



Office of the
Deputy Prime Minister

Creating sustainable communities

*New Horizons Research Programme
Which House Price? Finding
the Right Measure of House Price
Inflation for Housing Policy*

Policy Implications Report



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Inflation for Housing Policy*

Policy Implications Report

Gwilym Pryce and Philip Mason

Although this report was commissioned by the Office, the findings and recommendations are those of the authors and DO NOT necessarily represent the views of the Office of the Deputy Prime Minister. This report will form part of our evidence base when tackling future issues and policies.

Office of the Deputy Prime Minister
Eland House
Bressenden Place
London
SW1E 5DU
Telephone: 020 7944 4400
Website: www.odpm.gov.uk

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1 Introduction

1.1 Context

This research project was motivated by the recommendations of the Barker Review (2003, 2004) and the New Horizons report by Pryce (2004). Three Barker recommendations were particularly germane (*italics researchers*):

Barker Recommendation 3: “Further research should be undertaken to *improve the evidence base* for housing policies ...”

Barker Recommendation 4: “... Government should consider *a range of data improvements* to enhance understanding of the housing market, the effect of policy changes and planning processes.”

Barker Recommendation 7: “Government should *set out guidance* ... based on the following principles:

- Application of market information and signals, including *house prices and house price growth* and market affordability in decisions made about the scale and distribution of housing targets...
- Decisions about the scale and distribution of housing numbers should be informed by sub-regional and Local Housing Assessments (which should include *analysis of house price growth and affordability*, as well as local housing need).”

These recommendations rest on two premises. First, that house prices and house price growth can help inform land planning and housing supply decisions. Second, that improvements in data are needed to enhance understanding of the housing market.

This research project arose out of concern that the first premise – the usefulness of house price growth as a signal for planners – could potentially be undermined by the nature of house price index collection in the UK. All major price indices in the UK are based entirely on the transactions of new and second-hand properties. Those properties which do not come onto the market in a given year will not be included in any of the price indices currently available. As such, house price measures and estimates of house price growth could yield a distorted picture of the true value of the total stock of housing. The result: misleading signals for land planning.

This concern, if justified, reinforces the second premise, that improvements in data are needed. In fact, improvements are imperative if indices of local house price movements are to be used to inform housing supply decisions.

The two most important aims of our project, therefore, were:

1. to examine measurement bias issues in existing measures of house price change, particularly bias arising from differences in the frequency of sale of different types/locations of property.

2. to find practical ways of correcting transactions bias in English regions using existing data sources.

Details of our findings are presented in the *Which House Price? Technical Report* that accompanies this document. The purpose of the current report is to present a brief summary of those findings, to draw out the main policy implications and to offer appropriate recommendations.

1.2 Plan

The structure of the remainder of the report is as follows:

- Chapter 2 will present a brief summary of our findings.
- Chapter 3 will examine the implications of our results for the use of house prices to identify sub-regional supply shortages.
- Chapter 4 will consider the implications of our findings for the Greenfield/Brownfield debate.
- Chapter 5 will attempt to explore the implications of transactions bias for the estimation of price elasticities (the responsiveness of housing demand and supply to price changes).
- Chapter 6 will consider the implications for long-term wealth inequalities and affordability issues.
- Chapter 7 will summarise and offer recommendations.

2 Evidence of Bias in Transactions-based Indices

2.1 Introduction

This chapter summarises our findings with respect to the correction procedures employed in existing measures of house price inflation, the prospects for identifying transactions bias and possible methods of correcting for identified distortions in transactions based indices.

2.2 Existing Measures

We conducted a review of existing house price indices in the UK. We looked at the differences in the samples used in these measures, and in the method of calculation. We found that, while basic mix-adjustment measures are used in a number of indices (notably the Nationwide, Halifax and Financial Times), no index currently attempts to control for *transactions bias* – the bias that results from some properties trading infrequently.

We then conducted a brief review of the academic literature on transactions bias. Our investigations revealed a dearth of UK research on this topic. This was partly because existing approaches, developed in the US and Sweden, require data that are not currently available in the UK.

As a result, we set ourselves the challenge of developing new ways of correcting for transactions bias that could potentially be constructed from available UK data, and which could conceivably also improve on the existing approaches in terms of theoretical robustness.

2.3 Identifying Bias

One of the omissions in existing research on transactions bias (even the pioneering research conducted in Sweden and the US) is the analysis of duration dependence – the tendency for a household's length of stay to affect the current probability of moving. For example, if a household has only recently moved in, they are unlikely to immediately move again.

