space of the rate of change over a prolonged period in the unit price of housing services and then clusters dwellings according to contiguity and to similarity in rate of price change. The key elements are as follows:

- **An inflation surface:** the rate of price change is estimated for every single place in an area, which provides us with a criterion to group dwellings spatially that does not rely on arbitrary administrative boundaries.

- **Over a prolonged period:** the longer the prices are tracked, the more likely that observed spatial differences will be due to sub-markets rather than temporary market conditions.

- **Clustering by contiguity:** showing where clusters occur enables one to see instantly where the sub-markets exist.

Data

As with any study of this type, data availability is critical. After reviewing the data sources available, from Land Registry, Council of Mortgage Lenders and the Nationwide Building Society, the authors opted for Nationwide Building Society data. This provides precise spatial coding. It is also available for a reasonable time period (1996-2004), and includes a rich array of dwelling attributes. Most useful of all is the fact that it includes a record of total floor-area (measured in square metres). The main disadvantage of this dataset is that it only records mortgage transactions with a particular lender. This was not thought to be a huge disadvantage. So long as the data was augmented with a good range of location indicators that picked up peculiarities of the surrounding neighbourhood, it should be possible to minimise the effect of sample selection bias. The other issue is sample size. In some areas, the number of observations is relatively small, but this can be compensated for by building a model that includes the full range of years available and that spans a sufficiently large geographical area. While this data is not widely available for commercial use, its rich attribute information provides a useful benchmark for those seeking to apply the model they have developed, highlighting the kind of variables that researchers and consultants should aim for.

Figure 1

An application to Kent

So, how does it work and what does it show? Kent was selected as an appropriate test area, as it included a range of geographical features, was an area of particular policy interest, and is of a size to enable the precision of the technique to be tested. The area modelled is shown in Figure 1, along with the routes of the two cross-sections highlighted by the two dashed lines, one red (running from Tunbridge Wells railway station to Faversham station) and one blue (running from Rochester railway station to Appledore railway station). It is along these lines that cross-sections are taken to examine the shape of the various estimated surfaces. Place names on the maps refer to railway stations as these allow the identification of precise points in space (rather than the vague area often alluded to by the name of a town or city).

The easiest way of analysing sub-markets is by price per square metre, and the result of this is shown in Figure 2. This shows the huge variations in price per square metre even within this
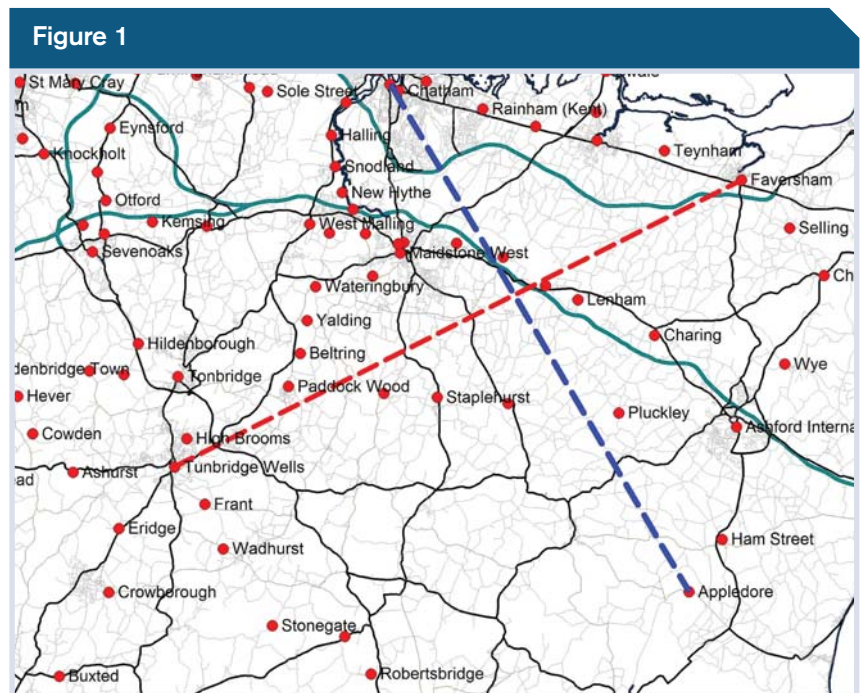
comparatively small area. However, this may not necessarily be showing sub-markets – the peaks and troughs may reflect different housing types, for which purchasers may reasonably pay different amounts per square metre. So, to identify sub-markets, it is necessary to control also for housing type. Doing this will produce a constant quality house price surface. Using the Nationwide data enables this to done more effectively than with the Land Registry data, as it includes a rich array of property-related information. Augmenting the Nationwide data with Mosaic, Hometrack and Ordnance Survey data enabled the creation of a fairly detailed profile of the postcode unit of each and every property in the area, including the average distance between dwellings, the average footprint area of each property, height above sea level of the postcode centroid, and the proportion of dwellings in the postcode in each property type and age category (detached, flats, bungalow, semi-detached, pre-1920, 1920-1945, 1946-1979, post-1979, based on data provided by Experian and Hometrack). These variables were also calculated for the nearest adjacent postcode to capture spill-over effects across neighbourhoods. Using this approach, the results are shown in Figure 3. Large variations in the price per square metre remain, which suggests that much of the variation in price is due to the effect of location, rather than dwelling attributes alone.

