PART TWO

THE UK HOUSING MARKET: BUBBLES AND BUYERS

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Andrew Farlow
Department of Economics and Oriel College
University of Oxford[1]

 This is the second of three articles taking a somewhat more sceptical perspective on the UK housing market than is currently prevalent in the housing and banking industries and the media. If nothing else, the intent is to provide some balance. I thank CSFB for encouraging this debate and for allowing me to express views that are not necessarily their own. All errors and omissions are mine. "Part One – UK House Prices: A Critical Assessment", is available from CSFB. Feedback is greatly appreciated: andrew.farlow@economics.ox.ac.uk.

1. INTRODUCTION

There is much evidence – economic theory, econometric, and psychological – that bubble-type behaviour takes place to varying degrees in many markets including those for currency, bonds, equity, consumer debt, and property. A positive bubble might be thought of as "a situation in which temporarily high prices are sustained largely by investors' enthusiasm rather than by consistent estimation of real value,"[2] or, more technically, as positive return correlation at short horizons followed by eventual reversion to some notion of fundamental value.

Confirming the presence of a bubble is, in some respects, a bit like proving the existence of a black hole – something difficult to look at directly, so we end up looking at the unusual behaviours of nearby objects that suggest its presence. Part One did this by looking at the evidence on fundamental factors. It concluded that while fundamentals helped to explain some of the recent level increase in prices, they fell well short of a full explanation. Part Two looks at the situation from the angle of house buyers. It argues that many buyers engage in momentum behaviour – basing buying decisions more on the recent behaviour of prices than on actual fundamentals. The heart of the problem is the inability of buyers to arbitrage, especially at times of excess; instead of correcting each others' mispricing, they reinforce it.

To complete the picture, Part Three will argue that banks at times do not arbitrage each others' behaviour or the behaviour of house buyers either; they face a problem of 'performance based arbitrage', such that acts of arbitrage, especially at times of market excess, are 'punished'. At such times it is more profitable to exploit the momentum behaviour of house buyers than to correct it. The behaviour of house buyers and mortgage banks mutually reinforce each other.

Recent developments in behavioural finance[3] are casting fresh light on the notion of bubbles. The central rôle of arbitrage is increasingly seen as much more problematic than the classical approach presumes. Arbitrage, when it works, ties price to fundamental value, and hence insures that mispricing does not last – indeed that it does not occur in the first place. In classical finance, individuals, on the whole, do not matter; the power of arbitrage negates their idiosyncrasies. Behavioural finance takes *people* seriously – especially their psychological motivations and their thought processes regarding each others' thought processes and behaviour. In classical finance, institutional detail is largely unimportant. In behavioural finance, *institutions* matter – especially in periods of 'excess'. Combining the psychological and the institutional, it turns out to be much more difficult to achieve arbitrage in certain circumstance and to rule out bubble-type behaviour.

Arbitrage failure is covered in section 2 and 3, illustrated with reference to all types of markets but with a particular emphasis on housing markets. Section 4 looks at some real-world survey evidence on the psychology of house-buyers, that again supports the notion that they largely fail to arbitrage mispricing, particularly at times of 'excess'.

Empirically, it might be thought that the case for or against bubbles could be settled regardless of the supposed problems with arbitrage. Section 5, however, demonstrates that testing for bubbles is problematic and that it is probably never going to produce evidence that would be completely conclusive (at least not for everyone). Any asset price change is explicable by *some* suitably defined change in supply and demand conditions (including expectations). Besides, since a bubble is measured relative to the transactions costs and the risks of trying to correct it, even a very volatile market might pass an efficiency test; there is a danger of degenerating into a purely semantic argument about 'bubbles' versus 'natural volatility'. However, even an 'efficient' level of volatility can be damaging when short-lived consumers build up debt on the basis of recent price peaks.

Part Two seeks to add value to the debate about the UK housing market by surveying, at a very rudimentary level, some of the behavioural aspects of the problem, and, hopefully, highlighting the key research in the area. If nothing else it is a collection of sceptical thoughts about the efficiency of the housing market, especially with respect to house buyers. There is no consensus on what follows. The reader has to draw his or her own conclusions. Just as one should be critical of the current story coming from the mortgage banks, one should not be uncritical of what follows.

[2] Shiller, R.J.,2000, p xii.

[3] Particularly good introductory treatments would include: Daniel, K.D, D. Hirschleifer, and S.H. Teoh, 2002; Hirshleifer, D, 2001; Montier, J., 2002; Shiller, R.J., 2002; Shefrin, H., 2000; Shleifer, A., 2000; Shleifer, A., and R. W. Vishny, 1997; and the seminal Kahnemann, D., and A. Tversky, 1974. For balance, also Malkiel, B.G., 2002.

2. ARBITRAGE FAILURE: WHY NO-ONE CORRECTS A BUBBLE

"To make a parrot into a learned financial economist it needs to learn just one word – arbitrage." Stephen Ross (a learned financial economist).

The notion of arbitrage is at the heart of the theory of financial market efficiency. Its failure is at the heart of cases of market inefficiency and bubbles.

Arbitrage is defined as the "simultaneous purchase and sale of the same, or essentially similar, securities in two different markets for advantageously different prices"[4]. Arbitrage is a game of co-ordination. The outcome presumed in classical finance is based on the common knowledge[5] of all players that they are all synchronising their arbitrage strategies and that it is riskless. In theory, the desired outcome involves no risk of capital loss.

However, we can't presume that agents converge on the optimal outcome in this game if this common knowledge is lacking. In practice, a player has to be sure that enough other players are also arbitraging, otherwise acts of arbitrage are just too individually risky and costly. Even in the simplest of cases, the textbook descriptions do not describe realistic arbitrage trades; in reality most positions involve capital and the risk of loss. Arbitrage is therefore limited by the risk-bearing capacity of arbitrageurs in the aggregate[6]. These risks vary across markets and institutional structures. Some apply more than others to housing markets and mortgage banks.

2.1. Risks to Arbitrageurs

Arbitrageurs face risk at various levels[7], though these levels tend to interact somewhat:

2.1.1. Fundamentals Risk

2.1.2. Financing Risk / Noise Trader Risk

- 2.1.2.i. Horizon risk
- 2.1.2.ii. Margin risk
- 2.1.2.iii. Short covering risk

2.1.1. Fundamentals Risk

Classical finance says that the greater the deviation from fundamentals the more aggressive the arbitrage activity becomes, since potential returns are higher. However, if acts of arbitrage are to bring market price to fundamental value, this rather requires some degree of certainty about fundamental value. Since arbitrage is a game of coordination, the less that players collectively understand that they have deviated from fundamentals, the less aggressively they collectively arbitrage. If an arbitrageur takes a position and then some good fundamentals news is released that justifies what had originally seemed a mispricing, the position must be closed at a loss.

In terms of bubbles, inability to define a fundamental value creates two problems. Firstly, it makes it more difficult to test market efficiency (one can never reject the null hypothesis of market efficiency when it may be that the model was misspecified). This applies both to economists running models of the market and, more importantly, to players in the market trying to calculate their optimal strategies. Secondly, hard-to-define fundamentals make it easier for bubbles to develop in the first place. With no unique fundamental value from which players can know (in the common knowledge sense of the word) that they have deviated, it is impossible to achieve common knowledge of deviation from fundamental value. This increases the uncertainty of players regarding the acts of other players and, hence, the uncertainty of gains from arbitrage; which reduces the expected payoff from any given position; which reduces the incentive to take those positions in the first place[8].

In housing there is the added problem of a very heterogeneous asset and a highly segmented market. There is no central exchange like there are for equities and many other assets and commodities, and information about the value of the underlying asset is much more imperfect. This increases fundamentals risk. This is aggravated by the behaviour of intermediaries. Very few (do any?) estate agents price according to macroeconomic or other fundamental factors – instead they price almost always in comparison to recent local sales. And consumers, we will see below, are no better at pricing relative to fundamentals.

This problem is especially severe if the asset has only very imperfect substitutes, since the risk will

[4] Sharpe, W., and G. Alexander, "Investments." 4th Edition, quoted in Shleifer, A., and R. W. Vishny, 1997.

[5] Common knowledge/belief is the notion that all agents know/believe that all agents know/believe that all agents know/believe, etc. It turns out to be important in games of arbitrage as in many other games of coordination. Here we stick to 'knowledge'. The concept is frequently referred to below.

[6] This is explained very well in Shleifer, A., and R. W. Vishny, 1997.

[7] The framework adopted here is taken from Montier, J., 2002.

[8] One of the distinguishing features of collapsing bubbles is conversion to common knowledge/belief regarding fundamentals.

have been poorly, if at all, hedged. Housing is an example par excellence of an asset without a close substitute with high fundamentals risk. Small transaction and information costs become serious impediments to arbitrage.

2.1.2. Financing Risk/Noise Trader Risk

Noise traders are "investors who make decisions regarding buy and sell trades without the use of fundamental data"[9]. The presence of noise traders forces others – both other noise traders and non-noise traders – to face risks that they would not face in a world devoid of noise traders, i.e. the world of classical finance. This can be analysed from various angles.

2.1.2.i. Horizon risk

Even if prices will eventually converge, the process may not be smooth or rapid. Shiller[10] remarks, in the context of eToys, "Absurd prices sometimes last a long time."

What happens if mispricing deepens – say, if noise traders' beliefs become temporarily even more extreme – even though it is known (to the informed arbitrageurs taking short positions) that price will eventually revert to fundamentals? This creates uncertainty about the resale value of the assets on which those positions are taken. The closing of the position cannot be guaranteed. Those lending resources to the arbitrageurs to take such positions will require more security as the position deviates ever further from fundamentals. The risk and cost of this has to be factored in. Treating arbitrage as a game, horizon risk relates to the number of repetitions of the game until the market corrects.

Horizon risk can be viewed with and without fundamentals risk.

