# Housing markets and the economy: the assessment

## John Muellbauer* and Anthony Murphy**

**Abstract**   Housing markets have multiple interactions with the rest of the economy and these are surveyed in this paper. The drivers of house prices include income, the housing stock, demography, credit availability, interest rates, and lagged appreciation, the latter a potential mechanism for overshooting. There is rather less agreement on the determinants of new construction, though planning constraints are widely seen as a major issue and one of the causes of the UK housing affordability problem. The paper argues that housing collateral and downpayment constraints are the key to understanding the role of house-price variations in explaining medium-term consumption fluctuations. Institutional variations between countries and over time account for major differences in linkages between house prices and economic activity. This illuminates debates about how monetary and other policy should react to house-price variations. The paper also discusses the role of housing markets in explaining regional migration and location decisions, intergenerational inequality, and restricting access of the less affluent to public goods, such as good schools, which are capitalized in local house prices.

**Key words**:  house prices, consumption, monetary policy, credit conditions, institutional change

**JEL classification**:  E210, E520, R210, R310

## I.   Introduction

Over the years, institutional changes in US housing and mortgage markets have significantly influenced both the transmission of monetary policy and the economy's cyclical dynamics. As our system of housing finance continues to evolve, understanding these linkages not only provides useful insights into the past but also holds the promise of helping us better cope with the implications of future developments. . . . Institutional factors can matter quite a bit in determining the influence of monetary policy on housing and the role of housing in the business cycle. Certainly, recent developments have added yet further evidence in support of that proposition. The interaction of housing,

*Nuffield College, Oxford, e-mail: john.muellbauer@nuffield.ox.ac.uk

**Hertford College, Oxford, e-mail: anthony.murphy@hertford.ox.ac.uk

housing finance, and economic activity has for years been of central importance for understanding the behavior of the economy, and it will continue to be central to our thinking as we try to anticipate economic and financial developments. (Ben Bernanke, Jackson Hole Symposium, 31 August 2007)

The declines in US house building, in US house prices, and in housing turnover have had substantial effects on economic activity. They have been exacerbated by the US sub-prime lending crisis. This, in turn, has had remarkably disruptive effects on global financial systems, as bad loans, securitized and sold off in tranches of different leverage and riskiness, have shown up in surprising places and at hard-to-quantify levels of losses. In turn, this has revealed serious errors in pricing risks more generally and in the information provided by credit-rating agencies. Behind these, in turn, lie classic problems of asymmetric information, managing maturity matches of liabilities and assets, and of aligning incentive structures for bankers and other originators of financial products to avoid negative outcomes for the economy. It has become clear that the practice of lending long and funding short has become over-extended in recent years and that liquidity cover held by parts of the banking system has been inadequate. The US sub-prime crisis has ballooned beyond the usually cited connections between housing and the macroeconomy by triggering a seizing up of large segments of credit markets and a widening of credit spreads.

This has refocused attention on the role of credit both in helping to drive house prices and in influencing consumption and residential construction, which serve as channels transmitting house-price fluctuations to economic activity. The question of how far house prices may fall has thus become a key issue for policy-makers, households, and other investors. This raises the question of whether house prices have been inflated to 'bubble' levels, i.e. substantially above fundamentals. Section II of the paper discusses UK evidence and preliminary US evidence on the determination of house prices.

Section III turns to the supply side. In recent years, the effects of zoning or land-use planning restrictions on construction volumes have received increased attention. Nevertheless, the econometric methodologies used for modelling supply and estimates of supply elasticities are remarkably diverse. There can be little doubt that, in the last decade and a half, private house-building in the UK has shown almost no response to house-price signals. Given strong demand growth, the resulting housing affordability problem has received increasing attention, as the four Barker reports and the contributions of Kate Barker and Paul Cheshire in this issue testify (Barker, 2008; Cheshire, 2008). Section IV addresses these issues and discusses some of the consequences, for example, for social exclusion and intergenerational inequality of the dramatic rise in house prices.

We have researched the consumption channel intensively over the years since Muellbauer and Murphy (1989), with the latest versions of this research in Aron *et al*. (2007) and Muellbauer (2007), summarized in section V. This research suggests that in the UK and in the USA what is often called a housing wealth effect is a misnomer: it should really be called the housing collateral effect. Classical life-cycle theory suggests that the 'housing wealth effect' on aggregate consumption (including imputed housing) is small or negative. The credit channel is crucial to explain a positive impact of house prices on consumption. Poorly developed credit markets, such as Italy's, imply aggregate consumption falls when house prices rise. Future first-time buyers (and renters) save more for a deposit (or higher future rents), and home-owners have limited access to home equity loans.

However, deep mortgage markets imply the opposite. A lower ratio of down-payments to value applies, so future first-time buyers will save little and not respond much to higher house

prices. Home-owners have easy access to home equity loans, which boosts spending when house prices rise. This means that heterogeneity across countries is important—Italy, Japan, China, and India are quite different from Anglo economies in the role of housing. Section V discusses these issues and summarizes recent evidence on the size of the housing collateral effect and how it may have shifted with credit-market liberalization.

The significance of credit markets and the potential for equity withdrawal in the USA is illustrated in the contribution in this issue by Alan Greenspan and James Kennedy (2008), which builds on their earlier work. They refine estimates of equity withdrawal and account for the multiple channels by which equity withdrawal could translate into spending and other decisions through a careful distillation of surveys, flow of funds and other data sets. The fact that the Chairman of the Federal Reserve spent many weeks of his personal time over a period of years poring over and refining these spreadsheets illustrates not only his legendary reputation for appreciating data, but also his desire to understand the processes behind one of the most significant parts of the monetary transmission mechanism.

Leamer (2007) argues that volume changes in house building in the USA have had substantial effects on activity: he claims that eight out of ten US post-war recessions were preceded by substantial problems in housing and consumer durables.[1] Construction has long been known to be very important in the transmission from interest rates to economic activity. He is very critical of the Federal Reserve for keeping interest rates so low for too long in the aftermath of the collapse in 2001 of the 'bubble' in technology shares and the events of 9/11, despite the Chairman's personal concern with equity withdrawal. Problems in the construction sector have not been confined to the USA. In 2006, Spain started around five and a half times as many dwelling units as the UK per head of population, while the Irish Republic started more than six and a half times as many. In 2005, the USA started about twice as many per head as the UK. In these countries, house building is quite responsive to house prices. The collapse of the housing and commercial property booms in these countries will therefore have larger effects on economic activity than in the UK. This and other issues for macroeconomic policy addressed by Charles Goodhart and Boris Hoffman (2008, this issue) and Simon Price (2008, this issue) are discussed in section VI.

Housing, location, and demographic choices are, of course, intimately connected. So it is no surprise that housing markets are crucial for understanding regional evolutions and regional differentials in economic activity and living standards. In our work for the UK Department of Communities and Local Government's housing affordability study, we examined the determinants of regional migration within the UK. As summarized in section VII, in addition to the effects of relatively high wages as an attractor and relatively high housing costs as a deterrent of migrants to a region, one of our new findings concerns the importance of expectations of house-price appreciation in, at least temporarily, overcoming the deterrent effects of relatively high house prices on potential migrants. But these are not the only effects of house prices on labour-market and other choices made by households. Thus, Geoffrey Meen and Mark Andrew (2008, this issue) estimate the effects of housing market conditions on household formation and tenure choice.

Research in spatial or urban economics, argue Tim Leunig and Henry Overman (2008, this issue), provides theoretical justification and empirical evidence for two propositions. First, in terms of living standards, there exists an optimal city size which changes over time. Second, again in terms of living standards, there is an optimal location for cities which, once more,

---

[1] The exceptions were the 2001 recession caused by the internet bubble collapse, and the 1953 recession after the end of the Korean war. The longer history of such fluctuations is discussed by Abramovitz (1964).

changes over time. In practice, if our cities are larger or smaller than the optimum, or in the wrong place, productivity, employment, and wages will be lower than they could be. The UK's land-use planning system is meant to correct for market failures which arise from the many externalities, for example those resulting from congestion and environmental degradation, present in land markets. However, most economists will agree with Leunig and Overman that the planning system has resulted in a sub-optimal spatial pattern of development. Their broad-brush historical analysis of cost trends and economies of agglomeration in driving up the optimal city size raises many interesting questions. One of them concerns the role of economies of agglomeration as against rising inequality of wages and wealth and sorting and selection in explaining differences in living standards and house or land prices at different locations.

Stephen Gibbons and Stephen Machin (2008, this issue) address a closely related question: to what extent are the benefits from public goods, such as access from particular locations to good schools, transport links, and low crime, capitalized in house prices at those locations? Since the benefits of public goods are hard to value, potentially, the answers should guide policy concerning the provision of such public goods at particular locations. More generally, the research highlights the role the housing market plays in translating the increasing inequality of income and wealth into increasing inequality of access to publicly provided services and other non-market benefits.

The capitalization of public goods and other public investments in house prices and their role in perpetuating inequality appear to offer a prima-facie case for property or land taxes based on current market values, which also have benefits for macroeconomic stability. However, governments have been most reluctant to embrace such taxes. The political economy of these and other policy choices faced by governments concerning housing and credit market are discussed in section VIII, which concludes.

## II.   What drives house prices?

As David Miles and Vladimir Pillonca (2008, this issue) observe, the international house-price boom in recent years has been on an unprecedented scale, though absent in a few countries, notably Japan and Germany. Many observers including the Bank for International Settlements, the International Monetary Fund (IMF), and the Organization for Economic Cooperation and Development (OECD) have raised concerns about prices overshooting fundamentals—exhibiting 'bubbles'—and the dangers of the subsequent corrections. Shiller (2007) is among those arguing that psychological factors have driven US and other house prices to greatly overvalued levels, with falls of as much as 50 per cent in prospect. Naturally, great controversy surrounds these kinds of judgements.[2]

---

[2] Indeed, the word 'bubble' for many economists is like a red rag to a bull. Many regard the rational bubble, as explained, for example, by Blanchard and Watson (1982), as *the* definition of a bubble. Many others, however, reject the idea that all agents are rational and share the same beliefs. Then there can be persistence in high valuations if optimists have sufficient wealth or access to credit, while pessimists are constrained by the inability to 'short' the asset (see Harrison and Kreps (1978) and Scheinkman and Xiong (2003) on the role of short-sale constraints). These are even more powerful for housing than for shares, see Stein (1995) for similar explanations for the inefficiency of housing markets. Models with 'noise' or momentum traders coexisting with 'fundamentalists' (see DeLong *et al.*, 1990) take a similar 'non-rational' view of mispricing. In such models, the word 'bubble' has a somewhat looser meaning.