This omission in the existing research could, ironically, yield a possible solution to the transactions correction problem in the UK because duration analysis would not require data on the whole stock, only the ability to identify when the same property has sold more than once. A preliminary analysis of Scottish repeat-sales data revealed significant evidence of duration dependence and of transactions bias. However, although the approach has the potential to be of use in the future, we concluded that it would not

be useful South of the Border for some time because it has only very recently been possible to identify repeat-sales in English and Welsh Land Registry data.

A second omission in existing research is the spatial distribution of sales frequency. It is likely that the location of properties that trade infrequently will be random. Spatial concentrations of particular property types, neighbourhood types and socio-economic factors, will conspire to cause non-randomness across space in the probability of sale. If this were found to be the case, then the possibility emerges of finding a spatially-based method of correction that could be applied to all parts of the UK and indeed to other countries with similar data limitations. This opportunity arises because, although property valuation data is not available for each and every property in the housing stock, data does exist on the proportion of properties in each postcode unit that trade in a given year.

We investigated the variation across space in the probability of sale. We found overwhelming evidence that the frequency of sale does indeed vary non-randomly by neighbourhood density, average elevation, and typical neighbourhood dwelling size, age and type.

2.4 Correcting for Bias

In the final stage of our investigation we examined the extent to which spatial variations in the probability of sale could cause bias in existing methods of house price measurement. Bias-correction would be somewhat redundant if the bias proved negligible, so this final step was crucial.

Our results were unambiguous. Based on very large samples, our estimates indicated considerable sample selection bias in unadjusted house price inflation series in certain counties. We also found that sample selection bias varied greatly between counties.

Perhaps the most positive and important implication of our results is that they demonstrate the feasibility of constructing an effective sample selection measure from existing data, not only for the South East, but also for all UK regions. This correction term could be incorporated into the main measures of house price inflation in the UK. More research is needed, however, to ascertain the extent to which the impact of transactions bias varies depending on the method used to calculate the index.

3 Implications for Sub-Regional Supply Policy

3.1 Introduction

This chapter discusses the implications of transactions bias for sub-regional housing supply. The issues raised are important because they directly affect the guidance given by central government to planners, as recommended in the Barker Review (Recommendation 7). We consider how transactions bias could distort comparisons of house price growth between sub-regions and indeed between regions. The chapter also discusses how this problem is set to increase because recent patterns in new construction will reinforce the distortion caused by transactions bias.

3.2 Transactions Bias Variation Between Sub-regions

Based on a simple hedonic¹ method of inflation measurement, we found that sample selection bias varied greatly between counties in the South East. The corollary of this finding is that comparisons of unadjusted price inflation series between counties is potentially misleading.

To illustrate, we compared the unadjusted cumulative inflation results for Oxfordshire (231%) with those of Surrey (262%) over the period 1996-2004. The story told by the unadjusted indices was that the rate of inflation in the two areas was fairly similar. We then compared the inflation results derived from the bias-adjusted procedure. We found that, for Oxfordshire, the *adjusted* rate of 230% was almost identical to the unadjusted estimate. In contrast, the adjusted figure for Surrey (407%) was massively greater than the *unadjusted* value. These results were based on very large samples (sample sizes for the county-level regressions ranged from 31,000 to 326,000).

Taken together, the results suggested that the appreciation of the housing stock in the two counties was in fact very different, leading to potentially profound implications for planning decisions and housing policy. For example, based on the *unadjusted* estimates, planners might have concluded that both counties needed a similar proportionate increase in new-build to ameliorate house price inflation. Using the *adjusted* series we would arrive at the very opposite conclusion: Surrey is likely to need a far more radical boost to housing supply if price stability is to be achieved.

Conceivably, similar distortions could occur at other spatial scales, such as local authorities, postcode sectors or regions. This is because we have no reason to believe that systemic variation in frequency of sale will be precluded by changing the size of the spatial unit.

¹ This is a statistical technique that uses regression analysis to establish the relationship between house prices and dwelling attributes.

This finding has important implications for Recommendation 7 of the Barker Review. Clearly, the guidance recommended by Barker should, in the light of our findings, include advice on how to control for sample selection bias, particularly now that a way forward for bias-correction has been identified. The spatial correction method detailed in the *Which House Price? Technical Report* could feasibly be reproduced for other UK regions and be incorporated into a variety of index calculation methods.