Case of horizon risk without fundamentals risk:

A good example of horizon risk without fundamentals risk is Royal Dutch/Shell[11]. Royal Dutch and Shell are traded on nine exchanges worldwide with an arrangement to split cashflows 60:40 even though they are completely separate legally. Yet, according to these markets, there is a minus 30% to plus 20% deviation from theoretical parity in market size – contrary to what efficient pricing would suggest should be the case. The financing/noise trader risk explanation is that if the price is wrong by, say -10%, and an arbitrageur initiates a 'put', and yet price deviates even further (to say -25%) then the arbitrageur faces large margin calls. If there is significant momentum (the degree of which is related to the number of noise traders present), then the risk of possible margin calls makes short positions very difficult to take on. If financing/noise trader risk can cause trouble in such obviously arbitrageable cases, it suggests real trouble in much less obviously arbitrageable cases like national housing markets.

Even in these obvious cases of mispricing, as the time taken to convergence increases, the return to arbitrageurs' falls dramatically. Some simple figures[12] illustrate the problem. Investments that are expected to yield 15% return over 92 days will generate an annualized return of 47%. If the number of days till termination halves, to 46, the annualized return rises to 238%. But, if days to termination rise, by just half, to 138, the annualized rate drops to 14%. In a proper model of risk – incorporating the risk of further deviation caused by noise traders, and the fact that further capital will need to be sought – this may well just not be a high enough return to justify taking on the risk in the first place.

Case of horizon risk with fundamentals risk:

A case of horizon risk *with fundamentals risk* would be a situation where the value of house prices can deviate from fundamentals for long, but uncertain, periods of time. If an owner sells and waits for correction (in the absence of forward markets this is the only strategy possible) the market may nevertheless get even more out of line before correcting. Combined with the fact that the fundamentals may not have been well specified in the first place, this becomes a very risky strategy[13]. Many current warnings of a possible real capital loss of 20% to 30% (or simply a warning that life-time wealth will be lower by buying now) are not enough to incentivise many current consumers to sell out or to put off buyers (though first-time buyers are currently at a record low); either they do not believe the overvaluation story or they find it just too risky to act given the horizons (and transactions costs) involved. Any house buyer who believed the story a

[9] http://www.investopedia.com/terms/n/noisetrader.asp.
See also DeLong, J.B., A. Shleifer, L. H. Summers and R. J. Waldmann, 1990; and DeLong, J.B., A. Shleifer, L. H. Summers, and R. J. Waldmann, 1991.
[10] Shiller, R.J., 2000, p176.
[11] Unilevar N.V./Unilever PLC is a similar case.

[12] From Montier, J., 2002, p 45, taken from Mitchell, M., T. Pulvino, and E. Stafford, 2001.
[13] Even more so if utility functions contain some sort of 'regret' term.

year ago (when it was almost certainly already true) and had acted upon it, will have since seen prices rise even further and their entry or return to the market pushed off even further. The ultimate 'truth' of the overvaluation story is irrelevant in such situations.

Technical points on volatility and fundamentals risk:

There are a couple of interesting technical points regarding the relationship between the degree of volatility of a market and fundamentals risk. They suggest further reasons why housing markets may be even more difficult to arbitrage than other markets (and it is a feature in which segmentation works to aggravate the matter):

Higher volatility night be associated with more frequent mispricing – and hence plenty of profitable opportunities for arbitrage. If all volatility were due to noise trader sentiment, then the out-performance of arbitrageurs relative to a benchmark is roughly proportional to the standard deviation of the noise trader demand shock. But high volatility does make arbitrage less attractive if the expected outperformance relative to the benchmark does not increase in proportion to volatility – in particular *when fundamental risk is a substantial part of volatility*. Fundamentals risk reduces the attractiveness of trade.

And the ratio of expected outperformance-to-benchmark to volatility may be low – for example for situations where the resolution of uncertainty is slow, and where noise trader sentiment can push prices a long way from fundamentals before disconfirming evidence comes in. So, the long run ratio of expected outperformance-to-the benchmark to volatility may be high, but the ratio over a horizon of, say a year – or several years in the case of housing – may be low (or very low). For arbitrageurs who care about interim consumption and whose reputations (mortgage banks for example) are permanently affected by their performance over a year or two, the ratio of reward to risk over short horizons may be very relevant. So, higher volatility (ceteris paribus) deters arbitrage against mispricing. Again, poorly defined housing market fundamentals are a danger sign not a reassurance.

Banks also face horizon risk. They have to resist supplying fresh – but currently highly profitable – loans on overvalued properties, and resist using overvalued prices as collateral for consumption loans. Uncertainty pertains to *when* the loans become unsupportable, and *whether* fundamentals turn out to make them unsupportable anyway. Meanwhile those banks that take arbitrage positions to short the market (i.e. they don't lend, which is the only way they can arbitrage the market) are destroyed by loss of market share and removal of capital due to poor performance. Any mortgage bank that believed the overvaluation story a year ago and had acted upon it, will have seen their profits heavily hit compared to those banks that ignored it[14]. Survey evidence (more on this below) indicates that the housing market is full of noise traders! And fundamentals risk is high. In combination, this makes for the sort of environment in which banks will not easily take short positions.

2.1.2.ii. Margin risk

If the position moves against an arbitrageur, he/she will have to make a margin call – a partial payment in the face of new values of securities. Just as they face the greatest potential returns, they have to reduce exposure to meet the calls. This has proved to limit the power of even large hedge funds, and so, collectively to reduce their unwillingness to correct market overvaluations. Even the largest of hedge funds find themselves as informed 'agents' trying to convince less well informed 'principals' – their financial backers – to invest more even as their previous investment decisions look not to be working. Such situations never arise in classical models of arbitrage where institutions don't matter and where capital is not, strictly speaking, at risk. The possibility of this situation arising might itself limit positions in the first place – so as to have some liquidity in case of movements even further away from fundamentals[15].

2.1.2.iii. Short covering risk

This refers to the risk of involuntary liquidation. An arbitrageur borrows stock to short it, but if the lender of the stock finds it difficult to maintain the level of supply they may even ask for it back; the arbitrageur has to liquidate any positions prematurely.

[14] This raises the issue of why the stock market does not correct this. In fact, ultimately, the arbitrage failure lies there.
[15] See Longstaff, F., and J. Liu, forthcoming.

2.2. Substitutes, Short-Run Supply, and Short Sales

It is essential to the working of arbitrage to have close substitute securities readily available – arbitrageurs go short[16] the expensive securities and go long very similar, but cheaper securities. This brings prices to fundamental value *even if* some agents are not fully rational and even if demands are correlated. Crucially, price is determined relative to close substitutes and not relative to the absolute supply of the asset.

It might, therefore, be possible to achieve the 'Law of One Price' in the shares of one company though not for the whole share market, because there is no relevant substitute portfolio for the whole market. But we find that this may fail even for individual shares. For equities, the degree of substitutability has been found to be weak. Roll[17] found that the amount of variation in return on large stocks that was explained by aggregate economic factors, returns on other stocks in the same sector, and firm-specific publicly-known news, was only about 35% on monthly data and 25% on daily data. In other words, there is very little substitutability between even equities.

Even if individual securities have better substitutes than the whole market, many broad categories of securities do not have substitute portfolios at all, so that there is no riskless hedge that can be used if the whole category is mispriced. One can sell stocks and reduce exposure to them, but this is not riskless given that the return on stocks is historically high and positive. For housing, the only strategy available is to get out altogether when rates of price growth are believed excessively high, with intent to get back in when levels are lower. But this is very risky too. It becomes extremely difficult to rely on arbitrage to pin down the price *level* of a whole category like stocks, bonds, or housing[18]. In addition, for housing, the release valve of international capital flows is not present; houses cannot be traded internationally.

The inability to go short in housing markets, creates an asymmetry: An incapacity to exploit profit opportunities if the market is expected to decline (unlike, at least in principle, the stock market) and a buy-and-hold strategy in periods of excess positive returns when prices are rising (or, indeed, if prices are below fundamentals). This asymmetry feeds into expectations (especially of banks) of how they can exploit volatility in the market, and, this feeds into bubble behaviour.

Similarly, the more easily replicable an asset (i.e. the more easy it is to create substitutes to the current asset) the less likely there will be a bubble in it. This has worrying consequences for how we interpret the relative rigidity of the UK housing stock and the slow response of fresh supply to price[19]. It is often argued that the 'inadequate supply of housing' is behind recent large price rises, and that somehow this is a fundamentals argument (though we found in Part One that it accounts for very little of the recent UK price rise). But this can be twisted on its head in the context of arbitrage failure. The very knowledge, ex ante, that excess price (relative to fundamentals) will draw forth greater supply of an underlying asset, will act to numb speculative price pressures in the first place.

Long supply lags feed a boom-bust cycle. If a surge in demand raises prices above replacement cost, builders should have an incentive to build to take advantage of the profit opportunity, and this would help bring prices back to fundamentals. But given a long planning and build process they are also aware that properties may come online when demand has fallen again, causing prices to slump, with this exaggerated by the way supply continues to increase even as price falls. This can also exaggerate the upswings. If builders come to perceive that a bubble is peaking, they should optimally choose to curtail supply plans so as to avoid expected future losses, but, of course, in the short run this adds to the price spike.

Even for easily-replicable assets, option price logic dictates that where there is high uncertainty about fundamentals – and especially if there are long gestation periods of investment leading to the creation of the assets – agents might resist supplying more of the underlying asset until some of this uncertainty is resolved. Already, a relatively fixed supply of housing makes prices tend to be largely demand determined over the business cycle. This

[16] For the uninitiated (hopefully, if this reaches the general audience intended, there will be one or two) 'going short' or 'taking a short position' means selling something for future delivery that you currently do not own, in the hope of being able to buy it back later more cheaply, making good on the short promise, and pocketing the difference. 'Going long' or 'taking a long position' is agreeing to buy the underlying asset at a future date for a specified price. When Lilly Savage told an audience that she had sold her flat – she just hadn't told the council yet – in a round about sort of way she was 'going short'.

[17] Roll, R.W., 1988.

[18] See Campbell, J.Y., and A.S. Kyle, 1993.

[19] Barker, K., 2003.

option-based restraint on supply adds to the problem and adds to the conditions that create price changes that feed momentum traders.

It is also forgotten that in a price collapse, at an already relative low rate of growth of the asset stock (such as the UK housing market at the moment), any additional supply of sellers has a much greater relative impact on price behaviour.