It is possible to take a 'slice' through the region and plot the results accordingly. This is shown in Figure 4 and it shows the huge variation in constant quality prices per square metre.
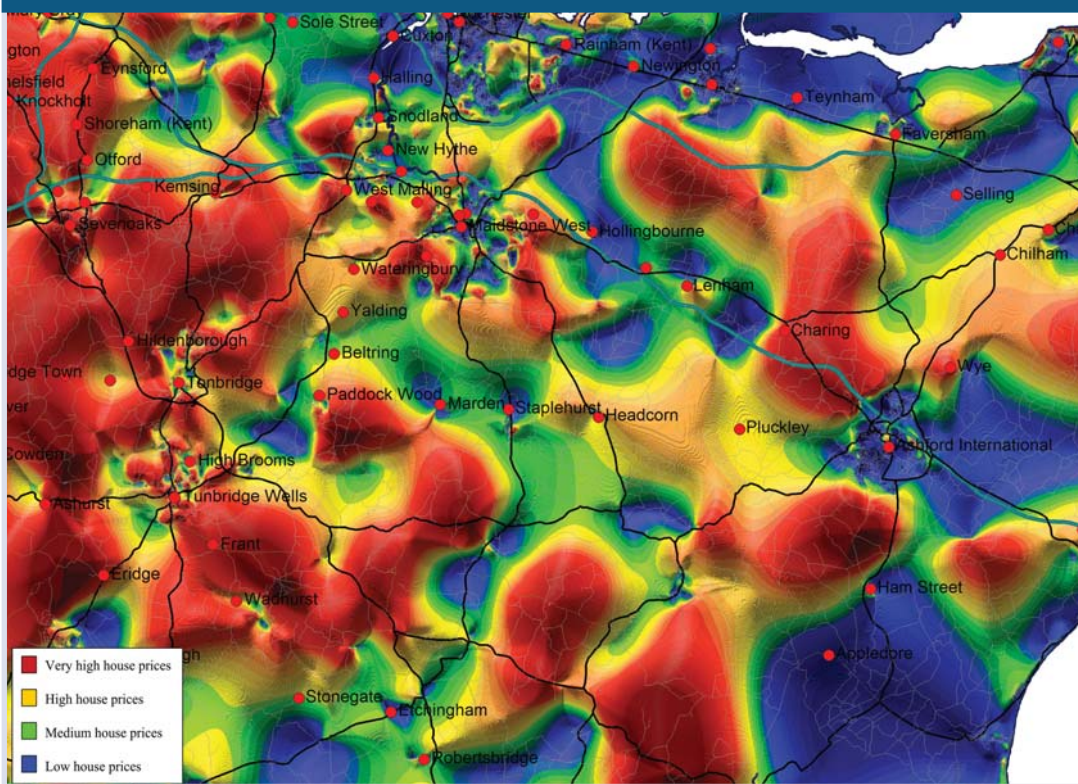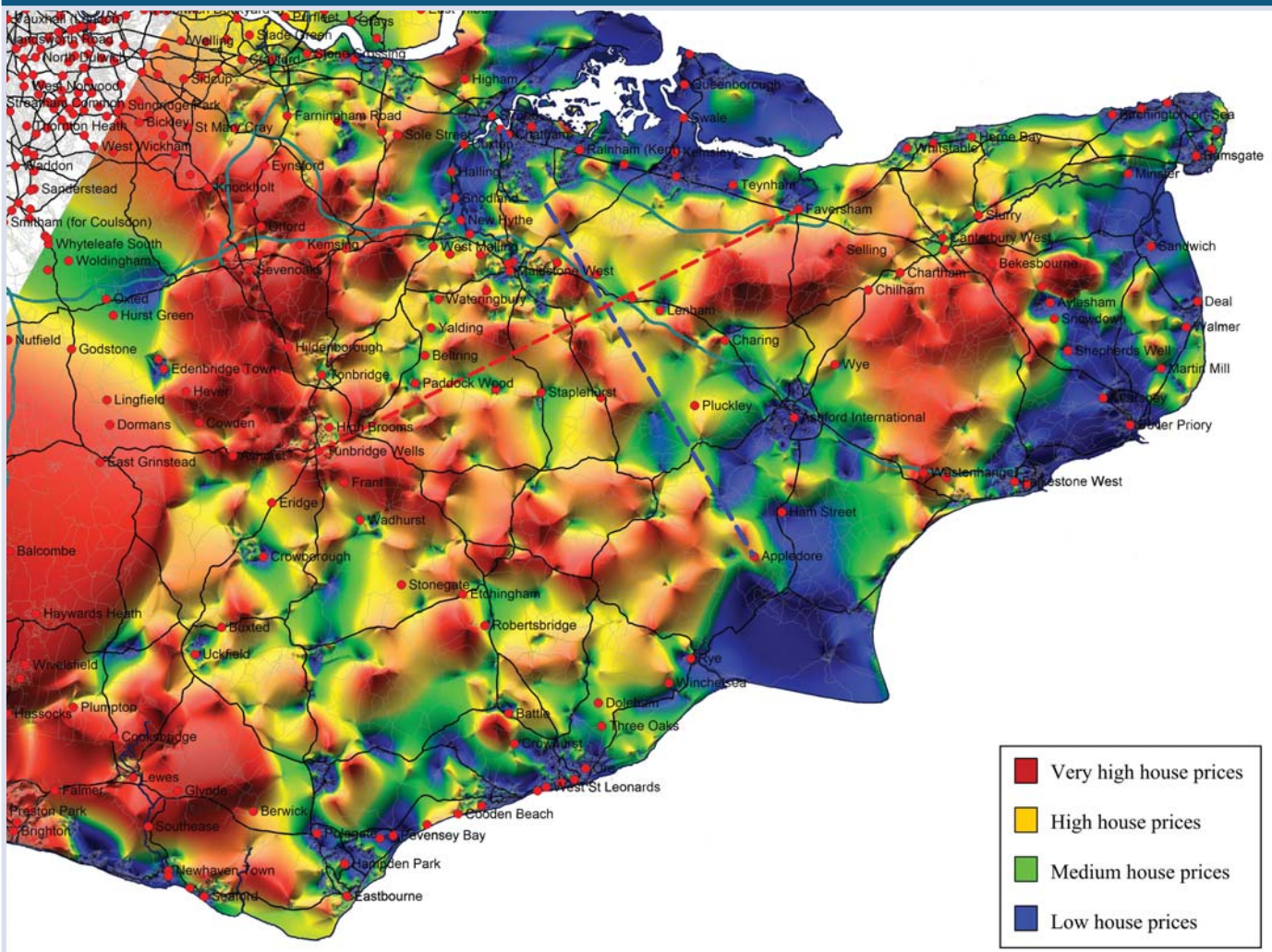
Figure 2