3.3 A Growing Problem?

Although not a central component of our research, one of the spin-offs of the empirical analysis was the finding that housing in low-density areas has tended to appreciate at a faster pace. Initial results suggest that for every 10 metre increase in the average nearest-neighbour distance in the post code in which the property is located, prices tended to rise by an extra £3,200 per year (based on a sample of 1.5 million Land Registry sales in the South East over the period 1996 to 2004).

Yet much of the recent new-build has been high-density and indeed this has been the policy goal. Unfortunately, increasing the supply of high-density properties is only likely to increase the disparity of growth rates between the prices of high- and low-density housing.

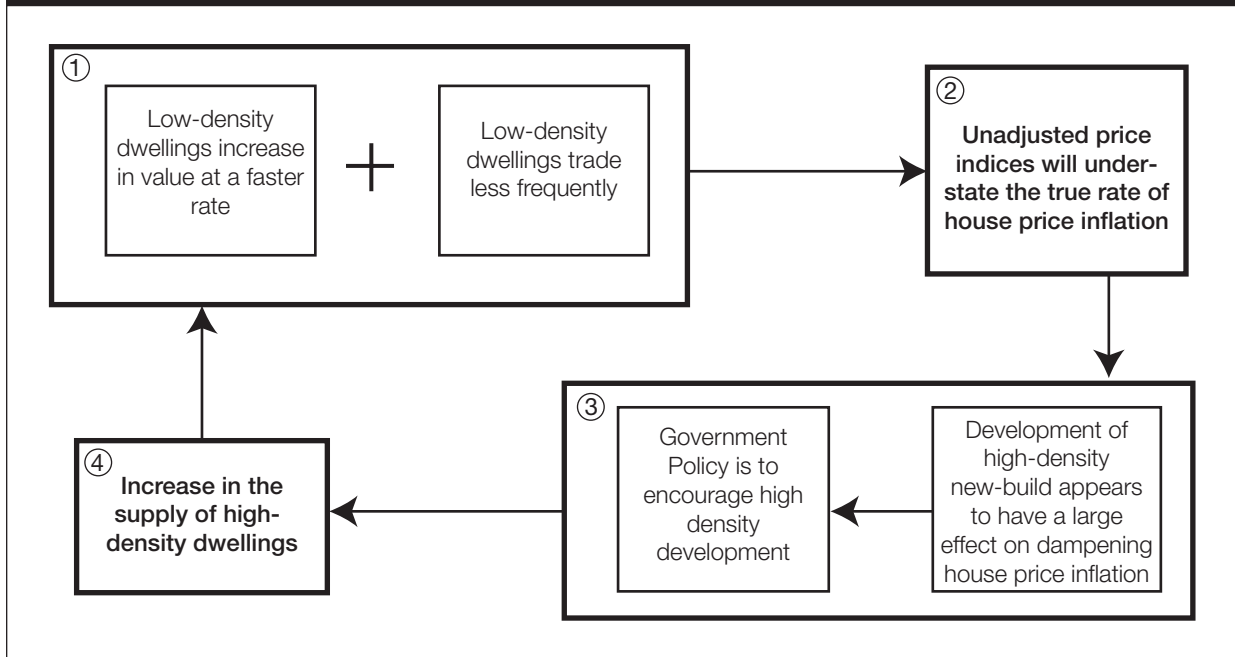
This effect could potentially be ameliorated if the new-build was of particularly high quality and attractively designed. Only then could we have a hope of attracting middle-class families back into the inner-suburbs (or at least slow the rate of outward migration). The findings of the recent Urban Task Force report², however, suggest that the opposite is true, particularly for new social housing:

“The majority of new developments remain poorly designed, with public ... buildings of a very low quality... too many housing projects are ... thoughtlessly laid out groups of cheaply built fragmented residential units relatively isolated from surrounding communities” (p.5).

The impact of poor quality/high-density new-build will be to drive a wedge between the house price growth rates of low- and high-density development (because increasing the supply of low-quality, high-density development will dampen house price inflation in those sectors of the market). Moreover, this negative consequence is unlikely to be fully reflected in the measures of house price change currently in use, because low-density dwellings are likely to trade less frequently, and so their price escalation may well go undetected.

We might deceive ourselves that the policy objective of price stability has been achieved when in fact our conclusion rests on price indices that largely exclude properties that are rising in value at the fastest rate.