2.3. Diversification, Liquidity, and Arbitrage

Portfolio theory suggests that players should be well-diversified – in the limit (taking into consideration transactions costs) participating in all securities markets. They should not over-invest in assets that tend to correlate with their income. In classical finance, when mispricing of any one security is spotted, large numbers of arbitrageurs take marginal positions against the mispricing such that each takes on only very limited extra exposure; the collective mass of decisions corrects the mispricing. This does not work in housing markets; most players are not well diversified and are heavily exposed to just this *one* asset, and most decisions do not relate to marginal purchases. This situation is encouraged by the tax system. It might also have behavioural explanations, in much the same way that people, on average, incorrectly over-invest in their own firm's stock or region believing it to be low risk, even though its performance is more likely to correlate with their income.

Even if arbitrageurs are relatively well-diversified, when markets fall they often fall in a correlated fashion; just when diversification is most needed, it disappears.

Liquidity makes it easier for smart traders to arbitrage away mispricing, but also makes if easier for foolish traders to arbitrage away efficient pricing. Those *in* the housing market already are less liquid than irrational entrants. In a price downturn, the forced selling into a highly illiquid market pushes prices even further down, making even what would once have been profitable trades much less profitable or even unprofitable.

2.4. What Markets Attract Arbitrageurs? An Ordering

Arbitrageurs (or rather, arbitrage strategies) are likely to be found in some markets more than in others. Mortgage banks are not traditionally thought of as 'arbitrageurs', but their lending strategies – sometimes feeding bubbles, sometimes acting against bubbles – can be thought of as 'not-arbitraging' and 'arbitraging' strategies respectively[20]. The key for arbitrageurs is to minimise the total amount of risk to which they are exposed for any given expected return.

Markets attract arbitrageurs where there is an ability to ascertain value with a degree of confidence and to realize it quickly. Mature economy bond markets, for example, have relatively low fundamentals risk, and fair value is relatively easy to compute (with periodic interest payments defined at the outset). These markets attract large amounts of extreme leveraging and short selling. This does not mean that such markets cannot experience bubbles[21]; it's just that it is more difficult to generate the conditions for bubbles. In FOREX markets, the calculation of relative values becomes more difficult and arbitrage becomes more risky. In stock markets, absolute and relative values of different securities are harder to work out, so it is even more difficult to tell when prices are not equal to fundamental value (though, this excuse didn't really work at the values at the end of the 1990s). And many standard methods of arbitrage, such as extreme leveraging and short selling are often restricted by government regulation and by the charters of pension and other funds. Performance-based fees are common too, limiting positions other than those likely to yield positive results quickly. And it is often not possible to keep positions confidential. Housing is at the bottom of the list; fundamentals are even more difficult to ascertain, the presence of noise traders is high, transactions costs are high, there is even less of a complete market in substitute assets, with no notion of leverage and short-selling. And short-term performance-based fees (at least shorter term than the house price cycle) drive mortgage bank lending and estate agents' strategies.

[20] More on this in Part Three, dealing specifically with mortgage banks.
[21] See Farlow, A.W.K., 2004, "Bubbles and Emerging Market Crises", forthcoming, Oxford Analytica, for an argument that this is currently the case in emerging market bond markets.

Tentative rank-ordering of major markets by ease of arbitrage (highest ability to lowest):

Mature Market Bond
FOREX
Equity
Housing

This can be turned on its head to produce the following tentative ordering of the degree of ease of bubble by market type (highest to lowest):

Housing
Equity
FOREX
Mature Market Bond

2.5. Greenspan, Real Estate Bubbles, and Central Bank Policy

"I don't think we have a bubble in house prices. First, let's remember it's very difficult to get one. Unlike stocks, where you have a single market, low transaction costs and an ability of people to pile on nationally and cumulatively, residential housing markets are all local." [22] Federal Reserve Chairman Alan Greenspan, 17 April 2002, *Testimony before the Joint Economic Committee*.

The reasoning of the previous sections puts the recent comments of Alan Greenspan in perspective. The emphasis seems to be on the *entry* of speculators – perhaps day-traders with low transactions costs, able to 'pile on', as Greenspan puts it, and generate herd behaviour and bubbles. But entry is not the only issue in a bubble phase; correction, via acts of arbitrage, is important too. Day traders can also easily 'pile out', correcting the market. We can't immediately presume that the power of the first dominates the latter (the very *knowledge* of the ability to 'pile out' may itself act as a corrective influence). Arbitrage is a double-edged sword; just as rational agents arbitrage away inefficient pricing, irrational traders arbitrage away efficient pricing. If each group has significant risk-bearing capacity, both will influence the price. The ability of the first group to offset the second group is very weak in housing markets.

All the features Greenspan mentions can make it *more difficult* for agents to adopt strategies that would act to *correct* mispricing in housing markets. The market is dominated by individuals who only trade in their own home. High transactions costs, carrying costs, and tax considerations make it relatively difficult for professionals to take advantage of profitable arbitrage opportunities when the market is overvalued. Markets are local (in the sense that house purchase decisions are related to many other aspects of the buyer's location) reducing the willingness to arbitrage across markets. And the inability to hedge – there are no futures or options markets - dramatically reduces the aggressiveness of arbitrageurs. With arbitrageurs discouraged, markets become more open to momentum and panic-based inefficiencies[23].

Central bank policy can make house price bubbles worse. Firstly, there is the usual, rationally-determined, 'put' option generated by central bank asymmetric behaviour[24]. In the housing market context this refers to that part of house prices that factors in the value of the downside insurance that buyers *and* lenders perceive (rightly or wrongly) on account of the central bank's willingness to act vigorously when prices fall, though being less willing to act when prices rise. Just as an investor can set a floor to the price of a security by buying a put option, so the central bank can set a floor for house prices by cutting interest rate when prices go too low for their liking. At the same time there is no call option, or ceiling, on house prices such that a rise in interest rates would be triggered. Recent pronouncements of the Bank of England have indicated the Bank's willingness to act to try to stem house price falls, while denouncing reference to house price bubbles. Of course, the ability of the central bank to make good on the 'put' option is

[22] It is novel to hear Greenspan talking in the language of the Tobin tax. Shiller, J.R., 2002, p14, describes Greenspan thus: "A modern version of the prophets who spoke in riddles, Greenspan likes to pose questions rather than make pronouncements. In the public exegesis of his remarks, it is often forgotten that, when it comes to such questions, even he does not know the answers."

[23] The author spent part of the summer of 2003 in Chicago. Many streets had large, bright red 'Apartment for rent' notices on nearly every door. Landlords' agents complained bitterly about the slump in the rental market caused by so many would-be tenants buying property in response to cheap credit conditions and the recent rapid property price rises (price rises held higher by the large amounts of empty rental stock). Agents would happily show spreadsheets of apartment stock that read 'vacant' all the way down (much having been vacant for many months), and would grudgingly, but eventually, chip 20% off the asking rent. One young agent – income depressed by the collapse in the rental market – cheerily explained that he had just tanked up on debt to buy two apartments that he had not managed to rent yet but on which he had 'made lots of money' since they had gone up significantly in value in just a few months and that he could sell quickly if prices started to fall (ignoring the fact that others might try the same strategy). Chicago, at least, showed all the classic symptoms of a property price bubble.

[24] For this put option in an equity market context see: Wadhwani, S., 1998; Miller, M., 2002, Cecchetti, S.G., H. Genberg, J. Lipsky and S. Wadhwani, 2000; Miller, M., P. Weller, and L. Zhang, 2002; and Smithers, A., and S. Wright, 2002.

another matter altogether. What consumers believe and what the central bank is able to deliver may be very different.

Secondly, there is an extra, behavioural, angle. By asymmetrically altering the uncertainty of those (both house buyers and mortgage banks) who would seek to arbitrage the housing market, there is an increase in the incidence of behaviourally generated bubbles. Arbitragers, when trying to correct a bubble, find that the central bank effectively works against them, and this is, ex ante, factored into the strength of their arbitrage and their ability to correct momentum behaviour, and this is, ex ante, factored into the behaviour of those engaging in bubble-type behaviour.

2.6. Bubbles and the Media

There is a twist on the arbitrage failure story for those making bearish pronouncements about any market. Since the timing of correction is, by the very definition of a bubble, impossible to determine, then those who predict the timing of correction (or are made out to have predicted the timing of correction) and yet find that it does not materialise in an orderly fashion will find themselves discredited – only serving to confirm in public opinion that the optimists (who were never expected to predict the timing of anything, and in fact repeatedly got their forecasts wrong) were right all along. It seems to be in the nature of bubbles, that as mispricing intensifies, alternative assessments of what is going on tend to become ever muted.

Demonstrating that the market is overvalued, and being able to predict the timing of correction, are logically mutually exclusive – though it is often presumed that the former is only valid if the latter is correct[25]. This expectation is the way matters are set up in some areas of the media[26]. At the close of 2003 we were told[27] that "The Nationwide's latest figures appear to have proven wrong those pundits who had predicted a sharp correction in prices during the past year," ignoring the fact that no 'pundit' had made any such prediction, and that such predictions had been manufactured by these areas of the media themselves with the help of the mortgage banks, so that they could be triumphantly knocked down later. At the close of 2003 this created the perverse result that prices could become more overvalued than even the mortgage banks had predicted, and yet, somehow, this made the overvaluation story look less valid and the mortgage banks look more right[28].

In fact the tone becomes more pro-price-rise. The overvaluation story would suggest that when prices rise by a third in one year for no fundamentals-based reason, this is potentially bad news for those freshly buying or wanting to buy, and for those taking out large debt. To the writers of the above story however: "The North of England did best – up by nearly a third on 2002 followed by Wales up by a quarter." But, by this stage they probably didn't even notice their slip into such value-loaded language.