Despite the difficulties, careful econometric work can make an important contribution to understanding what has happened to house prices and what are the likely prospects. Such research can reveal what are the most relevant fundamentals. One might then check whether there are large recent deviations of house prices from levels predicted by models estimated on historical data, one symptom of a bubble. But bubbles are perfectly possible without such deviations. For example, there are likely to be inherent regularities in house price dynamics consistent with systematic overvaluation, since a large psychological element appears to drive the behaviour of many housing market participants.

Indeed, almost the entire empirical literature on house-price determination agrees that the housing market is not efficient: systematic mispricing can persist. Many empirical models find important effects on current house prices of lagged appreciation, termed the 'bubble-builder' by Abraham and Hendershott (1996), consistent with an important extrapolative element in expectations. The deviation of prices from long-run fundamentals is then the 'bubble-burster'. For example, a series of positive shocks to fundamentals can lead to rising prices and the expectation of further appreciation leading to greater and greater overvaluation. In due course, the increasing negative pull from fundamentals reduces the rate of appreciation. When prices eventually fall, the falls can then be exaggerated by expectations of further falls.

This, in a nutshell, is the story of US house prices since 2000. Financial innovations in securitization and changes in procedures by rating agencies resulted in the sub-prime revolution, extending loans to borrowers whose credit histories would previously have denied them such access.[3] Many of these loans were for adjustable rate mortgages which particularly benefited from the lowest interest rates for decades in 2001–3. The house-price rises these credit-supply and interest-rate changes set in train fooled many participants, as seen in surveys of house-price expectations, into thinking that such rises would be sustained. In 2003, the fundamentals changed as interest rates belatedly began to return to more 'normal' levels, and high rates of building expanded the housing stock, while house prices became increasingly overvalued. As the extent of bad loans gradually became clear, the fundamentals changed again, as the supply of credit not only for sub-prime, but also for mortgages more generally, contracted.

This brief sketch already hints at some of the difficulties in assessing the extent of house-price bubbles. How does one judge whether the 'fundamentals' are at long-run sustainable levels, for example whether an increase in credit availability is temporary or permanent? In 2005, while the yield curve signalled that short-term interest rates would return to more normal levels, very few commentators fully appreciated how flimsy were the foundations of the sub-prime revolution. Another difficulty is that a single equation is unlikely to capture the full feedbacks.[4] Furthermore, monetary policy reacts to these changing economic conditions. Separating temporary from permanent shifts in the fundamental determinants of prices, including income, interest rates, and credit supply, is thus no easy matter.

The most basic theory of what determines house prices is just a story of supply and demand, where the supply—the stock of houses—is given in the short run. Then prices are given by

---

[3] See DiMartino and Duca (2007), Green and Wachter (2007), Mian and Sufi (2008), and Keys *et al.* (2008), *inter alia*.

[4] In the upswing, consumer spending and bank profits expand in part because of the rise in house prices, boosting growth and the willingness of lenders to advance funds, while in a downswing, the opposite holds, with bad loans constraining the willingness to lend.

the inverted demand curve, i.e. by the stock of housing and the factors driving demand.[5] Let log housing demand be given by

$$\log h = -\alpha \log hp + \beta \log y + z$$

where $hp$ = real house price, $y$ = real income, and $z$ = other demand shifters. The own-price elasticity of demand is $-\alpha$ and the income elasticity is $\beta$. Solving yields

$$\log hp = (\beta \log y - \log h + z)/\alpha.$$

An advantage of the inverted demand function approach (i.e. expressing price as a function of quantity and the other factors shifting demand) is that it is well grounded theoretically, unlike many 'ad hoc' approaches. In addition, we have strong priors regarding the values of the key long-run elasticities, corresponding to the 'central estimates' set out in Meen (2001) and Meen and Andrew (1998), *inter alia*. For example, many estimates of the income elasticity of demand suggest that $\beta$ is in the region of 1, in which case the income and housing-stock terms in the above equation simplify to log income per house, i.e. log $y$ – log h.

The demand shifters included in $z$ cover a range of other drivers. Since housing is a durable good, inter-temporal considerations imply that expected or 'permanent' income and 'user cost' should be important drivers. The user cost takes into account that durable goods deteriorate, but may appreciate in price and incur an interest cost of financing as well as tax. The usual approximation is that the real user cost is $uc = hp(r + \delta + t - h\dot{p}^e/hp)$, where $r$ is the real after-tax interest rate of borrowing, possibly adjusted for risk, $\delta$ is the deterioration rate, $t$ is the property tax rate, and $h\dot{p}^e/hp$ is the expected real rate of capital appreciation.

The *ex post* user cost can take on negative values as rates of capital appreciation in house-price booms have sometimes exceeded interest and other costs of owning a home. An important practical issue for the modeller is how to measure expected house-price appreciation, since only in recent years have surveys begun to ask households about this. A reduced form approach in which expected appreciation is assumed to be a function of lagged appreciation, interest rates, and of log income, log housing stock, and other components of $z$ is most often taken. Then log real house prices are explained by this same set of variables.[6]

Other factors are also likely to be relevant, given that many mortgage borrowers face limits on their borrowing and may be risk averse. These include nominal as well as real interest rates, credit supply conditions, demography (such as the proportion of households in the under-35 age group where most first-time buyers in the UK are to be found), and proxies for downside risk, particularly of mortgage default.

A recent and comprehensive econometric examination of what drives British house prices is Cameron, Muellbauer, and Murphy (CMM, 2006).[7] In that paper we exploit the richness of

---

[5] Inverse demand functions have a long history, particularly in the analysis of markets for natural resources. Theil (1976) refers to a 1909 Danish study as the first empirical study of inverse demand functions.

[6] An alternative is the limited rationality approach advocated by Demery and Duck (2007), in which it is assumed that households have access to a limited range of information. Then a model for $h\dot{p}^e/hp$ is estimated using this information set which satisfies the usual econometric criteria of parameter stability, good fit, etc. The fitted value from the model can then be taken as a proxy for expected appreciation. Muellbauer and Murphy (1997) use this approach.

[7] Comprehensive reviews of the regional house price literature for the UK can be found in Muellbauer and Murphy (1994) and Meen and Andrew (1998), as well as CMM (2006). The model fulfils eight criteria for a satisfactory model set out by the last of these, including: the model is data consistent; incorporates spatial lags and errors; has some spatial coefficient heterogeneity; has a plausible long-run solution; includes a full range of explanatory variables.

regional data and estimate a dynamic equilibrium-correction system of house-price equations for nine regions of Britain using annual data for 1972–2003. Our spatial approach means that the demand for housing in region *r* depends on real house prices, real income, and other demand shifters specific to region *r*, and *in addition* on house prices in contiguous and other regions of the country. The system of equations can be solved (or inverted) to obtain a reduced form in which the real house price in each region depends on the incomes, housing stocks, and demand shifters in other regions as well as in the own region, real and nominal interest rates, demographics, and a measure of credit conditions.

The model incorporates spatial parameter heterogeneity in a number of ways, including regional fixed effects and regional time trends. The lagged effects of own and other regions' house-price appreciation differ across regions, capturing the so-called 'ripple effect' by which house-price shocks tend to originate in London, and be transmitted first to nearby regions and then to more distant regions. Furthermore, the model captures differences between London and the South-east, on the one hand, and other regions, in short-term responses of house prices to income and to the stock market.

We show that credit-market liberalization had a direct demand-shift role on house prices, but also altered the relative role of real and nominal interest rates, *inter alia*, with interesting implications for monetary policy.[8] We also show that both flow and stock disequilibria play a role in price adjustment. In addition, we allow the speed of adjustment of prices to depend on the tax element of transactions costs (stamp duty). We find that higher stamp duties reduce the speed of adjustment from over 0.3 in 1985 to less than 0.2 in 2003.

## (i)   Long-run solution

The most important feature of our model is the long-run equilibrium which is meant to capture fundamentals such as the effect of income, population, age composition, the housing stock, and interest rates on the long-run level of real house prices. In the long-run equilibrium, real house prices in region *r* depend on real disposable non-property income per house in that region and nationally, a credit conditions index, CCI, the nominal mortgage rate interacted with CCI, the real mortgage rate interacted with CCI, and the sum of the real mortgage rate and the average Stamp Duty rate. The long-run elasticity of house prices with respect to non-property income relative to the housing stock is set to 1.6, which is close to the freely estimated value, and is near to our prior and the central estimates in the literature.

The credit condition variable CCI picks up direct credit liberalization effects on house prices.[9] The value of CCI, which is approximately zero up to 1980, climbs to about 0.22 in 1991, dips somewhat after this, and then reaches a maximum of about 0.25 in 2001 (see Figure 1). When modelling British house prices for periods including the 1970s, the inclusion of some measure of credit availability is necessary in order to obtain a correctly signed real interest rate effect—omission of CCI would induce serious omitted variable bias.

The inclusion of the real interest rate reflects its role in user cost of housing. The nominal interest rate is included because, as Kearl (1979) argued, when nominal interest rates rise with

---

[8] This matches the empirical findings in the model of debt in Fernandez-Corugedo and Muellbauer (2006) and the UK consumption functions in Aron *et al*. (2007).

[9] The CCI was estimated by Fernandez-Corugedo and Muellbauer (2006) from data on ten consumer-credit and mortgage-market indicators. It is intended to measure the shift in the credit-supply function to UK households, especially since 1980. See section V(iii).