² Towards a Strong Urban Renaissance: An Independent Report by the Members of the Urban Task Force chaired by Lord Rogers of Riverside, November 2005.

Figure 3-1: How Policy and Selection Bias Can Reinforce Each Other

The reinforcing effect of housing policy on transactions bias is depicted in Figure 3-1. The corollary of low-density dwellings increasing in value at a faster rate and also trading less frequently (box ①) is that unadjusted price indices will understate the true rate of house price inflation (box ②). This will give an exaggerated impression of the effectiveness of high-density new-build in reducing price inflation (box ③). This may encourage policy makers to continue with the policy of encouraging high-density construction, but even if it does not, there are other forces that will seek to maintain this policy (such as pressure from environmental groups). Consequently, high-density development rises still further as a proportion of all new construction (box ④), this then exacerbates the inflation differential between low- and high-density properties (box ①), and the self-reinforcing cycle starts anew.

Note though that there are likely to be buffers to this downward spiral. For high-density properties to trade frequently, there have to be many buyers, not just eager sellers. If there is a glut of supply in that sector of the market, the trade in high-density properties may slacken as a proportion of the total high-density stock. Also, there may be periods of exceptionally high-demand for low-density developments in a particular region, leading to sharp price rises and increasing willingness of occupants to trade (possibly moving to larger low-density housing in another region where prices have remained more stable, or taking the opportunity to draw on their housing equity). Periodic opportunities for arbitrage will lead to bouts of increased trade volume in low-density areas, diluting the transactions bias effect.

4 Implications for the Greenfield/Brownfield Debate

4.1 Introduction

In this chapter we consider the ramifications of transactions bias for the estimation of the relative benefits of greenfield development and hence for the greenfield/brownfield debate.

4.2 Transactions Bias = Brownfield Bias

Professor Sir Peter Hall has recently highlighted the dangers of pursuing an anti-greenfield planning strategy,

“... there is no overriding need to save greenfield land, of which we have a surplus in South East England; the case on sustainability grounds for further raising minimum densities is non-proven; the requirement to first develop brownfield land in the growth areas would in practice lead to inflexibility which would almost certainly slow their development; present policies are already inhibiting new housing completions and causing an unprecedented increase in apartment construction, unsuitable for families with children and undesired by potential residents...”³

His concern is that the recommendations put forward by the Urban Task Force Team to further restrict low-density greenfield development will “...deepen the well-documented housing crisis that faces us and our government”.

Other commentators (notably Lord Rogers) judge the benefits of housing density development to outweigh the costs. Which side of the debate one favours will depend on the weight one gives to the relative pros and cons of brownfield versus greenfield development. A crucial element in the mix of factors that will determine the Government’s position on this issue will be how it estimates the relative merits of greenfield development. Unfortunately, due to transactions bias, it is possible that existing house price measures may underestimate these benefits.

One way of viewing the benefits to the consumer of greenfield development is to estimate the monetary value that households would place on living in low-density greenfield housing rather than high-density brownfield housing. (There are of course other combinations but we shall stick with these for sake of simplicity and because they go to the heart of the debate). In truth, any county or local authority or even post code sector is likely to contain a combination of greenfield and brownfield sites. Note also that “greenfield” and “brownfield” are not dichotomous categories but denote a

³ *Towards a Strong Urban Renaissance*, Urban Task Force, 2005, p. 19.

continuum. The same is true of low- and high-density development. As a result, a comparison of the price indices of any two administrative areas – where one is characterised as having more greenfield than the other – could be misleading because each area will in fact contain a combination of both greenfield and brownfield development (and by assumption, some combination of low- and high-density neighbourhoods). However, if low-density properties tend to trade less frequently, any divergence in the price levels of the two administrative areas will be underestimated.

More generally, any estimation of the relative monetary value that society places on low-density greenfield development that is based on data drawn only from properties that trade will be biased in favour of brownfield construction unless an appropriate correction for sample-selection distortions is applied.

4.3 Ramifications for Submarket Analysis

The impact of density and other spatial factors on transactions bias, substantially reinforces the case for producing “inflation surfaces”⁴ for a city or region. Rather than relying on indices produced for particular administrative areas which contain an arbitrary mix of low- and high-density housing, these surfaces attempt to estimate house price inflation for every point on the landscape. Alternatively (or in addition), inflation indices should be produced for data-determined submarket areas which account for the variation in the volume of trade.

4 Such as the fractional-polynomial inflation surfaces being pioneered in the Department of Urban Studies, University of Glasgow.