It creates much less of a media splash and it doesn't seem to matter that the leading mortgage banks have repeatedly heavily underestimated house price growth, and only seem to get it right when they incorporate a large element of momentum. A year ago all the major mortgage lenders predicted a significant rise in the base rate; instead it fell and ended the year much lower than their predictions. All predicted a flat or, at most, a slightly increased level of gross lending; instead it romped ahead rising more than 20%. All predicted that house price inflation would reduce dramatically and not achieve anywhere near the gains that have in fact transpired over 2003; none of them got even remotely close to predicting the 34% rise in the north of England, or the 25% in various other regions. Given their central rôle in the decision-making processes of house buyers, any reasonable interpretation would regard this as a miserable failure – and a repeat of the previous year's performance. Arguably, this should cast serious doubt on the faith placed by the media in the mortgage banks' view of the world. If their fundamentals-based models could not produce a 34% figure, one would think that they would be challenged for an alternative explanation. A priori it suggests something other than fundamentals. But it is not expedient for any mortgage lender to admit this, nor, it seems, for the media to ask. And, as unexplained price rises intensify, the failure to challenge such poor predictions also intensifies.

At some point even dissent is rubbished. In recent news items, and within a few lines of each other, the BBC (news.bbc.co.uk) has developed the habit of

[25] At the CSFB conference the author fell into the trap of answering a question about timing, when strictly speaking the bearish sentiment and the timing issue were separate. 'Part One' and the original conference presentation make no predictions about timing. Neither does Part Two.

[26] The 'Financial Times' and 'The Economist' have, in particular, largely escaped this pitfall.

[27] http://news.bbc.co.uk/1/hi/business/3358617.stm.

[28]

referring to those promoting optimistic views as 'housing market experts' and those holding more cautionary views as 'housing market doomsayers' and 'pundits'. As this was going to press, a story appeared that illustrated all of these points beautifully[29]. Its text refers to mortgage banks as 'experts'; its headline to those who disagree as 'doomsters'. It then extensively quotes an 'expert' who had, until recently, spent a career in corporate PR. It quotes, without a hint of irony, this 'expert' describing the 34% price growth in the North of England – that this and other 'experts' had failed to predict – as the 'Year of the North'. The 'expert' is not challenged to give an explanation for such a high and unexpected figure, and none is offered in the article. Next year's predicted price growth of 8% – four times the rate of inflation – that in other circumstances might register as significant, is described as 'only 8%' (given the doubling in recent years, 8% is 16% of prices just a few years ago).

It is sometimes argued that 'if markets are inefficient why have those who argue this way not become rich?'[30] But, the arguments for arbitrage failure rest on the notion that it can be extremely difficult to make arbitrage profits out of mispricing even if it is obvious. It is, of course, this very lack of ability to exploit mispricing that makes it able to arise, and persist, in the first place. As Keynes put it "the market can stay irrational longer than you can stay solvent"[31]. It is perfectly consistent to be in a situation of talking about mispricing while still not being able to make any money out of it.

All of this creates a bias in public opinion-formers at times of bubbles in favour of optimists. Better not reveal your bear credentials unless you are absolutely sure that the bubble is peaking[32]. This was evident at the height of the stock market bubble of the late 1990s. It was the bears in 2000 who added seriously large value to the wealth of those who listened, and it was those who disparaged the 'doomsters' who turned out to actually create the greatest loss of wealth and the most 'doom and gloom'. As testament to the way the media and investors in general prefer optimists over pessimists whatever the damage optimists may inflict on the personal fortunes of ordinary investor, leading optimistic 'pundits' of the time[33] survived with reputation largely intact, deftly deflecting criticism elsewhere – onto Wall Street, Corporate America, Government, and even onto 'fickle' investors themselves.

3. PSYCHOLOGICAL BIASES OF HOUSE BUYERS

The following section covers a selection of the many ways that housing 'buyers' can differ psychologically from the sort of buyers pictured in the standard asset pricing formulae. Each of these biases either directly feeds bubble-type behaviour or simply reduces the ability to arbitrage the bubble-type behaviour of others. These, and many more, biases are well-surveyed in the literature in footnote 3 above.

3.1. Psychological Errors of Optimism, and Similar Biases

The most documented of all psychological errors is the tendency to over-optimism. The more difficult the question, the greater this seems to be[34]. In experiments, 98% confidence intervals only contain the true quantity 60% of the time[35]. This comes from the psychological biases of 'illusion of control' – investors exaggerate their ability to control the situation – and 'self-attribution/confirmation bias' – investors tend to interpret their investment successes as confirming their own abilities. Bad outcomes are put down to bad luck. Success in a housing price boom is attributed to one's own wise investment decisions. Failure in a bust is blamed on someone else (the market, all those thoughtless bears who 'talked the market down', etc.).

[29] http://news.bbc.co.uk/1/hi/business/3371395.stm

[30] For a typical example of the conflation of overvaluation and prediction stories, and the idea that bubbles cannot exist otherwise everyone could become rich exploiting them, Ray Boulger, Senior Technical Manager at Charcol mortgage broker, commented: "A common claim by those forecasting a property crash is that bust always follows a boom, or a bubble as they prefer to call it. But if things were that predictable we would all be millionaires." Not only does this conflate two totally different things, but the reasoning is tautological: Bubbles can't happen because bubbles can't happen. If everyone could become rich from exploiting bubbles, then clearly bubbles would not happen otherwise we would all become rich. But then nobody would become rich from exploiting bubbles because they would not happen.

[31] Not all consumers have to be irrational even if the market outcome looks that way. However, the presence of irrational agents makes even rational agents change their strategies, as we will shortly see.

[32] This is a non-too-subtle hint regarding the author. See sections on the US stock market, in Farlow, A.W.K., March 2000 (which, incidentally, does not particularly argue for stronger regulation).

[33] Such as Daniel Yergin, Larry Kudlow, James Glassman, Suze Orman, James Cramer, George Gilder, etc. Though optimists are usually called 'gurus' rather than 'pundits'.

[34] See Morgan, M. G., and D. W. Keith, 1995.

[35] See: Fischoff, B., P. Slovic, and S. Lichtenstein, 1977; Fischoff, B., P. Slovic and S. Lichtenstein, 1978.

Kuran and Sunstein[36] talk of 'availability cascades'; an expressed perception is perceived to be more plausible as a consequence of its 'increased availability in public discourse'. A myriad of TV programmes on house and home reinforce the belief that prices can only keep rising (UK and US shows that involve actual house prices have ballooned just recently, an amusing reflection on human psychology in a bubble perhaps?).

Optimists – those with reservation prices above the fundamental value – come to determine prices in markets such as housing, with little or no supply response and no short selling. Even the demand of a few relatively optimistic investors (buy-to-lets maybe) can push prices above the fundamentals price level. In an efficient market this price rise would be moderated by other investors going short. But with no organised futures and options markets in property, this is not possible.

Even if it might seem that they would 'die out' due to being overly-optimistic, so long as the upward trend in prices continues, the optimists survive – crowding out those adopting more rational pricing behaviour. And, so long as banks value property at market prices for collateral purposes, and so long as those providing resources to banks value the property they hold at market prices, the overly-optimistic consumers are able to borrow against higher prices. The rôle of overly-optimistic banks crowding out more 'rational' banks cannot be overestimated, and will be covered in Part Three.

Consumers are even biased toward *seeking* confirmatory information. Then they become attached to their views; Hirshleifer refers to evidence of a tendency to be excessively attached to activities for which one has expended resources, calling it the 'sunk cost effect'. Those who have exerted effort to join a group tend to like the group more.

The importance of the balance of optimist and non-optimists can be seen in the collapse of the Internet bubble in 2000[37]. Typically, at the initial public offering of an Internet stock only about 15% to 20% of the shares were sold to the public. On the instructions of underwriters, most were held from the market for, usually, four to six months. This created restricted supply and great ability to exploit optimists. Those with overoptimistic valuations came to set prices way out of line with fundamentals. There were not enough shares issued to meet the demand of those who would have shorted the market, limiting ability to arbitrage. At the end of this 'lock-up period' the insiders were free to sell. On average, in the five days up to and including the end of the 'lock-up', internet shares fell by about 4%. This was followed by a large jump in volume and a slow drift down in price so that, after about six months, prices were down 35% relative to a representative index of Internet stocks. But in the spring of 2000 an unusually large volume of shares, almost $300 billion worth, were unlocked and large numbers of insiders, venture capitalists, and early investors unloaded their shares. The fact that so many were unloading indicated that they knew that they were overvalued. In effect well-informed investors were at last able to communicate their knowledge to the market by shorting the stocks. The number of optimistic buyers willing to absorb these shares was exhausted. Prices fell. Further pressure on prices from the collapse in the number of optimists meant that even the remaining optimists went sour. The bubble collapsed.

In today's debt market, as Wynne Godley has repeatedly pointed out, the big issue is not about when the ratio of household debt to income will fall; it is about when the increase in the debt-to-income ratio slows, causing the flow of net lending into the market to fall. In a parallel to the Internet, the housing market optimists will be exhausted – of the expanding funds that they needed to keep feeding their expanding purchases, and hence expanding house prices.

3.2. Momentum Reasoning

There is both empirical and experimental evidence that agents engage in momentum behaviour, ignoring the laws of probability, and overreacting to patterns of news consistently pointing in the same direction (even if it is just random).

Kahnemann and Tversky[38] coined the term 'representative heuristic' to describe the way subjects use short series of data from the recent past as a basis for predicting the future. In the housing market context, if house prices rise strongly, perhaps because of some good reason like a fall in the long-term real interest rate, buyers assume that prices will continue to rise. They buy into this and it creates a

[36] Kuran, T., and C. Sunstein, 1999.
[37] See Ofek, E., and M. Richardson, 2003.

38 Kahnemann, D., and A. Tversky, 1974.

self-fulfilling prophecy (and nobody arbitrages them). The fact that current nominal interest rates are low, and the burden of current repayments is lighter, helps those behaving this way to survive for a while.

In experiments, when subjects are given a random walk (though they are not told this) and are asked to forecast the subsequent moves in the series, they tend to fall into two regimes[39]: In 'continuations', subjects tend to over-react to changes that were preceded by many continuations; in 'reversals' they tend to under-react to changes that were preceded by many reversals. In another experimental market setting[40] where the prices fed to the subjects fluctuated, subjects bought on dips and sold on rises – but when a trend appeared, they tended to switch to chasing it. Shleifer[41] reports people systematically violating Bayes's rule. And there are many other studies[42].