Very high house prices
High house prices
Medium house prices
Low house prices

Figure 3

Very high house prices
High house prices
Medium house prices
Low house prices

Figure 4a

Cross Section: Tunbridge Wells to Faversham
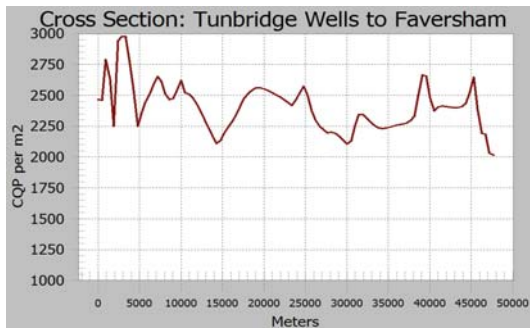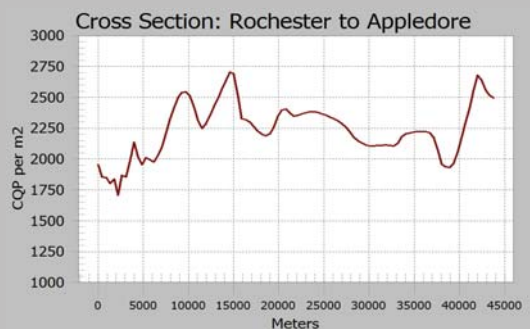
Figure 4b

Cross Section: Rochester to Appledore

- Estimate the time-location value signature for two points in time
- Work out the rate of inflation between the two periods – this gives us an inflation surface
- Calculate the average rate of inflation for every postcode sector
- Cluster the postcode sectors, based around their location and the estimated rate of inflation

This method also offers users the flexibility of drawing-up as many sets of sub-markets as we deem appropriate. Essentially, one can cluster properties into either a small number of large sub-market which possess broadly similar characteristics or a much larger number of small sub-markets which possess very similar characteristics. Producing different sets of groups also enables us to see how much differentiation there is between the sub-markets. Figure 5 demonstrates this – by going from thirty sub-markets down to three, we can see that two of them are quite similar and one of them is markedly different.

If we select the level of ten separate sub-markets, we can plot this by marking the centre of each postcode sector – this is shown in figure 6 where the ten groups are plotted separately.
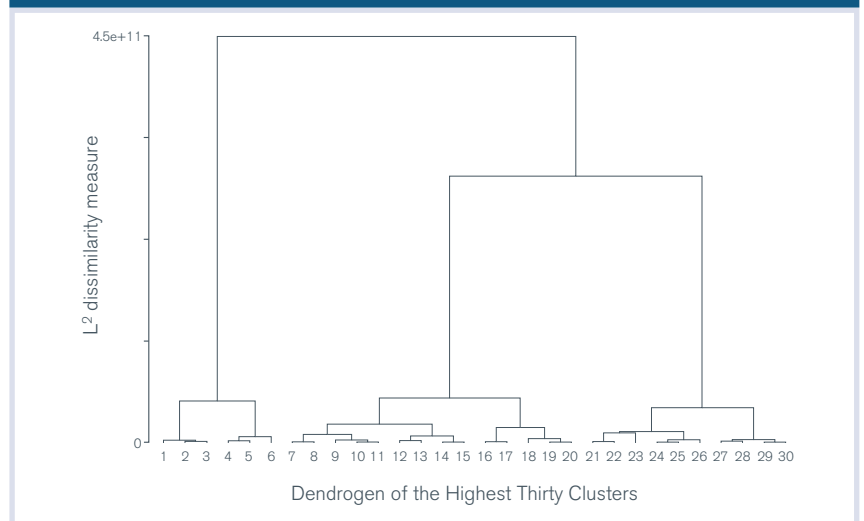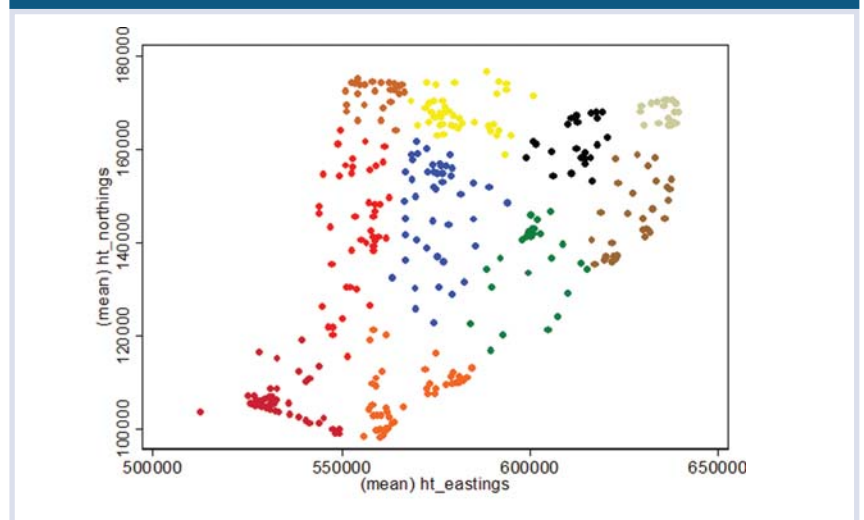
The next step