**Figure 1:** The estimated long-run effects of the credit conditions index CCI and interest rates, interacted with CCI, on the level of log real house prices
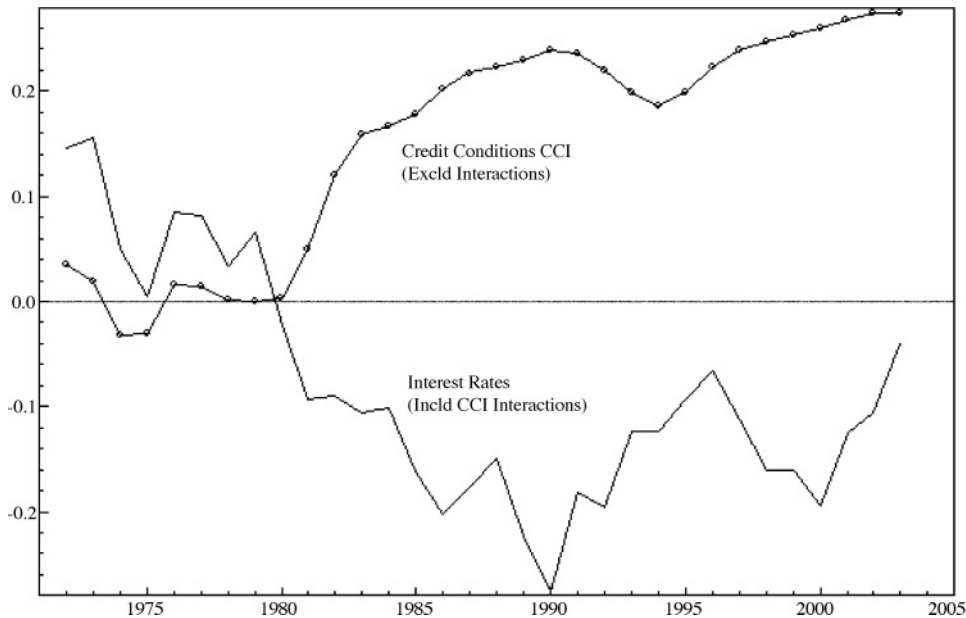


*Note*: To obtain the approximate estimated percentage effect, multiply the effects by 100.
*Source*: Cameron *et al*. (2006).

inflation, the real interest burden under standard mortgage contracts is more heavily tilted to or loaded on the first few years. However, as the liberalization of credit markets has made refinancing easier, households have been better able to get round this constraint. We therefore interact the log nominal mortgage rate with CCI, and find a positive effect, weakening the negative effect of the nominal rate on house prices as CCI rises. The same reasoning suggests that real interest-rate effects strengthen as CCI rises. This is strongly confirmed by our empirical results. Given recent international concerns with credit conditions in mortgage markets, our approach provides a conceptual and modelling framework for understanding the effects of such shifts.

## (ii)   Orders of magnitude of the long-run effects

Figure 1 shows the estimated long-run effects of the CCI and real and nominal mortgage rates interacted with CCI.[10] Relative to the 1970s, the estimated effects of CCI are roughly cancelled out by the effect of the rise in real interest rates. Figure 2 shows the effect of average income per house. Before 1997 or so, the rate of house building broadly matched rises in real incomes and working-age populations (and, implicitly, household formation). However,

---

[10] Note that the estimated effects are merely the products of estimated coefficients and explanatory variables and not a variance decomposition or stochastic simulation.

**Figure 2:** The estimated composite long-run income, population, and housing-stock effects on the level of log real house prices
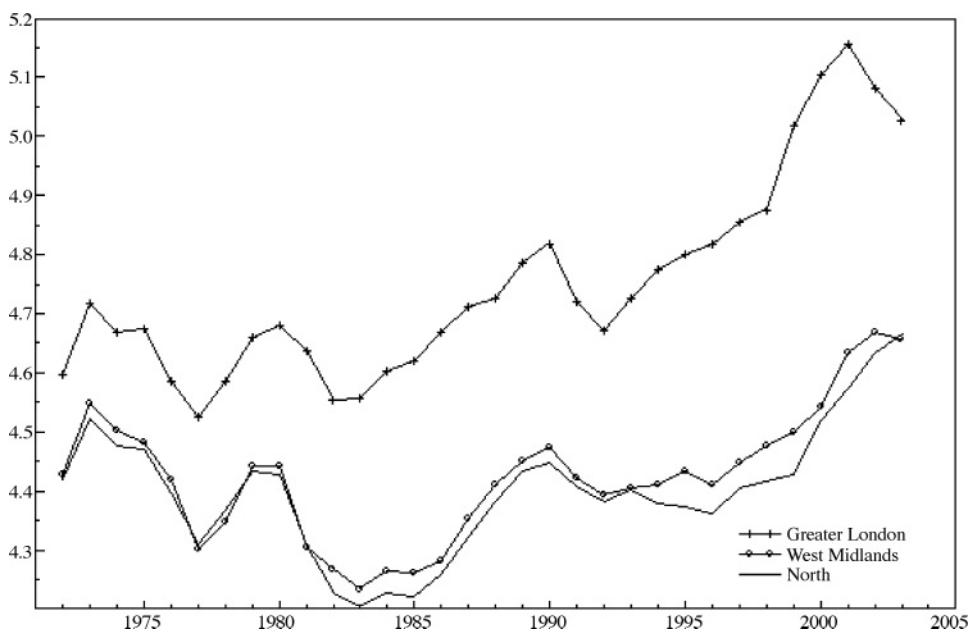


*Note*: The estimated percentage change in long-run house prices over time is approximately equal to 100 times the change in the plotted values. The estimated percentage difference in prices between two regions is approximately equal to 100 times the distance between the plots for the two regions.
*Source*: Cameron *et al*. (2006).

since then, the latter have greatly outpaced the rate of house building, especially in London, so driving up real house prices.[11] The rise in average real income per house explains most of the rise in real house prices since around 1997, thus confirming the relevance of the Barker inquiry on Housing Supply (Barker, 2004).

Figure 3 shows the estimated equilibrium correction term including income per house, credit, and interest-rate effects. It suggests that, given interest rates, incomes, population, and housing stock, London was only moderately overvalued in 2003, while the West Midlands and the North were substantially undervalued.

The question of stock and flow equilibrium effects on house-price determination is an important policy issue, since some commentators, such as Bramley and Leishman (2005*a,b*), suggest that an increased supply of new houses can have a large effect on affordability. In our model, the stock equilibrium effect enters through the log income per house variables discussed above. A flow equilibrium can be examined through the effects of housing-stock changes and population changes. The idea is that short-term increases in the housing stock relative to population lead to short-term local excess supply, with downward pressure on local

---

[11] In London, this was the result both of higher per-capita income growth and of population growth, driven by net foreign immigration. Since 2002 or so, the net change in population has altered, with net outflows from London to other regions partly offsetting immigration.

**Figure 3:** The estimated equilibrium correction terms or deviation of log real house prices from their long-run values obtained by Cameron *et al.* (2006)
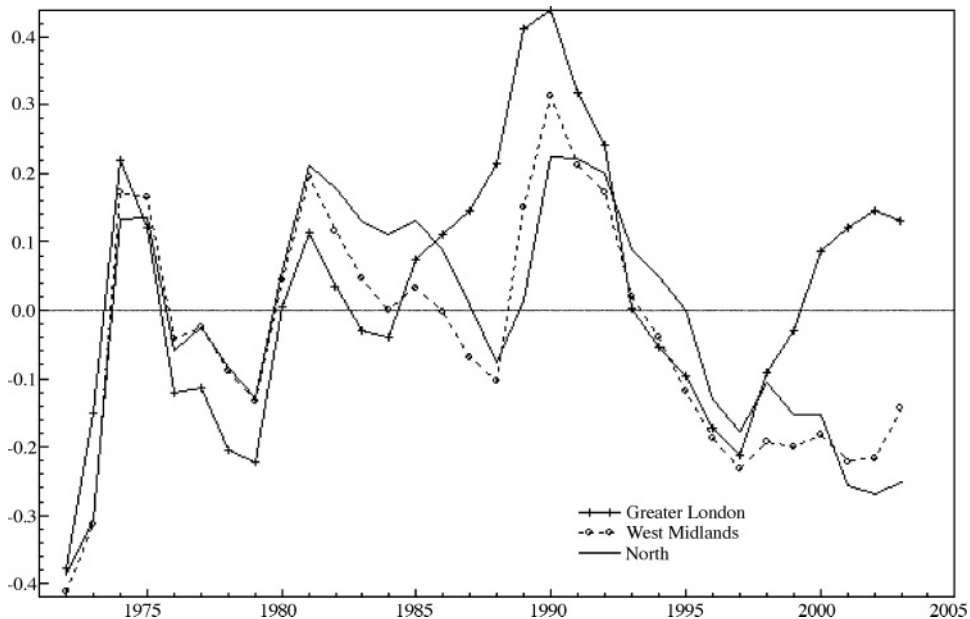


*Notes*: Positive (negative) values suggest that house prices are above (below) their long-run values. The estimated percentage over- or undervaluation is approximately equal to 100 times the value shown on the vertical axis.

prices. We find a significant short-run effect, suggesting that a 1 per cent rise in housing stock relative to the working-age population has a negative effect of the order of 1½–2 per cent on the region's house price.

## (iii)   House-price 'bubbles'

There has been a great deal of discussion of a 'bubble' in UK house prices in recent years, which we take to mean a systematic but temporary deviation of house prices from fundamentals. For example, the OECD (2005) suggested that UK house prices were overvalued by 30 per cent or more in 2003/4, whereas Nickell (2005) rejects the bubble hypothesis, arguing that a shift in fundamentals occurred.

We adopt a pragmatic approach to the bubbles question. One might conclude that there has been a bubble if we find substantial positive residuals (i.e. under-predictions) when forecasting house prices for recent years, given parameter estimates for earlier years. However, as noted above, it is perfectly possible for regularities in the dynamic behaviour of house prices to be well captured by a model with extrapolative expectations, so that bubbles can arise without such residuals being found. That is why the following test should be more decisive: using plausible scenarios for the drivers of house prices for the next 5–7 years, is a major decline likely? Even this test is subject to difficulties, since 'plausibility' is not entirely objective. One might have thought that setting the drivers to long-run

values would offer an objective criterion, but there is a range of uncertainty about long-run values.[12]

Despite these difficulties, systematic and comprehensive models are needed to distinguish fact from fiction in assessing the bubble hypothesis. Much of the debate about house-price bubbles focuses on charts of ratios of house prices to income or rents, or mortgage payment to income ratios. These ratios are not very informative about the presence or absence of bubbles, because they ignore a range of important factors, including demographic changes, house-building, credit conditions, and other asset prices.[13]

Another strand of the housing bubbles literature looks at the ratio of house prices to rents, using an equilibrium asset-pricing approach.[14] This approach appears very attractive and simple, since house prices as such do not have to be modelled. The basic problem with this approach is the small size of the private rented sector in the UK, which is not representative of the private housing sector as a whole, and the poor quality of the available rent data. Furthermore, even with good data on rents, demand shocks will shift price-to-rent ratios because rents are far stickier than house prices.[15]

Our model results do not suggest that house prices in 2003 were substantially overvalued. Fitting our model to data for 1972–96 to forecast 1997–2003 gives no signs of systematic under-prediction, either for the full period or for 2000–3. We find that most of the appreciation since 1997 was due not to short-run dynamics, but to strong income growth, higher population growth (partly from in-migration), low rates of house-building, and, to a lesser extent, lower interest rates. For the full sample, our model fits the data well, with little left over to be classified as a bubble. Moreover, the in-sample forecasts suggest that we have not over-fitted the model, which might have compromised bubble detection. Thus, the answer to our first 'bubbles' test is 'no'.[16]

Turning to our second 'bubbles' test, we have also examined out-of-sample scenarios to see what the model suggests about the course of real house prices in the next few years. If the model were to suggest that house prices might collapse in some circumstances, then house prices could arguably be substantially overvalued. The alternative forecast scenarios in CMM (2006) suggest that only quite negative shifts in fundamentals are likely to lead to significant falls in nominal prices, although moderate nominal falls in house prices are a possibility, especially in London and the South, but not in the country as a whole. Again, these results suggest that there was no house-price bubble in recent house prices, at least up to 2005, with

---

[12] As we have seen, the expansion in credit supply conditions in the USA from 2000 to 2005 might have been regarded as a permanent shift in 2005, but from the perspective of 2008 looks unsustainable.