In a stock market setting, Barsky and De Long[43] found that a 1% rise in the level of dividends was associated with about 1.5% rise in equity values. Hence, faster dividend growth increased stock prices more than proportionately. In the context of housing markets, agents extrapolate recent series of price rises to draw conclusions about underlying fundamentals, forgetting that the series were generated by the momentum behaviour of others in the market.

Momentum reasoning also happens when prices fall. Initial price declines discourage some investors, demand falls, causing further price falls, this feeds momentum traders and discourages more investors, etc. It is sometimes argued that a zero price floor (unlike a limitless ceiling) puts a limit on this in the downward direction. However, real payoffs in debt-backed housing can go well below zero, as the late 1980s and early 1990s experience in the UK amply demonstrates.

3.3. Anchoring, Regret, and Disposition Effects

3.3.1. House price anchoring

In the absence of solid fundamentals information, past prices are used to anchor today's price. In a study by Northcraft and Neale[44], participants were asked to inspect a property for 20 minutes with, in hand, a 10-page report on the house and other houses in the area. Reports were identical in all ways except asking price. The initial asking price swayed values by 11-14%!

3.3.2. Regret

Psychologists[45] have found that regret has great motivational power. Watching others in the stock market or housing market 'making money', even 'making a killing', motivates people – via regret – to get into the market even when recent excessive price rises might otherwise dictate more caution (and might suggest a higher risk of capital loss)[46]. At such moments, potential loss is less diminishing to expected utility than the failure to participate. This stops some people getting out in a house price bubble too, in an attempt to avoid the feelings of regret if they have to get back in at a higher price later.

3.3.3. The disposition effect, and house price stickiness

People dislike incurring losses much more than they enjoy making gains[47]. Genesove and Mayer[48] find a 'disposition effect' in housing. In the falling downtown Boston housing market in the 1990s, owners facing negative equity tended to set prices at about 25% to 35% of the difference between the property's expected selling price and their original purchase price; consequently, they held out too long and made an even greater loss (one observes similar behaviour in private rentals markets, when owners would rather take another month without a tenant then chip 5% of the rent). This helps explain some part of the fall in volumes of housing market trade at a peak before prices come down, and why house

[39] Bloomfield, R., and J. Hales, 2001.
[40] Andreassen, P.B., and S.J. Kraus, 1990.
[41] Shleifer, A., 2000, p11.
[42] See, for example, Daniel, K.D., D. Hirschleifer, and A. Subrahmanyam, 1998, Hong, H., and J.C. Stein, 1999, Barberis, N., A Shleifer and R.W. Vishny, 1998, Bikhchandani, S., and S. Sharma, 1998, Banerjee, A. V., 1992, Avery, C., and P. Zemsky, 1998, Lee, I.H., 1998.
[43] Barsky, R., and J. B. DeLong, 1993.
[44] Northcraft, G., and M. Neale, 1987.
[45] See, for example, Loomes, G., and R. Sugden, 1982; Bell, D.E., 1982; Josephs, R., R.P. Larrick, C.M. Steele, and R.E. Nisbett, 1996; Ritov, I., 1996.
[46] As Charles Kindleberger once put it: "There is nothing so disturbing to one's well-being and judgment as to see a friend getting richer." (Kindleberger, C.P., 2001).
[47] See Shefrin. H., and M. Statman, 1985.
[48] Genesove, D., and C. Mayer, 2001.

price falls in the early stages of a collapse can be slow.

There is evidence too of price stickiness, with sellers comparing their selling price to the selling price of other homes nearby. It is hard to coordinate price drops if each seller does not want to be the first to cut. This, too, feeds the potentially slow onset of the unwinding from a bubble. Since there is less resistance to price rises in the bubble phase, this generates a ratchet effect.

3.4. Inflation Mistakes – in Stock Markets and Real Estate

In studies of public attitudes to inflation, low inflation is perceived as a sign of economic prosperity, and of good government[49]. For this on its own to bid up any asset price is irrational. Modigliano and Cohn[50] however suggest that markets tend to be 'depressed' when nominal rates are high even when real rates are not, due to a form of 'money illusion'[51].

3.4.1. Stock markets

In equity markets, it is argued, people fail to see the bias in measures of corporate profit in high inflation periods. Since corporations deduct from their profits the total interest paid on debt – not just the real interest – in inflationary periods, part of the interest paid is a repayment of part of the real debt. This depresses measures of corporate profit. Few investors, it is claimed, realise this and fail to make the correction.

In the 1970s and 1980s stocks were often seen as a hedge against inflation[52]. Today the opposite is commonly believed. Of course neither of these is correct reasoning.

Firstly, there is no basis in logic. Stocks are a claim on real assets. In long-run equilibrium – when stock markets and real capital have fully adjusted – the cost of capital should equal its return, and inflation should have no effect on this claim. The argument must therefore be assuming that the equity risk premium falls when inflation falls, generating higher stock prices. However, past inflation has had a major impact on assets like bonds and cash for which returns are fixed in nominal returns. In particular, *fluctuations* in inflation have caused major *fluctuations* in real returns on bonds and cash, increasing the risk of holding them. If inflation is permanently lower and more stable, then the real return on non-indexed cash and bonds will be safer. If anything, given that the risk of investing in stocks has not fallen, the equity risk premium should have risen, justifying a lower level of stock prices.

Secondly, if one looks at US and UK data for a period longer than 20 years, there is no statistical relationship between inflation and the equity risk premium. For the 1980s and 1990s there was a relationship between falling bond yields and falling dividend and earnings yields. It is often claimed that falling inflation, and thus falling nominal interest rates, by increasing the present discounted value of future profits, led to higher stock prices. However, the opposite argument sustained enthusiasm in the previous bull market (1950-1968) when inflation and interest rates were rising and there was just as accidental a correlation between rising bond yields and rising P/E multiples. Inflation was then deemed good for shares; it would increase future earnings, and share prices had to rise to reflect this. If one looks at a wider group of countries, the relationship also breaks down. The favourable evidence that lower inflation has pushed up share prices is simply the statistical fluke of data mining, akin to that used to 'prove' a link between inflation and the weather. The evidence is perhaps better interpreted as a speculative bubble pushing up stock prices, pulling down yields, and generating falling estimates of the equity risk premium.

The real value of the stock market should, therefore, be relatively immune to news of moderate inflation. Neither do studies show much of a relation between real long term growth and moderate inflation[53].

In the 1990's stock market bubble this fallacy provided a neat sales pitch. Ironically, the counter-arguments provide an equally neat excuse when stocks perform poorly.

3.4.2. Real estate

Similarly, it is argued, in high inflation periods few make the connection to the payback of real-estate debt, so when inflation is low they forget they are not paying back the debt so quickly. And for some

[49] See Shiller "Why Do People Dislike Inflation?" in Romer, C.D., and D. H. Romer (eds), 1997.
[50] Modigliano, F., and R. A. Cohn, 1979.
[51] See also Shaffr, E., P. Diamond, and A. Tversky, 1997; Ritter, J.R., and R.S. Warr, 2001; Fisher, I., 1928; Sharpe, S.A., 1999.
[52] See Shiller, R.J., p110.
[53] See Bruno, M., and W. Easterly, 1998.

reason the media and mortgage bank obsession is *always* with the nominal interest rate. It is the only rate that gets quoted in real estate and mortgage bank promotional material and media articles; when inflation is high the quoted rates are high and when inflation is low the quoted rates are low (even though the real rate might have always been the same or even higher in the low inflation period).

This form of 'money illusion' is very useful if you are trying to sell mortgages. Take the notion that house prices have risen by "300% *over* 20 years" (as trumpeted in a recent Halifax headline and dutifully, and uncritically, run in the media[54] – with emphasis added) and the statement that "residential property is a very good *long-term* investment by any standard" (which we know to be the case if you get the timing right – again, with emphasis added). On a moment's reflection, however, 200% of that 300% nominal rise is accounted for by the recent nominal doubling, and more than 100% by just the previous year's rise. Once one considers real rates, then, given the very low levels of current inflation and much higher levels of inflation in previous periods, the majority of the real house price increase took place in only the recent two years.

A huge upward bias from a bubble at the end of the data series in a low inflation period is used to enhance the apparent long-term performance over a 20 year period. The Halifax figure also ignores the collapse in the middle of the data series (in the late 1980s and early 1990s), when a million people lost their homes. And it chose a low valued year as its start point.

The Halifax story had been written by someone who had spent a career in corporate PR at a string of financial institutions. A classic symptom of a bubble is the need to promote the bubble in its latter phases by stories, that mix 'marketing' objectives with spurious 'economic' reasoning, that ignore even the most basic statistical considerations[55].

There are two added stings in the real estate money illusion tale. Firstly, if agents engage in momentum behaviour, then low nominal interest rates generate 'frenzy' (described below) as well as 'money illusion'. Secondly, given that inflation tends to wipe out nominal declines in speculative markets, this will not be possible in a low inflation environment: Any given real price fall will translate into a much greater nominal price fall than it would have done in a higher inflation period. There will be no 'money illusion' that prices have not fallen. If agents engage in momentum behaviour in the downwards direction, with that momentum based on nominal variables, then any given price fall will translate into a much greater momentum effect in a low inflation period.

The situation is illustrated nicely by those (including CSFB in its assessment of the housing market[56]) who, inadvertently, slip into money illusion reasoning by regarding it as a sign of the *inherent safety* of investing in housing that nominal house prices have not fallen in the past, even though the real prices had fallen massively – by up to 40% in the late 1980s and early 1990s. One wonders how the argument will develop when even moderate real price falls would have to translate into nominal price falls.

3.5. Transactions Costs and Housing Market 'Frenzy'

Fama[57] defines an *efficient* market as one where "deviations from the extreme version of the efficiency hypothesis are *within information and transactions costs"*. We need to understand, therefore, whether transactions costs can cause a degree of volatility that is even greater than the *efficient* level of volatility. In a world with momentum traders, it can be.

Low transaction costs and low barriers to entry are standard in many financial markets, but this fails to explain a large amount of the deviation that actually takes place in such markets. Clearly, lower transactions costs enable more day-traders to enter the market in Greenspan's view of the world, and more of these can be amateurs. However, while the expansion of online trading and out-of-hours trading might conceivably raise volatility, that it leads to *permanently* higher or lower prices is certainly not proven, though this is the suggestion of some[58].