5 Implications for Price Elasticity Calculations

5.1 Introduction

Two important indicators of housing market performance are: (i) the responsiveness of housing *demand* to changes in price (the “price elasticity of demand”) and (ii) the responsiveness of housing *supply* to changes in price (the “price elasticity of supply”). Having reliable estimates of these two parameters will give us a crucial insight into how the market is likely to respond to price changes, and will also determine how prices are affected by changes in quantity demanded and supplied. For example, if there is a large outward shift in the supply of housing, the price elasticity of demand will determine how much price falls. The lower the price elasticity of demand, the greater the shift in price from a given shift in supply. Similarly, the price elasticity of supply will determine how much outward shifts of demand will feed through to price changes. If supply is highly responsive (“elastic”), increases in income and other factors that cause demand to expand will only have a modest impact on house prices.

In this chapter we discuss the possible implications of transactions bias for the robustness of elasticity estimates.

5.2 Price Elasticity of Demand

The simplest definition of the price elasticity of demand is that it is the percentage change in quantity demanded in response to a percentage change in price. Because changes in price enter the denominator in this calculation, under-estimation of price changes will result in an over-estimation of demand responsiveness. For example, suppose that once other factors (such as income and demographics) have been controlled for, it is estimated that the demand for housing has fallen by 10% in response to a rise in the price of housing, which is estimated to be around 20%. So the price elasticity of demand is estimated to be $10\% \div 20\% = 0.5$. However, suppose the true price rise that caused demand to fall was in fact 30%. That demand only fell by 10% suggests that housing consumption is significantly less responsive to price than we had anticipated: the true price elasticity of demand = $10\% \div 30\% = 0.33$.

Why might our estimate of price inflation be overly conservative? Because of transactions bias. If properties that rise in price at the fastest rate are being under-represented in the indices on which our price elasticity of demand calculation is based, then we will under-estimate the price change, and over-estimate the responsiveness of demand.

5.3 Price Elasticity of Supply

A parallel argument can be made for the estimation of supply elasticities. The price elasticity of supply, in its simplest form, is the percentage change in quantity demanded in response to a percentage change in price. Because changes in price again enter the denominator, any under-estimation of price changes will result in an over-estimation of supply responsiveness.

More worrying is the implication for our perception of future improvements in supply response. If the distortionary effect of transactions bias becomes more potent over time (a rationale for which was summarised in chapter 3) then it is feasible that we could deceive ourselves into believing that the price elasticity of supply has increased when, in fact, it is only the transactions bias that has increased. As transactions bias increases, so our estimates of price change will increasingly fall short of actual price changes, and lead to the illusion that supply elasticities have improved.⁵

5 Of course, if properties that do not trade appreciate at a slower rate, then the opposite will be true.

6 Implications for Wealth Inequality and Affordability

6.1 Introduction

In this chapter we discuss some of the long-term equity issues associated with transactions bias and its distorting effect on policy.

6.2 Density Divides

Serious consideration needs to be given to the long-term implications of current planning policy for wealth inequality. If low-density housing is already increasing in value at a faster rate than high-density housing, any policy to increase the supply of high-density housing will serve only to exacerbate the polarisation of housing wealth.

Housing-wealth inequalities have the potential to be a major source of social division in the future. This is partly because of the class-reproduction effects that follow from the combination of high rates of home ownership and large differentials in the rates of house price inflation; and partly because differentials in housing wealth accumulation are likely to fall along racial and educational lines:

- Race: for example, if there is a predominance of white middle-class households in low-density areas, and properties in those areas appreciate at a faster rate, then wealth inequalities will increasingly reflect racial classifications.
- Education: in many cities the best state schools are located on the edge of the city. Local house prices will reflect school performance and the low-density nature of outer suburban development. Further house price polarisation between low- and high-density housing will exacerbate the de-comprehensivisation of state schooling because only wealthier families will be able to locate near the best schools.

Current housing policy may well perpetuate this effect. By promoting urban high-density new-build as opposed to low-density greenfield development, the relative increase in supply at the bottom end of the market will exacerbate price divergence. It will become ever harder for inner-city households to trade their homes for those located in close proximity to quality schools.