Having obtained a snapshot across the region, the next step was to take these snapshots for more than one point in time and to see what happens over time. Given the limitations of the sample, the greatest time interval that could be considered was January 1996 to December 2004. By deducting constant quality prices at the former date from those estimated for the latter, is possible to produce a similar type of map and cross section, but showing cumulative inflation rather than prices. As can be seen, inflation rates have varied significantly over the region, and it is not necessarily the most expensive areas that have shown the highest rates of inflation. The map also helps us identify sub-markets – they are areas that exhibit similar rates of price change. The only question remaining is how to allocate points in space to individual sub-markets.

The authors did this using cluster analysis. Having both calculated the rate of inflation for properties and adjusted for the different attributes of those properties, all that remains is simply to attach their geographical location and group into housing sub-markets. Thus the necessary steps are as follows:

Figure 5

Dendrogen of the Highest Thirty Clusters

Figure 6

> **It would be possible to add a variable for flood risk into the model, to see what the impact would be on house prices**

So how could we use this technique?

How could this model be used? By giving three examples, the possible applications and future benefits of the model can be indicated.

Impact of new housing supply and other spatial shocks: This model could be used to examine the impact of external shocks – an obvious example of this is the effect of flooding on house prices. It would be possible to add a variable for flood risk into the model, to see what the impact would be on house prices. This effect is important because house price changes will change the levels of housing equity (and hence the wealth that many households are relying on to fund their retirement), the distribution of wealth, and the propensity for mortgage default, particularly in areas like the South East where debt gearing is relatively high.

Council tax revaluation: If this model is used to calculate the total selling price, rather than the price per square metre, then it could be adapted to become an Automatic Valuation Model (AVM) and be used to estimate the value of properties for the purposes of Council Tax revaluation or property tax reform.

Trajectories in neighbourhood well-being: a key policy ambition of the UK government is to tackle social and economic inequality. This has a definite spatial component – inequality is often associated with particular localities, but it is important to identify cause and effect in this respect. The approach described here may offer powerful insights, in that it explicitly controls for variations in dwelling types. So, all other things being equal, sub-markets with low constant quality house prices will generally offer lower quality of life – the price differences reflecting the fact that house buyers vote with their feet.

An extension of this approach to cover the whole country would potentially enable policy-makers to assess more effectively the impact of regeneration interventions. At the moment, it is notoriously difficult to determine whether interventions in the market to encourage regeneration have had the desired effect.

Conclusions

This approach has shown that it is possible to find a way of defining housing sub-markets that can be analysed at a range of spatial scales and which is based on sound and reproducible economic analysis. Key next steps could be:

- To roll this method out for all areas in the UK

- To explore ways in which the model could be improved (by including additional spatial variables)

- To compare the housing sub-market boundaries calculated using this approach with those generated by alternative methods

- To explore how this approach could be used explore policy questions such as the impact of increased densities and rising sea levels

About the study

The study was undertaken by Professor Gwilym Pryce of the Department of Urban Studies, University of Glasgow, with funding provided by the Department of Communities and Local Government and the RICS Education Trust. Research assistance was provided by Gareth Evans from the Geography and Geomatics Department at the University of Glasgow.

The full report is available at:

www.communities.gov.uk/index.asp?id=1510297

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