Transactions costs are high and lumpy in the housing market: brokerage fees, buyers' and sellers' search costs, moving costs, capital gains costs (for

[54] http://news.bbc.co.uk/1/hi/business/2693411.stm.

[55] The other myth, currently popular with mortgage banks, is that of the *rapidly* collapsing bubble that never materialises – so that the bears (*none* of whom has predicted a *rapid* collapse in a year or two) are ridiculed for something they never promulgated in the first place.

[56] Credit Suisse First Boston, November 2002.

[57] Fama, E.F., 1991.

[58] Day traders may also be biased (relative to other sorts of traders) in various ways. They might, for example, be more likely to take winnings and not realise losses. See French, K. R., and R. Roll, 1986.

buy-to-lets who decide to temporarily sell out in an overvalued market), tax on interest earned from holding cash rather than property while waiting for correction, etc. This reinforces the illiquidity of the market. Empirical studies further find that lumpy transaction costs lead to important nonlinearities in price dynamics. The large fixed element of transactions costs influences the choice between buying and renting, and whether to trade up. In periods of greater appreciation of house prices, more households are pulled over the transactions cost hurdle to engage in momentum trade, in the expectation of capital gain. At these times of heightened activity – of 'frenzy' – increased demand feeds *back* into higher prices and further demand.

This is also consistent with the behavioural/arbitrage failure framework. In stable periods both consumers and banks are more likely to behave in ways that arbitrage the market. Many speculative agents keep out and the market is less likely to deviate from fundamentals for long periods of time, and arbitrageurs – both banks and house buyers – are less likely to be 'punished' for doing their job. In unstable, 'frenzy', periods agents stop arbitraging the market since it is too dangerous – prices may deviate even further from fundamentals as many speculative agents enter, and arbitrageurs are much more likely to be 'punished' for trying to correct the market.

Given the phasing out of mortgage tax relief over the 1990s – which should in theory have helped to cool matters by giving less benefit to owners than to renters – recent 'frenzy' must have been particularly severe. Low nominal rates have fed agents' ability to 'go with the frenzy'.

The number of houses on estate agents' books is a function of the 'frenzy' effect. In 'frenzy' periods the flow off estate agents' books is greater than the flow onto them. In bust periods the resistance to price cuts means that the flow off the books falls relative to the flow on. Casually asserting that stock on the books is a measure of fundamentals supply and demand conditions is simply wrong[59]. The 'disposition effect', price stickiness and 'frenzy' effect, together mean that housing on estate agents' books and trading volume are good leading indicators of future price changes[60].

[59] See Credit Suisse First Boston, 2003, Figure 28.
[60] Another good leading indicator would be credit card arrears, which have been rising in the UK over the past 2-3 years.

There is plenty of econometric evidence[61] for 'frenzy' behaviour in housing markets, though most of the mortgage bank analysts use models based on efficient markets reasoning that ignores the possibility of such effects. Muellbauer and Murphy comment in their study of the UK housing market that "Without such a nonlinearity or dummies for the spikes in the data, the equation standard error more than doubles". They find that by taking the frenzy component and downside risk term out, the shift in the income growth component and the 1980s real interest rate effect become "quite insignificant". In conclusion they comment: *"These results suggest that the omission of a non-linear 'frenzy' effect is a major specification error. The omission worsens the fit and fails to support the predictions of economic theory regarding the consequences of financial liberalisation, which are supported by a better specified model including a 'frenzy' effect."*

This also explains why zero house price growth can be serious news for a market that has recently experienced 'frenzy'. Price rises are no longer high enough to draw many over the threshold and the market grinds to a halt, before declining.

4. HOUSE BUYERS: SURVEY EVIDENCE

So how do house buyers actually 'think'? In ways likely to make the market more or less easy to arbitrage? The nearest thing we have to a controlled laboratory experiment was performed by Case and Shiller in the US on four cities facing fairly similar macroeconomic fundamentals[62]: two boom cities, a post-boom city and a control city. They used identical questionnaires of actual home buyers[63].

The survey evidence makes interesting reading alongside recent reviews of the UK housing market – including the 'Miles Review'[64] – that find that house buyers hold overly-optimistic assessments of future levels of interest rates, are under-influenced by the risks of future changes in the interest charge,

[61] See: Muellbauer, J., and A. Murphy, 1997; Hendry, D.F., 1984; Quigley, J.M., 1999; Case, B., and J.M. Quigley, 1991; and Hall, R.E., 1978.
[62] Case, K.E., and R. J. Shiller, 1988 (also found in Shiller, R.J., 1989, p403-430). Boom cities: Anaheim and California. Post boom city: Boston. Control city (where no price changes in past five years): Milwaukee.
[63] Hence they are likely to be non-typical of those *potential* buyers in the general population, but who did not buy.
[64] H.M. Treasury, December 2003.

are irrationally influenced by the current-period cost of a loan and the current-period nominal interest rate offers on mortgage deals, and generally have no sense of where interest rates are going (The Miles Review describes people as openly 'laughing', according to some studies, when asked to predict the cost of loans by forming assessments of future interest rates). This section reviews evidence that house buyers are no more rational and long-sighted in their assessment of housing asset prices and the risks of capital loss, as they are in their assessments of interest rates and the ultimate cost of housing assets.

4.1. What Acted as a Triggering Factor?

● There was no exogenous trigger for the housing price booms.
● In all four cities interest rate changes were cited as a major factor. However, interest rates were virtually identical in all cases; the same interest rates got the credit for the boom in California and the blame for the stagnation in Boston. Price changes could not have been driven in *all* four cities by the same interest rates.

4.2. Knowledge of Fundamentals

● There was evidence of strong investment motivation and of higher price expectations in the boom cities than in the control city, but these were "*expectations that they could not show any ability to justify...Since most people expressed a strong investment motive, one would assume significant knowledge of underlying market fundamentals. The efficient markets hypothesis assumes that asset buyers make rational decisions based on all available information and based on a consistent model of underlying market forces...The survey reveals little real knowledge of or, agreement about, the underlying causes of price movements. Rather than citing any concrete evidence, people retreat into clichés*."
●The second most cited feature was a 'strong local economy.' Yet "*None...cited any specific evidence of such strength or any detail about its character... people look to observed price movements to form their expectations and then look around for a logic to explain and reinforce their beliefs*."
● Many – in the boom city and in the post boom city, but not in the control group – cited 'not enough land'. But this is not news and cannot explain a sudden boom.

As the authors conclude: "*An especially striking feature.... not a single respondent referred to explicit quantitative evidence relevant to future supply or demand for housing...one would expect some to volunteer such evidence if it figured prominently in their views*."

4.3. Price Feedback

● The evidence – and that of equity market studies – leads to the conclusion that the feedback of price changes on price dynamics is very important.
● In equity markets the feedback is very rapid – a downward price movement attracts attention leading to further price declines within a day or so.
● In real estate, price increases attract attention and contribute to increasing prices over periods of a few years.
● Asked whether price increases influenced their decision to buy, those responding 'yes' were:
Boom cities: 90%
Control city: 84.8%
Post-boom city: 77.8%
● 25% overall expressed a fear of never being able to get into the market.
● 65% in the boom market expressed this fear.

House buyers seem to form expectations on the basis of past price movements rather than any knowledge of fundamentals. In conclusion, they act as destabilising speculators.

4.4. Attitudes to Risk

The willingness to pay for an asset is related to the level of perceived risk.
● "*Very few of the home buyers in any of the four cities thought that the housing market involved a great deal of risk.....even where openly speculating about a crash*". The degree of risk perceived was lowest in the boom markets.
● *"Rising prices seem to dampen fears, and that may well fuel the boom*." Practically all buyers in the two boom markets and the vast majority in the post-boom and control groups believed that prices were bound to increase, reflecting the popular myth that "*one cannot lose in this market; houses are always a safe investment, so long as one holds out long enough*." It is a myth that, as we have seen, is happily promoted by the mortgage companies and a willing media, in stories like that of the 300% price

increase described above. In Part One it was shown that this reasoning is plainly wrong, that timing matters, and that lifetime wealth can be dramatically lower when buying at a price peak.

There is the same curious attitude towards risk in housing markets as can be found in overvalued stock markets. A recent period of good performance leads investors to have a very high tolerance for risk, and to accept relatively low expected returns for holding stocks[65], and hence equity valuations rise. Unfortunately, this contrasts with survey evidence on investor expectations in that they expect high returns on stocks in the future, not the low returns that they supposedly accept because they are especially risk-tolerant[66]. The two things are totally irreconcilable – one of them *has* to give. As Case and Shiller put it in the context of housing markets: "*Prices are high because investors expect them to go even higher not because they are ready for prices to go down*."

4.5. 'Self-Awareness' of Psychological Influences

- In stock market surveys people are much more aware of possible investor psychology explanations for price *rises*, whereas "*most participants in housing markets do not attribute market events to the psychology of other investor...Perhaps we should conclude that social psychology is an important factor in transmission of [housing] booms, but that individuals' perceptions of the psychology of others are less so*."
- "*Perhaps popular [housing] boom theories emphasize fundamentals as causes of upward movements ... while crashes are thought to be due to panic*." (not surprisingly, the highest percent who did attribute market events to psychology, 18%, was in the post-boom city). This may go some way to explaining why those who urge caution today are labelled 'doom-mongers' in the press. Psychological explanations are, it seems, only to be tolerated in the downwards direction and only after the downward trajectory has begun.

4.6. After the Survey

Two years after the survey, a major bust started in the boom cities, wiping 20+% off prices – this being the typical down-payment of first-time home buyers in those cities, 98% of whom had been convinced prices would rise and 63% of whom had said they faced little or no risk.