Such a prospect is not based on unfounded speculation. A recent Shelter report indicates that there are already important sociological side-effects of the growing housing gap:

“... children born this century will be starting life more financially unequal than has been the case since Victorian times... [T]he growing inequality in housing is marginalising a whole section of society... Those whose parents have housing wealth are more likely to be advantaged in childhood and to benefit from financial

assistance, for example, in finding their own homes... For the children of the poor there will be large parts of the country to which they cannot consider moving in the future even if they should wish to. When they have problems in their lives, there will not be recourse to family wealth to bail them out, to help with a time when they cannot work or find work, to help pay their way through university...”

If transaction bias has the potential to encourage policy decisions that inadvertently exacerbate housing wealth inequality, the effects could be far-reaching. There is, therefore, an imperative to develop methods of bias-correction which ensure that price measures accurately reflect changes in the value of the whole stock, not just those properties that frequently trade, and to understand more fully the spatial pattern of house price appreciation in the South East and elsewhere.

7 Summary and Recommendations

7.1 Summary

In chapter 2 of this report we summarised the main findings of our Technical Report regarding evidence for transactions bias and possible methods of adjustment. We found significant evidence that the proportion of the housing stock which trades in a given period varies non-randomly across space. We also found evidence that this distortion can cause bias to emerge in house price index calculation due largely to the fact that low-density areas not only have lower rates of turnover but have also been appreciating at a faster rate.

In chapter 3 we explained how a policy that encourages high-density development may inadvertently increase the disparity in price accumulation between low- and high-density areas, and further exacerbate transactions bias. Since this bias is likely to lead to an over-inflated estimate of the role new-build has played in reducing price inflation, we may falsely conclude that the policy has been successful. Transactions bias also poses particular problems for planners trying to use local house price inflation estimates to identify the areas with the greatest supply shortages. This is because differences in measured house price growth may simply reflect the different proportions of low- and high-density housing in the areas being considered.

Chapter 4 looked at the implications of transactions bias for the greenfield/brownfield debate. We noted that, if our calculation of the relative benefits of greenfield development rely on house price indices that only include those properties which have traded, then our estimates are likely to understate the benefits of greenfield housing. This is because untraded properties are likely to have increased in value at a faster rate and are more likely to be low-density/greenfield developments (or adjacent to such sites).

In Chapter 5 we attempted to explore the implications of transactions bias for elasticity estimation. We concluded that the omission of untraded properties from price index calculations is likely to lead to an overestimation of both the price elasticity of demand and the price elasticity of supply. Moreover, if transactions bias is set to increase (partly due to the promotion of high-density development) then supply may appear to have become more responsive (“elastic”), when in actual fact, it is only the bias in our price measure that has increased.

Finally, in chapter 6, we speculated on the long-term implications of transactions bias (and the associated distortion of policy decisions) for equity and race. Evidence from previous research suggested that house prices may already have polarised. There are clearly far-reaching implications in using house price measures that potentially encourage policy decisions that inadvertently exacerbate housing wealth inequality. There is therefore an imperative to develop methods of correcting house price measures so that they accurately reflect changes in the value of the whole stock, not just in those that frequently trade, and to understand more fully the spatial pattern of house price appreciation in the South East and elsewhere.

7.2 Recommendations

Recommendation 1

We recommend that the investigation of transactions bias be extended to examine other house price series (such as those based on mortgage lender data), and that a variety of index computation methods be investigated to assess the extent to which sample selection bias persists under different sampling regimes and computation methods.

Recommendation 2

We recommend that sample selection correction variables for the South East be made freely available to other housing economists and providers of house price information so that they can conduct their own analysis of the impact of including this correction term.

Recommendation 3

We recommend that more research be done on alternative correction terms. For example, the probability of non-selection could be predicted from Fractional Logit regression methods, and combined with duration-based methods (applied to survey data) to provide a comprehensive measure of the probability of non-selection.

Recommendation 4

This report has provided a compelling case for sample selection correction in house price calculation. We recommend that analysis of sample selection bias be extended to all other UK regions. By developing corrected price indices for all regions, it would be possible to estimate the extent to which transactions bias distorts existing estimates of differences between regions.

Recommendation 5

We recommend further investigation into the nature of spatial variation in house price inflation using “inflation surfaces” rather than indices for administrative areas. Such approaches could help avoid some of the misleading effects of transactions bias. More work also needs to be done on the causes of diverging price trajectories, particularly between low- and high-density areas.

Recommendation 6

We have put forward the hypothesis that transactions bias could lead to distortions in price elasticity measurement. We recommend empirical investigation of the magnitude of these distortions in elasticities estimated at regional and national levels.