[13] In the USA, Himmelberg *et al.* (2005) also argue that conventional metrics, such as house-price-to-rent ratios, are misleading because they fail to account for long-run trends in real interest rates that have made housing rather more affordable.

[14] For example, Ayuso and Restoy (2006) suggest that UK house-price-to-rent ratios were about 20 per cent above their equilibrium value in 2002. Weeken (2004), whose results imply that house-price-to-rent ratios were only a few percentage points above their equilibrium level in 2002, suggests that 'because of data and model limitations, no firm conclusions can be drawn'.

[15] CMM (2006) discuss a third strand of the housing bubbles literature which is more technical and involves estimating switching models. See Roche (2001) and Garino and Sarno (2004), for example.

[16] A test of this type with a mis-specified model can give different results. The IMF (2005) estimates a dynamic, error-correction equation for log real house prices as a function of log real disposable income per household and real interest rates only. The resulting equation is not a reduced form, since no supply-side variables, such as construction costs, are included. It is also rather unstable since supply, the changing age structure of the population, nominal interest rates, and shifts in UK credit conditions play no role. Nevertheless, the IMF (2005) suggests that, on the basis of its model simulations, UK house prices were overvalued by 30 per cent or more in 2003.

immigration, income growth, and strong stock-market rises explaining further appreciation and the outperformance of London and the South-east. By mid-2007, however, prices looked a little overvalued, even without the rise in interest rates between 2006 and 2007.

## (iv)  Prospects

The CMM (2006) model is a useful tool for understanding the future. Stock-market declines and likely bonus and job cuts in the City of London will have most impact on the London and South-east markets. Effective mortgage rates have risen, in part because of policy actions by the Bank of England, and lately because of higher risk premia, higher inflation, and the fact that some borrowers are reaching the end of their introductory interest-rate-discount periods. Moreover, real income growth is likely to be lower in 2008/9 than in recent years, in part because of slower growth or contraction in financial services and rising government deficits leading to higher taxes or lower spending. The model also has a role for the credit conditions. As a result of the sub-prime loans crisis, a retrenchment of credit supply is likely over the next 2 years, though on a smaller scale than in the USA.[17] These are negatives for the UK housing market, particularly in those locations most exposed to financial-sector troubles where appreciation has also been highest in recent years.

However, the downside in the UK is limited by three factors. The first is pent-up demand from buyers priced out of the market in recent years, and continuing population growth, if indeed net immigration remains high. The second is that, with UK house building so low and so unresponsive to house prices, the effect on economic activity from lower levels of residential construction will be slight. The third is the policy response. UK interest rates have been led a little lower by Federal Reserve action, responding to the more serious housing-market problems in the USA. Two recent changes in taxation support house prices. The first is the reduction in capital gains tax to 18 per cent, benefiting buy-to-let investors. The second is the rise in the inheritance-tax threshold, which is likely to reduce the supply of homes coming on to the market to settle estate taxes. As ever, forecasting is fraught with difficulties: even if one were completely confident in the estimated parameters of the model, considerable uncertainty surrounds the future paths of most of the drivers, such as inflation.

Prospects for house prices in countries such as Ireland and Spain, where house-price booms have been accompanied by massive increases in construction, look poor given excess supply and the inevitable slowdown in economic growth and rise in unemployment as construction activity drops. These countries, along with Denmark and the Netherlands where household debt levels relative to incomes[18] are at or close to world records, may not be helped in 2008 by the European Central Bank's concern with inflationary trends and the larger weight of Germany, Italy, and France in its deliberations. This is a classic example of how institutional differences can create serious tensions for monetary policy in the Eurozone.[19]

Miles and Pillonca (2008) note the move towards foreign-currency mortgages in Eastern-European accession countries before currency union becomes a reality. With large balance-of-payments deficits in the Baltic republics, Bulgaria, Romania, and some of the Balkans

---

[17] Some of the fall in observed loan-to-value and loan-to-income ratios will, however, be due to higher rates of mortgage repossessions and negative returns in housing, as implied by Fernandez-Corugedo and Muellbauer (2006).

[18] This is not meant to imply that other asset wealth is unimportant. However, falls in prices of equity as well as of houses and higher unemployment will increase the fraction of households in the vulnerable tail of the distribution of debt.

[19] See Maclennan *et al.* (1998, 2000).

accompanying rapid house-price appreciations, one does wonder what the consequences might be if the currency pegs in those countries came to be questioned, and debt levels and mortgage costs measured in domestic currency were suddenly to jump.

## III.   Residential construction

The literature on the econometrics of new house building is extraordinarily diverse and contradictory. Di Pasquale (1999) explains some of the reasons why we appear to know so little about housing supply. Housing supply comes from new build as well as conversions and rehabilitation of the existing stock. Data on expenditure on improvements suggest that it has become a substantial fraction of total gross investment in housing. But the behaviour of builders and owners is likely to be different, while among owners, owner-occupiers may behave differently from landlords. New build can be for owner-occupation, the private rental sector, or for the social rental sector, each with different drivers. Housing is very heterogeneous and the available data on numbers of units usually ignore this heterogeneity by type and location.

Finally, government intervention is on a massive scale. For example, as a matter of policy, the construction of social housing in the UK (and, for that matter, in many other countries, such as the Netherlands) has declined sharply since the 1970s. The incidence of rent controls has varied greatly. Where the literature on private residential construction has found some convergence in recent years is in agreeing on the importance of land supply and, hence, zoning and planning restrictions and other interventions, such as taxation of developers. Titman (1985), Mayo and Sheppard (1991, 1996), Bramley (1993*a,b*), Evans (1996), Pryce (1999), Mayer and Somerville (2000*a,b*), Malpezzi and Maclennan (2001), Swank *et al*. (2002), Barker (2003), Bramley and Leishman (2005*b*), Green *et al*. (2005), Quigley (2007), Vermeulen and Rowendal (2007), and Saiz (2008) all agree that restrictions on land supply have potentially important effects on the responsiveness of new house building to house prices.[20]

Wide disagreements on details remain. For example, Evans (1996) questions the interpretation by Bramley (1993*a,b*) of the empirical evidence to suggest that easing of planning constraints would have relatively small effects on new housing supply (and prices). Many of the estimates for housing-supply elasticities differ greatly, even when they are meant to refer to the same country and time period, sometimes even within the same study. Mayer and Somerville (2000*a*) argue that residential construction responds not to the level of real house prices, but to the rate of appreciation, and that this could be part of the reason for the great instability of estimates of the supply elasticity.

To simplify, they advance two main arguments. The first is that residential construction is a stationary series while real house prices are non-stationary, so that a cointegrated relationship cannot exist explaining the former by the latter. The second is a set of theoretical arguments based on the urban growth model. It rests on the simple idea that house values are basically land values plus the value of the bricks, mortar, etc. erected by builders on the land. The structures are reproducible and their supply price is given by costs little affected by demand

[20] Quigley provides a useful review of the US literature, while Saiz (2008) is a good illustration of the sophisticated econometric modelling that can be undertaken in this area. *Inter alia*, Saiz uses GIS (Geographic Information System) data to give empirical content to the concept of land abundance and models the regulatory component of housing supply.

in the long run. Land, however, is non-reproducible. Builders effectively re-sell the same land they acquired earlier so that their profit consists of the normal mark-up on construction costs plus the capital gain on land. Capital gains in land are approximately capital gains in housing minus the rise in other construction costs. Hence, expected capital gains in land (or housing) will be important drivers of residential construction volumes. In line with this view, Ball (1988) has long argued that the acquisition and management of land banks has been the main source of profits for UK house-builders. In a volatile house-price environment, he argues, it has dominated the business agenda of house builders to the neglect of concern for technological advance in building methods, design quality, or work-force training, which count for more in more stable house-price environments, such as, say, that of Germany.

It typically takes a number of years for a piece of land acquired by a builder to be sold on with the addition of a dwelling. Since it is the expected gain in land prices between purchase and sale which is important, it can be seen that unexpected gains could actually be counterproductive in terms of the supply response: to the extent that prices are thought to be trend reverting, large gains over the previous 3 years may reduce expected gains over the next three and so reduce supply. However, with an extrapolative element in expectations, supply is still likely to increase with recent house- or land-price appreciation.

## IV.   UK housing affordability

Since private house building in the UK has expanded very little since 1997, it is clear from the discussion in section II that this lack of supply in the face of strong demand growth is a major reason for the housing affordability problem analysed in the four Barker reports (2003, 2004, 2006*a*,*b*). One of the consequences of the problem is a rise in poverty and social exclusion—in other words, greater inequality at the lower end of the distribution of long-term living standards. This is seen in the pricing out of the housing market of people without pre-existing housing equity or family connections with such equity. This perpetuates disadvantage through the generations. The government has a concern for poverty and social exclusion, backed by a proliferation of means-tested subsidies. Yet, the past 10 years have seen one of the greatest rises in social exclusion in post-war history.