5. EFFICIENT MARKETS, BUBBLES, AND HOUSING MARKET TESTS

5.1. Introduction

The position taken here flies in the face of the 'rational expectations' school of thought, embodied in the 'efficient markets' view of asset prices, that asserts that financial prices always reflect all information (defined at various levels of stricture), that prices are always correct, that current price is an unbiased predictor of the future value of the asset if information arrives randomly[67]. Following Fama[68], and doing the discrete case, let the expected return on an asset between t and t+1 be $r = E_t[r_{t+1}] = E_t[P_{t+1}-P_t + d_{t+1})/P_t]$, where E is the expectations operator, P is the per unit price of the asset, and d is the dividend or rent. If $E_t[r_{t+1}]-\rho = 0$ is a fair game[69], where ρ is a constant term, then, by substitution, $P_t = E_t[(P_{t+1}+d_{t+1})]/(1+\rho)$.

Solving for n periods recursively, using iterative expectations (something that economists easily slip in without thinking too much what it actually implies about those, such as house buyers, doing it):

$$P_t = \sum_{t=0}^{n} \frac{E_t[d_{t+1}]}{(1+\rho)^n} + \frac{E_t[P_{t+n}]}{(1+\rho)^n} = P_t^* + B_t$$

If the second term converges to zero for large enough n, then the equation gives the long-run equilibrium price P_t^*, and the value of the asset is the sum of expected future dividends or rents. If the second term does not converge to zero, then the asset price is said to include a bubble term, B_t. Sharpe et al.[70] defines a perfectly efficient market as "one in which every security's price equals its investment

[65] See Campbell, J.Y., and J. Cochrane, 1999.
[66] See Durell, A. 1999.

[67] In explaining the way many cling to the notion of 'efficient markets', Andrew Lo, an MIT financial economist suggests: "A peculiar psychological disorder known as 'physics envy'...We would love to have three laws that explain 99% of economic behaviour; instead, we have about 99 laws that explain maybe 3% of economic behaviour. Nevertheless, we like to talk as if we are dealing with physical phenomena."
[68] Fama, E.F., 1970.
[69] Stochastic process x_t is considered a fair game if $E_t[x_{t+1}]=0$. In the case here, $E_t[x_{t+1}]=E_t[r_{t+1}]-r_t$.
[70] Sharpe, W.F., G.L. Alexander and J.V. Bailey, 1995.

value at all times". The efficient markets hypothesis makes certain presumptions about investors:

1) Either all investors are rational and this is 'common knowledge'[71], or;
2) To the extent that some are not rational, their trades are random and cancel each other out so as not to affect price, or;
3) To the extent that some are not fully rational and their trades are not random but are serially correlated, rational arbitrageurs eliminate their influence on price. Market forces work to eliminate the wealth of the irrational types, and they die out in the population.

5.2. Tests of Efficiency

In a strongly 'efficient' market, financial asset price changes should be unpredictable since they only respond to new information – which by definition is itself unpredictable; prices changes should follow a 'random walk'[72]. Returns would be *unforecastability* – where the mathematical expectation of returns is based on all publicly available information at time t. Efficiency tests then essentially become tests of forecastability of price changes.

Unfortunately, the power of statistical tests in distinguishing the efficient markets hypothesis from the alternatives is weak. The null hypothesis of market efficiency is not well defined. This is the 'joint hypothesis' problem: Market efficiency is always tested jointly with some model of equilibrium – an asset pricing model. Whatever the result, it can always be claimed that the asset pricing model was misspecified[73]. In particular, it can always be argued that a higher return could simply be compensation for accepting higher risk. To make things worse, we have no agreement on how to measure risk either. A behaviourist would argue that most traditional notions of risk – that it is exogenous and can be read from historical data – are elegant but wrong anyway, that it is therefore wrong to use the term 'risk premium' in the same place as 'mean return in excess of the risk-free rate'. A behaviourist would further argue that the relevant asset pricing theory – some sort of dynamic psychology-based asset-pricing theory – doesn't exist yet anyway.

Furthermore, all models of asset pricing used in tests require *current expectations* concerning future paths of all variables in the pricing formula – no mean feat. And no model is any good at dealing with non-linear feedback loops (even chaos) since this makes the tests – based on linear models – impossible to use to prove lack of a bubble (never mind the fact that agents are supposed to form expectations over the future paths of such systems)[74]. We never get definitive answers.

Nevertheless, many of the tests do not show that returns are not forecastable – just 'not very forecastable', something that can easily be created by psychological reasoning.

5.3. Specific Problems in Testing Housing Market Efficiency

Many of the problems when testing for real estate bubbles are not much different from testing for equity price bubbles – and probably much worse. We do not have many long or high-quality time series on prices or rents (the 'dividends' for real estate) for owner-occupied dwellings. The implicit rent of owner occupiers is never directly observed – there is no market to derive an exact valuation. We end up using proxies from rental indexes in government statistics. However, if the measure is based on properties different from those that are owner-occupied – which it often is – the tests are biased. House price series are hard to construct, since real estate is not a standard commodity (size, quality, depreciation, expenditure on improvements, etc.). We really would like to use repeat sales on the same properties where the kind and quality is known. We are also interested in the after-tax returns – but agents vary in tax liability, and after-tax returns are pretty impossible to measure. And we need decades of data to do analysis of volatility. The only consolation is that while there may be little

[71] Several recent interesting models of bubbles have all agents rational, but this not common knowledge, with the rest of the framework essentially classical. See Abreu, D. and Brunnermeier, M. K. 2003.

[72] This random walk notion may even hold in a market that is not fully efficient – if the aggregate demand of ordinary investors is not unlike a random walk anyway, say because of unpredictable fashions.

[73] To give some idea of how this bites: In testing the theory of 17th century tulipmania, Peter Garber concludes that we cannot clearly declare it a case of 'irrational' pricing; gyrations in price could have been based on information revelations at the time about which we know relatively little now, and we may misuse our benefit of hindsight. Besides, the large prices contain an option element at the very least. Garber concludes however that he is "hard pressed to find any market fundamentals explanation" (Garber, P. M., 2000, quoted from Garber, P.M., 1989). As John H. Cochrane puts it (in a review of "Famous First Bubbles"): "Garber suggests fundamental explanations, but he does not nail the case shut. If it were easy, the events would not have passed into legend."

[74] For a review of this literature see: Boldrin, M., and M. Woodford, 1990; Arthur, W.B., S. Durlauf, and D. Lane (eds.), 1997, and Sornette, D., 2003. For an experimental setting, see Smith, V.L., G.L. Suchanek, and A.W. Williams, 1988.

chance of proving definitively that a market is not efficient, this conclusion may not apply in periods of extraordinary price rises. And these are usually the periods we are most worried about anyway.

Incidentally the same problems that economists have, will equally apply to ordinary investors in such markets. Yet we presume that these investors think about these issues in order to work out when and how to invest efficiently!

In conclusion – it probably is bit of a red-herring presuming that we can *rely* on tests of housing market efficiency for definitive answers. Like a good doctor dealing with a difficult patient, we might want to treat tests as one of our possible diagnostic tools, and look at other analysis, such as in Part One, and at the logical reasons for why markets may find it hard to be efficient due to arbitrage failure, such as in earlier sections of Part Two.

As Shleifer[75] nicely puts it: "*The bottom line...is that theory by itself does not inevitably lead a researcher to a presumption of market efficiency. At the very least, theory leaves a researcher with an open mine on the crucial issues....market efficiency only emerges as an extreme special case, unlikely to hold under plausible assumptions.*"

5.4. Does Efficiency Matter Anyway?

Since Fama[76] defines an *efficient* market as one where "deviations from the extreme version of the efficiency hypothesis are *within information and transactions costs*", this leads to several conclusions:

i) A market can be 'efficient' and still produce very volatile prices – it's just that it is impossible to exploit mispricings. Regarding housing policy, even if we find the market to be efficient 'given information and transactions costs', the 'efficient' level of volatility can still be damaging to both individuals and to resource allocation in the aggregate. And if the information or transactions costs are somehow controllable, there is still room for efficiency improvement by modifying these underlying conditions (including, for example, the treatment of capital gains and interest on withdrawn capital for those who wish to temporarily move out, use of stamp duty, use of leverage, etc.)

ii) To show that a market is not efficient we need to be able to find an investment strategy that achieves higher returns without higher risk. But this means that financial markets can go through periods (sometimes years) when mispricing persists, mainly because such profit opportunities cannot be exploited – in particular because of the uncertainty about when the mispricing will end.

That 'smart' money finds it extremely hard to correct these anomalies does not make the market 'efficient' in some meta-sense of that word.

5.5. Housing Market Tests

There is some literature testing the efficiency of real estate markets, though much less than for, say, equity markets. Housing market efficiency should result in housing prices anticipating optimally the stream of real returns (including housing services) that housing will pay *in the future*. Inefficiency will show up in the serial correlation of house price changes – the result of expectations being set backwards rather than forwards. Another way to think of this is that future house price movements can be predicted from information available now – namely deviations from the long-run trend and recent price increases. The general conclusion is that housing markets are not efficient.

A simple test is to treat housing just as any other asset (something that ultimately gives utility via consumption, including housing services) and to compare the change in the theoretical price of housing with the actual price. The theoretical optimal price (P^*) equals the sum of the discounted future income that it will generate. Here, R is the rent level, g the expected growth rate of rents, r the mortgage interest rate, τ the risk premium. Those who own are treated as renting from themselves – which is how their ownership is treated in the National Accounts (Blue Book) under 'imputed rent'[77].

$$P^* = \sum_{t=1}^{\infty} R\left(\frac{1+g}{1+r+\tau}\right)^t \approx \frac{R}{r-g+\tau}$$

(so long as $r-g+\tau>0$)

[75] Schleifer, A., 2000, p16.
[76] Fama E.F., 1991.

[77] Or, since the alternative to owning is renting, the opportunity cost of owning (via payment of interest) is compared to the alternative of renting. So if the typical rent is falling as house prices are rising, then buying housing and renting it to yourself is getting more expensive than letting someone else buy it and you rent it from them. There are, however, some weighty problems in dealing with the tax advantage of housing and the different tax treatments of renting.

Hence $\frac{P}{P*} = \left(\frac{P}{R}\right)(r - g + \tau)$

If $\frac{P}{P*}$ falls, real estate prices fall below their initial point (not necessarily the optimal reference point itself). If $\frac{P}{P*}$ rises significantly (exceeding 1 with caveats) this is described as a 'bubble'.