Another consequence of the rise in real house prices has been a redistribution of living standards between the generations—from those younger than their early thirties to older people. As Weale (2007) has cogently observed:

> There is rather a close analogy between the effects of rising house prices and the effects of government debt. The latter, like the former, imposes a burden on future generations while providing resources to those currently active. Rising house prices reduce the need for people to save to finance their retirement. Low taxes reduce the amount of consumption that they have to give up to finance their retirement, so the effect is similar. Both have the effect of depressing saving which either reduces the economy's stock of productive capital (crowding out) or results in investment being financed from abroad, with a similar effect.[21]

---

[21] On the assumption that between 1987 and 2007 'excess' house price appreciation was 1.9 per cent per annum, Weale (2007) argues that this appreciation was roughly equivalent to a government deficit *per annum* over these years of 4 per cent of GDP.

While the government has made somewhat of a fetish of its prudence with the public finances, it has fallen for the easy but myopic politics of permissiveness towards rising house prices. The burden falls on the young, many too young to vote. As Weale notes 'rising house prices are a transfer largely from people who cannot vote to those who can. This makes it politically very difficult to address the redistribution of wealth to which rising house prices give rise.'

An important difference between higher house prices and higher government debt is that while the increase in debt may be used to fund goods such as health and education, benefiting the mass of the population, the redistribution from an increase in average house prices is towards the haves from the have-nots. The far greater political 'voice' of the haves is therefore another aspect of the political difficulty.

That the strong house-price rises of recent years have been accompanied by widening fiscal deficits since 2002/3, despite liberal use of the private finance initiative (PFI) to shift spending off balance sheet, is a worrying constraint on UK growth over the coming years. We have more to say on the implications for consumer spending of high debt levels and low growth of disposable income in section V.

The Barker reports have focused attention on the planning system, on the land release incentives for local governments, and on the other constraints on the effective expansion of supply, such as infrastructure provision and its financing. Barker early on dismissed the hypothesis that builders with land banks might postpone building in anticipation of even greater house price gains. However, the evidence to the Callcutt Review advanced by the Royal Town Planning Institute in 2007 has resurrected this hypothesis and the Calcutt Review has recommended a welcome improvement in transparency concerning land-bank holdings by builders (Royal Town Planning Institute, 2007). Without such historical data at a regional level, the discussion in section IV suggests that decent empirical models of residential construction at the regional level will be hard to achieve.

From the 1990 and 1991 Town and Country Planning Acts, supply constraints have been tightened in the UK, interestingly paralleling similar developments in the Netherlands (Vermeulen and Rowendal, 2007). The 1991 legislation introduced a system of rationing development land, rather than controlling the location of development. As Barker (2003) observed, failure to enforce the system resulted in many local authorities having no plan or very dated plans. But even when plans were up to date, the rationing system inevitably produced shortages. Locally, oversupply is impossible since builders will not build more than makes commercial sense. But in many locations, land supply has been the binding constraint, particularly in the southern part of the UK.

The targets for the proportion of development on brownfield land increased substantially. Section 106 agreements, introduced in 1990, which often delay development by years, have taken an increasing burden of financing social housing and infrastructure. In addition, the Department for Communities and Local Government has been increasingly interventionist in specifying density levels, under Planning Policy Guidance (PPG3), and sometimes the mix of housing types in planning guidance.

Barker (2008) argues that policy changes in the last 2–3 years should ease the planning constraints, but is uncertain about the extent of the improvements, partly because some of the critical reforms have not yet been formalized. She is also concerned that the Lyons Review of Local Government Finance missed an opportunity to improve the local incentives for land release. It remains to be seen how effective the National Housing Policy Advisory Unit (NHPAU) will be in improving the link between the demand side and land supply.

# V.   Consumption and housing wealth

There is much disagreement among economists on whether variations in housing wealth matter for consumption. Attanasio and Weber (1994) and Attanasio *et al*. (2005) take the view that house-price fluctuations reflect shifts in income expectations and play no causal role for consumption. The Bank of England has long argued similarly that there is no housing wealth effect on consumption (see Benito *et al*., 2006). Buiter (2008) regards a 30 per cent decline in UK house prices over 2–3 years as likely, but sees little effect on consumption, except for a transitory one via a liquidity or collateral effect.

Many others, like ourselves, disagree: the 'housing wealth effect' on consumer expenditure works mainly via the credit channel and has persistent medium-run effects. There have been major shifts in behaviour with credit-market development. Once credit constraints are taken into account, a liberal credit market tends to result in a positive effect from house prices on consumption as collateral constraints on owners are relaxed and because the need to save for a housing deposit by the young is then limited even at higher prices. With an illiberal credit market, the collateral effect is weak, while the need of the young to save for a housing deposit is greater with higher house prices. In the latter case, higher house prices reduce consumer spending, as seems to have been the case in Italy and Japan (Muellbauer and Murata, 2008). Institutional differences between countries therefore matter greatly, and so does the proper control for changing credit conditions in econometric work.

## (i)   Life-cycle consumption theory

For infinitely lived households, Muellbauer (2007) shows that traditional life-cycle theory implies that the effect of a permanent rise in the price of housing on aggregate consumption (including imputed rent) is negative. Assuming finite lives and relaxing some other assumptions might give a small positive effect, at best. The Bank of England is broadly correct to assume there is no basis for a housing wealth effect in the traditional model. However, the limitation of the Bank of England's model is that it is missing the credit channel—except via short-run dynamic effects in house prices. Moreover, Benito *et al*. (2006) reveal that this short-run effect has broken down since 1998.

## (ii)   Credit-market evolution and revolution in the UK

The key features of credit-market evolution have generally included the following: changes in prudential and wider capital-market regulations; technological change and reductions in the cost of information technology, giving rise to internet banking; and better sharing by lenders of information on borrowers' credit histories. The deepening of markets for securitized contracts and derivatives with financial globalization has been another important feature. However, it has now been recognized that many of the developments, particularly since 2000, have been founded on misconceptions and a poor incentive structure for bankers and others selling financial products (see Rajan, 2005, and Blundell-Wignall, 2007).

For the UK, the elimination of exchange controls in 1979 integrated the UK into global capital markets. The key constraint on bank lending—the 'corset'—was removed in 1980, so that banks crowded into domestic mortgage markets. The competitive response and relaxation of constraints on existing mutual mortgage lenders (formalized in the 1986 Building Society Act) further eased access to mortgage credit. A new breed of mortgage lender selling via

**Figure 4:** UK housing equity withdrawal/non-property income, UK credit conditions index and housing wealth/income.
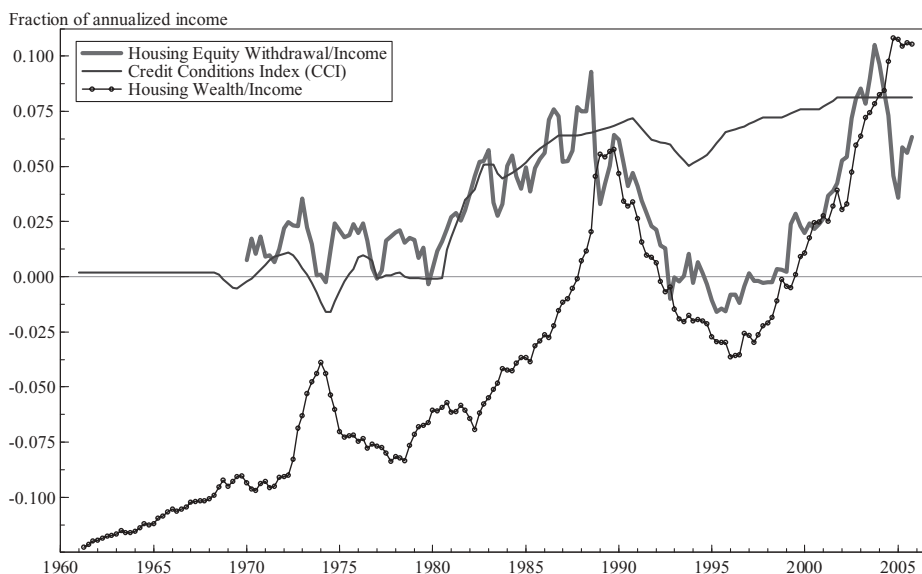


*Note*: The scaling of the CCI and of housing wealth/income is tuned to the units of housing equity withdrawal/income.

intermediaries (the 'centralized mortgage lenders') entered the market from 1985. A partial retrenchment of credit conditions occurred in the early 1990s as it became clear that default risk insurance for major mortgage lenders had been under-priced. Later, more evolutionary changes described above shifted the credit supply function to a new plateau. These changes can be tracked in the form of an index.

## (iii)   Credit conditions index

Fernandez-Corugedo and Muellbauer (2006) construct their credit conditions index, CCI, for the UK using loan-to-value (LTV) and loan-to-income (LTI) data extracted from the Survey of Mortgage Lenders (with over 1m observations, 1975–2001). The fractions of LTV and LTI ratios for first-time buyers above certain thresholds were extracted and classified by age and region to give eight series. Adding aggregate consumer credit and aggregate mortgage debt, gave a total of ten credit indicators. CCI was then estimated as a common factor in ten jointly estimated credit indicator equations—controlling for a rich set of economic and demographic factors. We interpret the index (Figure 4) as a scalar measure of the position of the credit supply function.

## (iv)   Literature review

Recent empirical studies of the housing–consumption link on macro data include: Catte *et al*. (2004), Case *et al*. (2005), Carroll *et al*. (2006), and Slacalek (2006) (see Muellbauer (2007) for a more detailed discussion). The last two are particularly interesting because the data are differenced by Carrol *et al*. and Slacalek to make them robust against omitted trends

or structural breaks, and they take the lagged response of consumption into account. They find that the US marginal propensity to consume (mpc) for housing wealth, at around 0.09, substantially exceeds that for stock-market wealth.

Hatzius (2006) takes a different approach, emphasizing, like Miles (1992, 1994), the role of mortgage equity withdrawal. In his consumption model, he augments household net worth with the measure of US housing equity withdrawal constructed by Greenspan and Kennedy (2008) and finds a stable model with a highly significant equity withdrawal effect. With notable perspicacity (in February 2006), he argued that US house prices were heavily overvalued and that when they declined, they would bring down equity withdrawal and slow consumption growth sufficiently, together with lower residential construction, to reduce the 2007 growth rate by 1.5 per cent.

The US state panel study by Case *et al*. (2005) is based on an excellent concept since time dummies should serve as good controls for macro shocks. They conclude, too, that the US housing wealth effect exceeds the stock-market effect, but also make a case for an asymmetric response of consumption to house-price changes. However, there are major robustness problems discussed by Muellbauer (2007), though their US conclusions may well be broadly correct.