To use this to work out the degree of overvaluation of a property market we need to know some moment at which the market was actually in equilibrium.

5.6. Bubble Tests, the US, Hong Kong, and the UK

Another popular method used for checking for 'bubbles' in property markets, and applied in various countries, is the methodology of Abraham and Hendershott[78]. The methodology is also useful for locating the moment at which a property market is in fundamentals equilibrium. The nomenclature here is identical to that of Abraham and Hendershott.

The equation for property prices contains a fundamentals long-run equilibrium term (based on the efficient markets hypothesis, using a standard asset pricing model), $drppi_t*$, and an error term:
$drppi_t = drppi_t* + u_t$

Concentrating on the fundamentals term for a moment. The growth rate of the fundamentals term is modelled as a function of the growth rate of rental prices, real interest rate, real construction costs and real effective exchange rate, real GDP, real GDP per capita, nominal wage, real wage, population, and various supply factors (with all prices, rent, etc. deflated by the CPI). All variables (except interest rates) are in logs, so that rppi = log real property price index, RINT = real interest rate:

$$drppi_t* = a_0 + a_1 RINT_t + a_2 drrisa_t + a_3 dpcrcgdp_t + ... \\ ... + \text{lagged variables}$$

The error term is further specified to capture the dynamic adjustment. The term is the sum of a bubble 'builder' (expected future appreciation), a bubble 'burster' (the possibility of a price drop if price *exceeds* the fundamental price by a certain limit) and a random variable:

$u_t = \lambda_0 + \lambda_1 drppi_{t-1} + \lambda_2 (rppi_{t-1}* - rppi_{t-1}) + \varepsilon_t$

Something more technical:
This analysis of course requires some estimate of the parameter rppi*, which needs also to be consistent with drppi* and the estimates of parameters a_i. This is done as follows (and is worth explaining since it indicates a method for working back to the moment when the UK property market was last in fundamentals equilibrium):
i) Estimate without λ_2;
ii) Construct a first-pass estimate of rppi* by cumulating the drppi* over time using the parameter estimates derived from i);
iii) Calibrate (not always a sound idea) the rppi* series on the assumption that actual property prices were, at some particular point in time, in equilibrium;
iv) Re-estimate drppi, this time including the λ_2;
v) Keep repeating steps i) to iv) until the a_i estimates stabilise, at which point the drppi* and rppi* will also have stabilised. This also pins down the year when the market was approximately in fundamental equilibrium. In the UK this would be about 1994. In the original paper, in Hong Kong it was about 1990.

If $\lambda_1 > 0$, the lagged growth of real property prices acts in a way to perpetuate the growth of real property prices, i.e. a bubble. $\lambda_2 > 0$ captures the notion that the bubble bursts when the actual price level $\lambda_1 drppi_{t-1}$ exceeds the equilibrium price level $rppi_{t-1}*$.

Putting all this together we get real property price growth:

$$drppi_t* = (a_0 + \lambda_0) + a_1 RINT_t + a_2 drrisa_t + a_3 dpcrcgdp_t + ... \\ ... + \lambda_1 drppi_{t-1} + \lambda_2 (rppi_{t-1}* - rppi_{t-1}) + \varepsilon_t$$

These studies often start with the nominal interest rate included as a variable, but find that it drops out as insignificant in the long run. This is a rather striking revelation. It backs up the claim made and analysed in Part One, and found in many studies, that ultimately – and contrary to much of the mortgage bank emphasis and media coverage – it is *real* interest rates that matter.

[78] Abraham, J.M., and P.H. Henderschott, 1996. Hall, R.E., 1978, runs a stochastic switching regime model in real house prices. Booms in house prices are associated with an unstable regime. The probability of the system staying in the regime fall as deviation from equilibrium increases.

There have been interesting applications of this framework to, in particular, the US and Hong Kong housing markets, with lessons for the UK market[79]. In both Honk Kong and US metropolitan cities[80] the data pointed to tendencies towards bubbles – both the estimated bubble builder and the bubble burster parameters were significant and comparable. Specifically, the coefficient on the one-period lag in ARIMA(1,1,0) was found to be large, positive and significant: in other words *appreciations tend to be followed by further appreciations***.** Over the period covered, in US metropolitan cities a 1% increase in real property prices in a quarter tended to be followed by a 0.6% increase in the next quarter. In Honk Kong, the absence of volume changes in the number of apartments and of the real construction cost index as explanatory variables in the estimated equations was "striking" and confirmed the relative importance of demand side factors in explaining short-term property price movements. In the US metropolitan cities, changes in market fundamentals and adjustment dynamics (including the bubble builder and bubble burster components) together explained about 60% of the variation in price movements and, separately, about 40%.

Bubble builder parameter:
Hong Kong: 0.3
US metropolitan cities: 0.5
US remainder: 0.2

Bubble burster parameter:
Hong Kong: 0.05
US metropolitan cities: 0.1
US remainder: 0

On the assumption that Honk Kong prices were broadly at equilibrium in the early 90s, the upswing peaked at about 40% to 45% above fundamentals level: "This estimate is broadly consistent with market perceptions at the time." In 1998, property prices declined by an average of 40%.

As the authors comment, the estimated models do not reject the null that the market may be subject to speculative bubbles.

These results again suggest that fixed supply has a big impact on the probability of getting a bubble. Those regions with more flexible supply were much less prone to bubbles, even largely immune to them. Supply constraints in the UK housing market, rather than being a reassurance to us that 'prices must be right because supply is tight', are instead a warning to us that these are just the sort of market scenarios in which bubble-type outcomes are generated, with price able to 'take off' and generate momentum and self-feeding 'frenzy' effects.

5.7. Further US Tests

A test performed on 39,210 repeat sales on houses that had not apparently changed (in Atlanta, Chicago, Dallas, and San Francisco)[81], found – like many other studies – that real house price changes were forecastable; a change in real citywide housing prices in a given year tended to predict a change in the same direction the following year and about quarter to half as large. Furthermore, predictable changes in interest rates did not tend to be incorporated into prices.

Most studies concentrate on macroeconomic variables – but, as Shiller and Case observe, the most dramatic US examples occurred in well-defined geographical areas whilst prices were not rising elsewhere: *"Macro variables offer only a partial explanation"* as they put it.

5.8. The UK Housing Market

The recent IMF model[82] of the UK housing market (Bank of England data, 72(Q4)to 2001(Q3)) employed a simple error-correction model with real house prices (all components adjusted by RPI) adjusting to long-run equilibrium while responding to short-run movements in house prices in previous quarters, to interest rates, and to real income per household. The entire model is demand driven in light of the relative fixity of supply. The IMF use the framework to forecast from 2001(Q4) to 2002(Q2) and compare to that predicted by the model. They come up with the following key results:

i) Earnings and real interest rates (again, note, *not* nominal interest rates) are the key determinants of UK house prices;

ii) Changes in real house prices exhibit large persistence which can contribute to price overshoots;

[79] The author has not seen it applied to the UK housing market, but it should be perfectly possible.
[80] Abraham, J.M., and P.H. Henderschott, 1996, covers 30 US Metropolitan cities for the period 1977-1992.
[81] Case, K.E, and R.J. Shiller, 1989.
[82] IMF 2003.

iii) The actual price increases were way off in the second quarter of 2002, by 26%, even allowing for short-run adjustments; house prices continued on a strong upward trend even as the equilibrium prices flattened out**.** Actual price changes lie more than one standard error outside of the prediction of the model: "*the magnitude of recent price increases over their equilibrium value cannot be explained by short-term developments in real income and interest rates.*" According to the IMF paper, things were not so seriously askew even as recently as early 2000 – though, as the authors point out, even in this early period there could be a bubble – it's just that it might be undetected. And in the past 18 months prices have since got even further away from the predicted fundamentals value. The model suggests *at least* 30% real overvaluation as of start 2004;

iv) Both the housing market models of Capital Economics and the IMF have the actual market price equalling the predicted price in about 1994, before falling beneath the predicted price and crossing back over the predicted price some time in 2000. Such a trajectory, imparting as it does extra momentum possibilities from the mid-1990s, suggests even more ability than normal for an overshoot today. The fact that the Bank of England in late 2003 expressed surprise that price increases had not settled down towards their preferred path of zero growth, and the fact that the mortgage banks had also been caught out by the levels of price growth (and that nobody with a fundamentals driven model had forecast rates of price increase anywhere near those taking place), is perhaps indicative of just how strong momentum behaviour has been in the UK housing market since the mid 1990s.

Groupe Caisse des Dépôts[83], using a slightly different methodology, also find that UK house prices have risen much more sharply than rents (which are stagnating, if not falling) and they come up with similar degrees of overvaluation and a strong suggestion of a bubble. In contrast, using the same methodology, they find that for Spain and France, the fall in interest rates in the 1990's and the rise in rental growth could explain the sharp rise in real-estate prices.

As Muellbauer and Murphy comment, in the context of the UK housing market, "The strong evidence that both house prices and relative rates of return in housing are forecastable is consistent with the hypothesis that housing markets are far from efficient."

6. CONCLUSION

Part One concluded that fundamental factors were incapable of explaining all of the recent surge in UK house prices. Part Two has sort to explore the ways in which buyers themselves may drive markets away from fundamentals. Of course, it is not the complete picture since they cannot do this without the acquiescence of financial players, in particular the large mortgage banks. Even if house buyers find it extremely difficult to arbitrage long-lasting price distortions, it is just possible that financial institutions can. It turns out, however, that there is arbitrage failure at the financial institutions level too. We turn to this in Part Three.

By the start of 2004 the leading mortgage banks seem to have concluded that the market is not being driven by fundamentals either. When the Halifax predicts that most of the house price growth in 2004 is expected during the first half of the year "as the momentum already built into the housing market carries over into early 2004", and the Nationwide reports that "The momentum that the market is carrying...suggests that prices will rise by nine per cent in 2004," you know that they too have stopped trying to model house prices on the basis of fundamentals.

The key to preventing this situation from arising in the future is the creation of financial instruments and institutional features that better enable efficiency-enhancing arbitrage. Hopefully, Part Two will have contributed some thoughts to the ongoing debate about how this might be achieved.

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[83] Groupe Caisse des Dépôts, December 2002.

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