## (v)   OECD heterogeneity

By pooling 14 countries, Case *et al*. (2006) assume homogeneity—but institutional differences *are* important. Shifts in credit conditions are omitted from the country data—but Finland, Norway, Sweden, the UK, and the Netherlands all went through revolutions in credit availability. Kennedy and Andersen (1994), Boone *et al*. (2001), Catte *et al*. (2004), and Slacalek (2006) all find evidence for OECD heterogeneity.

## (vi)   Micro data

Two studies on UK micro data reaching diametrically opposed conclusions are Campbell and Cocco (2007) and Attanasio *et al*. (2005). There are robustness problems with both studies. Poor controls are a problem for the latter. Campbell and Cocco's results appear to be sensitive to idiosyncratic price deflators and the first-difference specification (see Cristini and Sevilla, 2007). The US panel study (PSID data) by Lehnert (2004) is more robust than either, and it is also consistent with credit channel interpretations. Disney *et al*. (2006) also focus on the credit channel using UK data from the British Household Panel Survey. Browning *et al*. (2008), using Danish micro panel data, also find support for a housing collateral effect.

## (vii)   A solved-out consumption function

The Friedman–Ando–Modigliani consumption function requires an income-forecasting model to generate permanent non-property income. Unlike the Euler equation, it does not throw away long-run information on income and assets. The solved-out consumption function has advantages for policy modelling and forecasting. This basic aggregate life-cycle/permanent-income consumption function has the form:

$$c_t = \gamma A_{t-1} + \lambda y_t^P, \tag{1}$$

where $c$ is real *per capita* consumption, $y^p$ is permanent real *per capita* non-property income, and $A$ is the real *per capita* level of net wealth. We now find a log-linear version of (1).

Dividing equation (1) by $y_t$ and a little manipulation shows that the equation implies:

$$c_t/y_t = \lambda\left[(\gamma/\lambda)A_{t-1}/y_t + 1 + (y_t^P - y_t)/y_t\right]. \tag{2}$$

The right-hand side of equation (2) has the form $1 + x$, where $x$ is usually a fairly small number. We can then take natural logs, using the fact that $\ln(1 + x) \approx x$ and $\ln(y_t^P/y_t) \approx (y_t^P - y_t)/y_t$. We then see that

$$\ln c_t = \alpha_0 + \ln y_t + \gamma A_{t-1}\big/ y_t + \ln\left(y_t^P \big/ y_t\right). \tag{3}$$

The log formulation is very convenient with exponentially trending macro data, since residuals are likely to be homoskedastic.[22] Adding further realistic features, such as habits, a role for variable interest rates and income uncertainty, splitting up assets into different types, and introducing a role for the credit channel gives rise to an empirical model that encompasses the basic life-cycle model given by (3).

## (viii)   A modern version of the Friedman–Ando–Modigliani consumption function

This extension of (3) is as follows:

$$\Delta \ln c_t \approx \beta[\alpha_{0t} - \alpha_{1t}r_t - \alpha_{2t}\theta_t + \alpha_{3t}E_t\Delta\ln ym_{t+k} + \gamma_1 NLA_{t-1}/y_t + \gamma_2 IFA_{t-1}/$$
$$+ \gamma_{3t}HA_{t-1}/y_t + \ln y_t - \ln c_{t-1}] - \beta_{2t}\Delta nr_t(DB_{t-1}/y_t) + \varepsilon_t \tag{4}$$

where $r$ is the real interest rate and  is an uncertainty indicator. $E_t\Delta\ln ym_{t+k} = \ln(y_t^P/y_t)$ measures income growth expectations. $NLA\big/y$ is the ratio of liquid assets minus debt to non-property income, $IFA\big/y$ is the ratio of illiquid financial assets to non-property income, $HA\big/y$ is the ratio of housing wealth to non-property income; $\Delta nr\left(DB\big/y\right)$, where $nr$ is the nominal interest rate on debt and $DB$ is debt, measures the cash-flow impact on borrowers of changes in nominal rates; the speed of adjustment is $\beta$, and the $\gamma$ parameters measure the mpcs for each of the three types of assets. Note that $\beta = 1$, $\alpha_{1t} = \alpha_{2t} = 0$, $\gamma_1 = \gamma_2 = \gamma_{3t}$, $\beta_{2t} = 0$ and $\alpha_{3t} = 1$ are the restrictions which result in the basic life-cycle/permanent income model equation (3).

The credit channel features through the different mpcs for net liquid assets (Otsuka, 2006) and for housing; through the role for the growth rate of income[23] and the cash-flow effect for borrowers; by the possibility of parameter shifts with credit-market liberalization. Credit-market liberalization should *raise*: the intercept $\alpha_0$, implying a higher level of $\log(c/y)$; the real interest rate coefficient, $\alpha_1$; the impact of expected income growth, $\alpha_3$; and the mpc for housing collateral, $\gamma_3$. Credit market liberalization should *lower*: the cash-flow impact of the change in the nominal rate, $\beta_2$. We handle these shifts by writing each of these time-varying parameters as a linear function of the credit conditions index CCI so that CCI enters the model as an intercept shift and in interaction with several economic variables.

---

[22] It is important that assets *not* appear in the widely used log form, which gives poor approximations for low levels of assets and breaks down for negative net worth.

[23] This effect can arise from Campbell and Mankiw's (1990) aggregation of current income-constrained and -unconstrained households (see Muellbauer and Lattimore, 1995).

**Figure 5:** Long-run contributions to log consumption/income of the credit conditions index and its interaction with housing wealth/income
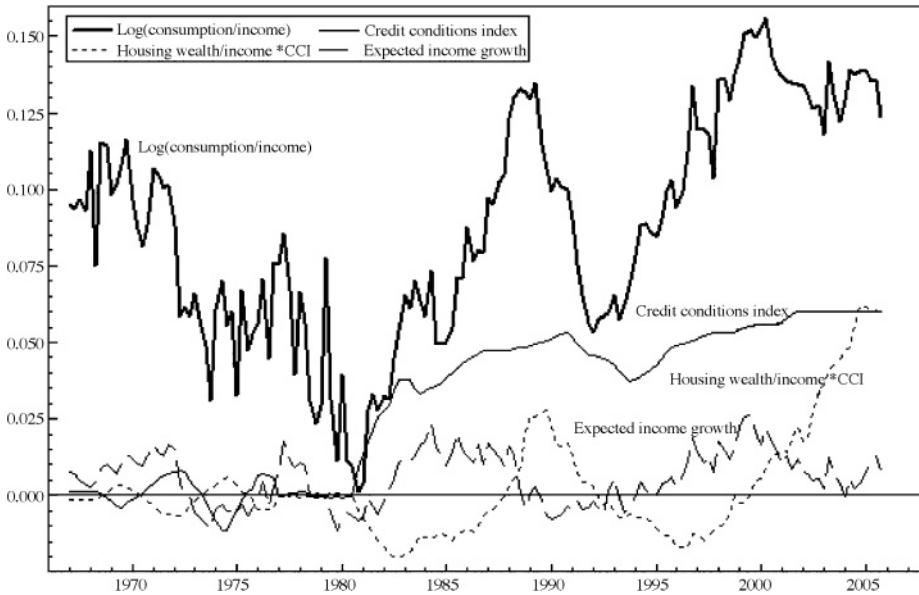


*Notes*: Asset-to-income ratios are defined as end of last quarter assets/4 (current quarterly non-property income). Explanatory variables are scaled by the estimated coefficients in the long-run solution.

A general formulation such as equation (3) has a number of advantages over an Euler-equation approach. These include: taking advantage of long-run information in the data; being consistent with less strict assumptions about consumer rationality, expectations, and the efficiency of financial markets; and permitting a role for the credit channel. At the same time, however, as seen above, it encompasses the text-book model as a special case.

## (ix)  UK empirical evidence 1967–2005

In research undertaken with Janine Aron, we find that the CCI intercept or level effect is important: in partial equilibrium, it lowers the current household saving rate by 6.5 percentage points compared to 1980. The housing collateral effect on consumption rises with CCI and appears to be close to zero before 1980 (Figure 5). The figure also shows the contribution of the fitted forecast income growth rate over a 3-year horizon, interpreted as a long-run effect. It can be seen that the contribution to the fall in the saving ratio (rise in log consumption relative to income) in the 1980s is small relative to the contributions of increased credit supply and the rise in housing collateral. The fall in the unemployment rate, not illustrated, also had an important effect from the mid-1980s. This evidence supports the credit liberalization and housing collateral interpretation of the 1980s fall in the saving ratio proposed by Muellbauer and Murphy (1990) against the dominant emphasis on growth expectations advanced by our discussants, Mervyn King and Marco Pagano.

We also find that the cash-flow impact of nominal rate rises weakens with easier access to credit. The mpc for liquid assets is 0.11 (close to micro evidence by Gross and Souleles (2002)); the mpc for illiquid financial wealth is around 0.02 (Figure 6); and the mpc for

**Figure 6:** Long-run contributions to log consumption/income of the ratio to income of net liquid assets and of illiquid assets
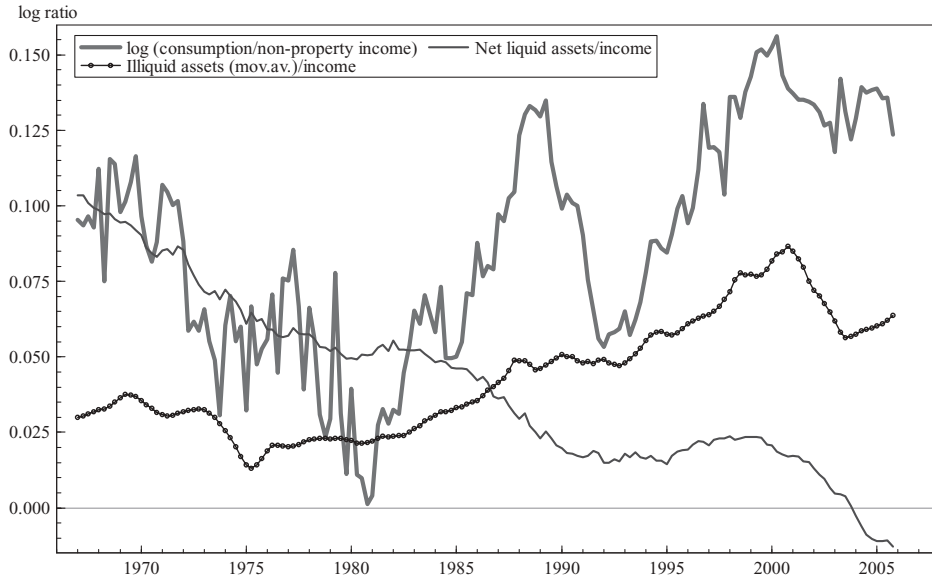


*Notes*: Asset-to-income ratios are defined as end of last quarter assets/4 (current quarterly non-property income). Explanatory variables are scaled by the estimated coefficients in the long-run solution. The data are normalized to equal 1 at the maximum, for both indices.

housing wealth from 2001 is 0.032 (at the CCI maximum). The t-ratios for the mpcs are at least 5. Co-integration analysis suggests there is a single vector linking $\ln(c/y)$ and the three ratios of assets to income. Parameter stability is excellent. Furthermore, housing equity withdrawal is well explained by CCI and its interaction with housing wealth (Figure 4).

## (x)   US evidence

The model of Hatzius (2006) can be thought of as variant of equation (4). He reports the following estimates for 1968Q3–2005Q3:

$$\Delta \ln c_t = constant + \underset{(6.7)}{0.32}\,\Delta \ln y_t - \underset{(6.3)}{0.135}\,r_t + \underset{(4.7)}{0.009}(A/y)_{t-2}$$
$$+ \underset{(3.0)}{0.115}(MEW/y)_{t-1} + \underset{(1.4)}{0.065}\,\Delta(MEW/y)_t$$
$$- \underset{(5.5)}{0.23}(c/y)_{t-1} + \underset{(1.4)}{0.05}(ty/y)_{t-1}$$

$$R^2 = 0.407, \quad DW = 1.86, \; t\text{-ratios in parentheses}$$

where $ty$ is transfer income, $y$ is not disposable non-property income but conventional disposable income, $A$ is net worth, and *MEW* is mortgage or housing equity withdrawal. Note that this formulation implies a long-run mpc out of net worth of $0.009/0.23 = 0.039$ and out of equity withdrawal of 0.499, if one can think of the latter as a long-run relationship. This appears to suggest that around half of active equity withdrawal shows up in consumption (see Greenspan and Kennedy (2008) for further discussion). Of course, equity withdrawal is very endogenous, reflecting a mixture of credit availability, housing wealth, house-price

changes, interest rates, and other factors. While the same could be said of the asset prices that govern short-term variations in housing and stock-market wealth, their drivers are probably better understood. Nevertheless, in the absence of good measures of credit-market liberalization, this kind of equation, if it proves to be as stable as Hatzius claims, is useful for short-term forecasting. And the economic story is consistent with the general points made in this section.

In our research with John Duca, preliminary results of which are reported in Muellbauer (1997), we estimate a model closer to equation (4). Here, we use data from the Survey of Senior Loan Officers to construct a US CCI proxy. We find the mpcs out of net liquid assets and illiquid financial assets to be almost the same as in the UK, and also confirm the shift in the housing collateral effect. However, the mpc for housing wealth, now around 0.07–0.09, from a range of different specifications, is consistent with Carroll *et al*. (2006), and is over twice the UK figure.[24] One can ask why the housing collateral effect is larger in the USA than the UK. Unlimited US tax relief on mortgage interest encourages home equity loans (tax relief in UK was heavily restricted and is now zero). Interest-rate risk is far lower in the USA: Fannie Mae and Freddie Mac underwrite 'conforming' loans and, together with a deep financial sector, provide fixed-rate loans with cheap refinance options. In many US states, there is a 'walk-away' mortgage default option, while in the UK, bad mortgage debts are pursued for up to 7 years.

### (xi)  Other countries

Research with Janine Aron on South Africa data finds results consistent with our model, though the larger 'wealth' effects suggest that asset prices may partly be proxying for uncertainty or growth expectations. Muellbauer and Murata (2008) find that Japan is different in having experienced far less household credit liberalization. There is a negative real land-price effect on consumption: the inheritance tax advantage of housing discourages home equity loans and downsizing for older households. Monetary transmission via households thus works differently in Japan, helping to explain the weak response of the economy to low interest rates in the 'lost decade'.

## VI.  Macro policy issues

Our discussion so far implicates housing in multiple ways for monetary transmission, i.e. the spending consequences of changes in short-term interest rates and liquidity operations of the central bank. The large literature on the role of housing and credit in monetary transmission is well reviewed in Mishkin (2007). As noted in the introduction, the interest sensitivity of residential construction has long been a standard theme of business-cycle and policy discussions. Part of the mechanism undoubtedly works through housing-price changes, which, as the discussion of section IV implied, strongly influence residential construction. Part is accounted for by the effects of interest rates on the cost of capital and access to credit faced by house-builders. The 40-year record set by the share of residential construction in

---

[24] In further work, not reported in Muellbauer (2007), there are indications that the long-run effect is rather less than 0.07–0.09 but larger than the UK effect of 0.032, when capital gains in housing are included, the latter having proved insignificant for the UK. There is also some evidence for a short-term asymmetry: falls in house prices appear to change consumption less than do rises.

GDP in the USA in 2005 is well explained by recently low interest rates, strong house-price growth, and easy access to credit.

Standard consumer theory gives a role to real interest rates in explaining changes in consumption. As explained in Muellbauer and Lattimore (1995), higher real rates are more likely to reduce consumption when consumers are less averse to consumption fluctuations and have positive income growth expectations relative to their current income and asset holdings. The consumption models discussed in section V offer further insights. For example, with a role for income growth expectations, higher interest rates will dampen such expectations if consumers understand their effect on future growth rates. An increase in nominal rates will reduce the cash flows of households holding floating-rate debt. The consumption impact will depend on how much of this type of debt households hold, how quickly the rates of interest on such debt respond to a higher policy rate, and on how easy the credit environment makes it for such households to take on more debt to overcome a temporary cash-flow problem. The evidence summarized in section V suggests important differences over time and between countries—far smaller in countries where debt is mainly at fixed rates.

The discussion of wealth effects implies that the asset-price channel works through equity prices and through housing collateral, with the latter effect being conditional on access to credit and other institutional features, which vary greatly from country to country. Standard asset-pricing theory implies that higher real rates will tend to reduce equity prices, partly because future returns are more heavily discounted and partly because these returns are themselves likely to fall. For the determination of house prices, section II distinguished several components in the interest-rate-to-house-price transmission channel. The first is a negative real interest rate effect, strengthened in the UK by the financial deregulation of the 1980s. The second is a negative nominal interest-rate effect, which has become somewhat weaker with the easing of credit conditions. The third effect is non-linear and operates through a downside risk measure which is zero if the rate of return in recent years was positive, but equals the average lagged return if this return was negative. A last effect operates through equity prices, at least in the UK.

To find the time-path of the full effects, a macro-econometric model is needed which articulates the differing channels, and builds in the shifting structure as credit conditions have evolved. To our knowledge, there are no such models in current use. The dynamic stochastic general equilibrium (DSGE) models currently fashionable with central banks do not build in a credit channel, since information asymmetries and heterogeneity are difficult to handle in a completely micro-founded general equilibrium setting, even if one could make rational expectations consistent with information asymmetries. There have, however, been modifications to such models introducing a role for housing in which an exogenously set LTV constraint plays a role; see Iacovello and Neri (2007) and Notarpietro (2007) for estimated DSGE models on these lines. The Federal Reserve's FRB/US model is closer to a traditional multi-sectoral macro-econometric model, though based on a common treatment of expectations and of dynamic adjustment, which improves its coherence with theory relative to its predecessors. The model specification issues we have raised, in particular the role of and interactions between credit availability and other variables, such as interest rates, could be used to modify the FRB/US model. This would make it into a more powerful and robust vehicle to address the debate about asset prices and monetary policy by permitting multiple scenarios to be run and risks to be assessed.

Some participants in the debate about how monetary policy should respond to asset prices, such as Bordo and Jeanne (2002), Borio and Lowe (2002), and Cecchetti *et al*. (2000), have taken the view that central banks should respond to extreme deviations of asset prices from

fundamentals because of the risks they generate of future instability. Others, such as Bernanke and Gertler (2001), Greenspan (2002), Bean (2004), and Mishkin (2007), have argued that the current inflation-targeting framework is capable of dealing with asset-price bubbles, through their effects on future output gaps and on inflation. They further argue that the difficulties of identifying a bubble (see the discussion in section II) and the uncertainties and lags in the transmission process make pre-emptive action close to impossible. Mishkin contrasts the very different simulation outcomes, depending on two variants of the FRB/US model, of a large negative house-price shock. But in both cases, a simple Taylor rule for monetary policy is really rather successful in preventing extreme declines in GDP growth. Interestingly, Taylor (2007) shows that, under a Taylor rule, US interest rates would have been raised rather earlier in 2002 and 2003 than the actual path followed by the Federal Reserve, thereby avoiding some of the excess appreciation of US house prices.

One of the dilemmas in targeting house prices in a small open economy, such as the UK, may be the unintended effect on the exchange rate. Thus, if short-term interest rates are raised in response to an excessive appreciation in house prices, the exchange rate is likely to appreciate. If the real exchange rate overshoots, this may also damage the real economy.

Of course, monetary policy is not just about setting short-term interest rates and facilitating the liquidity of private banks, it is also about prudential regulation. While it is true that responsibility for prudential regulation is shared between central banks and other regulators (e.g. the Securities and Exchange Commission in the USA and the Financial Services Agency in the UK), the role of central banks is crucial. There is an emerging consensus that prudential regulation in recent years was too lax.

Returning to the practical issue of interest-rate setting, a key input into a persuasive model for running policy simulations should be measures of credit conditions of the kind constructed by Fernandez-Corugedo and Muellbauer (2006). In the absence of such measures, vector auto regressions (VARs) have been used, as by Goodhart and Hoffman (2008), to obtain insights into house-price and credit shocks and their consequences. They find multidirectional links in a multi-country VAR between house prices, broad money, private credit, and the macroeconomy, though Price (2008) expresses cautionary notes on the interpretation of such results. Money growth has a significant effect on house prices and credit, credit influences money and house prices, and house prices influence both credit and money, with the connections even stronger in recent years after credit liberalization, and stronger credit effects when house prices are booming. They suggest central banks follow a 'leaning against the wind' strategy with an increased weight on money and credit data at such times. They also recommend using counter-cyclical regulatory limits on LTV ratios in the mortgage market to supplement monetary policy.

While these are potentially valuable suggestions, there remain the deeper questions raised by the sub-prime mess and the wider financial crisis of how to reform bank regulation, credit and derivatives markets, rating agencies, and, indeed, the incentive structures within banks and companies in general, the better to align the interests of executives and employees with the interests of shareholders and the wider economy.[25] Behind these are two classic questions. The first and deeper of the two is how to design institutions to cope with the

---

[25] Martin Wolf in the *Financial Times* of 5 February 2008 discusses the particular problems of the banking system and credit markets and their wider economic importance, and reviews recent debates about the reform agenda with great insight.

information asymmetries that are at the core of the current problems. The modern theory of corporate finance (e.g. Tirole, 2005) analyses these problems in a particular setting. In the banking and credit markets, the second ancient problem is how to resolve the maturity mismatches of borrowers who want to borrow long with those of lenders, who sometimes want difficult-to-predict immediate access to their funds. This is a key aspect of the more general issue of the different risk profiles faced by borrowers and lenders under different types of mortgage contracts (see Green and Wachter (2007), Miles and Pillonca (2008), and Honohan (2008, this issue) on the difficulties of indexed contracts). With hindsight, we can see that recent 'solutions' to these problems via greatly increased securitization, collateralized debt obligations, special investment vehicles, or, indeed, using short-term money-market funding for mortgages, as in the case of Northern Rock, involved taking on greatly underappreciated risks. Allen and Gale (2007) examine financial crises, from both historical and theoretical perspectives. Their discussion of issues of fragility, liquidity, bubbles, contagion, and optimal regulation is highly relevant to the current international financial crisis.

## VII.   Housing-market dynamics and regional migration in Britain

Migration between regions plays a central role in the working of regional housing and labour markets. As such, it has often been said that the relatively low level of labour mobility in the UK is intimately connected with the poor performance of some regional labour markets and the relatively unusual structure of housing tenure in the UK, with its small private rental sector and declining social rented sector.[26] The high degree of persistence in regional unemployment rates compared with the USA is perhaps one symptom of this inefficiency.

Bover *et al*. (1989) and Muellbauer and Murphy (1991) suggest a number of ways that a large owner-occupied sector could exacerbate regional mismatch over and above the fact that owners face higher transactions costs in moving.[27] A body of econometric evidence has now built up to suggest that high relative earnings and employment opportunities, along with other amenities, encourage migration to a region, while high relative house prices discourage it.[28] The most obvious mechanism for this negative effect of house prices on migration arises through cost-of-living differentials between regions and, to a lesser extent, credit constraints operating through the mortgage lending system. However, Muellbauer, Murphy, and Cameron (MMC, 2006) show that there are additional housing-market effects.

A more plentiful housing provision per unit of population tends to attract migrants. This is because, outside the owner-occupied sector, quantity constraints are likely to matter, given controlled rents in the social housing sector and sticky rents in the market sector. In addition, uncertainty, risk aversion, expectations formation, and adjustment costs play an important

[26] See Hughes and McCormick (1987, 2000), McCormick (1997), and Oswald (1997), *inter alia*.

[27] For example, De Graff and van Leuvensteijn (2007) suggest that the macroeconomic findings in Oswald (1997), Nickell (1998), and Green and Hendershott (2001) that home ownership constrains labour mobility and thus increases unemployment is due to the confounding effect of transactions costs.

[28] See the literature review in MMC (2006), whose main conclusion is that empirical studies of inter-regional migration that have reasonable time variation in the data, and include fixed effects and relevant housing market variables, generally find significant and plausibly signed coefficients on the latter. Contiguity effects and the commuting–migration trade-off are important.

role in migration and commuting decisions, as Mohlo (1984) and others have pointed out. Thus a recent history of negative returns in housing will deter a risk-averse household, given the short-to-medium-run persistence of housing returns. Furthermore, expectations of earnings growth and of house-price appreciation may overcome high house prices. The speed of response of migration to the basic labour- and housing-market forces may also be time varying.

MMC (2006) model gross and net regional migration rates in Britain using National Health Service register data for 1975–2003.[29] The models include: a variable speed of adjustment, which depends on the rate of property transactions; region-specific fixed effects and trends; labour-market variables—relative unemployment rates in change and level form, as well as forecast growth in and the level of relative earnings; housing market variables—the forecast appreciation in and level of relative house prices; a measure of downside house-price risk (recent negative returns); and a quantity variable—the housing stock to working-age population ratio.[30] Most previous research either ignored house prices altogether, or only included level effects. Leaving out housing-market effects typically results in mis-specified models in which labour-market effects are estimated as being weak or even perverse in direction.

The findings thus confirm the importance of housing, as well as the central and different way in which regional migration to London operates. Both have interesting implications for analysing the effects of increased house building in different regions on the affordability of housing in different regions. The important role played by relative expected house-price appreciation and earnings growth, as well as downside risk, helps to explain phenomena many have found puzzling: for example, why the greater South-east continued to attract net migrants in 1988/9 when house prices were rising very strongly relative to other regions and had become very expensive relative to earnings. In turn, this helps a little in explaining why relative regional house prices in Britain have such sustained periods of appreciation. The model also explains why foreign in-migration disprorrtionately shared by London has had less dramatic effects on London house prices than one might have expected: as the population in London rises relative to the housing stock, out-migration to the regions increases sharply, so dampening the impact on London house prices.

## VIII.   Conclusions

In many economies, credit markets and housing markets play far more important economic roles at the macro level, as well as at the micro and spatial levels, than will be found in most economics textbooks. House prices are determined by the interactions of supply and demand at a spatial level. On the demand side, income, interest rates, credit availability, demography, and expected appreciation are major drivers. On the supply side, land-use planning controls, the

---

[29] The migration rates are scaled by the overall rate of regional migration.

[30] The labour- and housing-market variables are formulated so that there is an own-region effect relative to Great Britain as a whole, and a contiguous-region effect. The way the 'own region' and 'contiguous region' effects are combined varies for labour-market and housing-market variables, since the migration and commuting implications of these two types of variables differ. Relatively good labour-market propects (high earnings and low unemployment, etc.) in a region tend to increase both migration and commuting into that region. However, in the case of housing, relatively good prospects (low house prices, high expected capital gains, etc.) tend to raise migration and reduce commuting into the region.

tax system, and the structure of local government can all have large effects on housing supply. Thus, housing wealth plays a potentially very important role in macroeconomic fluctuations and the distribution of welfare. However, this role is dependent on the institutional framework governing property rights, access to credit, financial architecture and regulation, and trading costs.

The simplistic view, that for spending power and macroeconomic consequences, housing wealth is just like financial wealth, has been disputed here. Logic and evidence suggest that net worth does not capture fully the relevant information in wealth portfolios to explain consumption. Liquid assets tend to be more spendable that illiquid assets, and the liquidity of housing is quite context dependent. Housing is both an asset and a good providing important services and this implies that changes in its price have different implications from changes in other asset prices. Moreover, the collateral role of housing varies greatly with the structure of institutions. This implies that important differences exist between countries and over time, since increased access to credit increases the impact of house prices on consumption.

An important reason why this matters for macroeconomic stability and the stability of the financial system is that house prices can overshoot their fundamentals. The empirical evidence is that housing markets are not 'efficient'.[31] There is evidence that in many countries house-price expectations contain an element based on the extrapolation of recent gains and the UK evidence discussed in section II is entirely consistent with this. This means that a sequence of positive shocks, causing prices to rise, results in further appreciation beyond the fundamentals. The second chief reason why house prices can overshoot is because credit markets tend to do so, as so clearly illustrated by the US sub-prime explosion of lending and its subsequent collapse. The reasons have been much debated in recent years and include the skewed incentives for bankers selling products from which they personally make short-term gains, even though banks as a whole may lose in the long run. Since banks are essential to the functioning of the economy, they know that public agencies will save them from the worst consequences of their risk-taking excesses. Unsustainable increases in credit availability, together with the positive feedbacks on the wider economy of rising housing wealth (and the associated borrowing and spending, and house building in some economies), can thus be another element in house prices potentially overshooting.

Increases in the average real price of housing change the distribution of welfare towards the old, who tend to be owners, and away from the young, who tend not to be owners and may not even be old enough to vote. The effects on the intergenerational distribution of welfare are similar to those of higher government budget deficits (see Weale, 2007). An important difference, however, is that while deficits may be used to fund public goods, such as health and education, the redistribution from an increase in average house prices is towards the haves from the have-nots. Because access to a clean environment and publicly funded goods, such as transport and education, is reflected in land or house prices, as Gibbons and Machin (2008) demonstrate, inequality of income and wealth is often transmitted into differential access to such goods. Thus, higher average house prices tend to amplify market inequality and social exclusion. The lack of voting power of the young and the disproportionate influence of wealth, via the media and the funding of political parties, tends to make governments complicit in policies resulting in higher house prices. This includes planning or zoning policies favouring incumbents, as well as tax policies. While planning policies are in the process of being

---

[31] For example, see Stein (1995) for reasons to do with credit and short sale constraints and lack of 'deep pockets' by traders.

reformed, Kate Barker herself hints that it is too soon to judge how effective these reforms will be, as well as expressing regrets about the missed opportunities to change the financial incentives for land release of local government.

One ingredient in the UK policy mix, the planning gain surcharge, has already been dropped, given strong opposition from developers as well as from academic experts. Despite the failure of previous development taxes, documented in Barker (2004), this was to have taxed part of the capital appreciation caused by the granting of planning permission. Discussions are proceeding about the form of an alternative charge, which seems likely to be related to the size, e.g. square metres, of the development. If, indeed, the charge takes this form, it will be lowest as a fraction of the value of the development in the locations with the highest land prices, and highest in the most deprived locations where land is cheap. It therefore has the perverse effect of encouraging development in the most expensive and often most congested locations, while discouraging it in the poorest parts of the UK, and is liable to increase demand for bureaucratic interventions for urban regeneration and other ways of helping deprived areas.

An important part of the argument used by governments for transactions taxes of this sort, of which capital gains tax currently contributes the biggest revenue stream, is that property transactions only affect a small fraction of the population at any one time, so minimizing political opposition. Taxes on current market values of land or residential housing, which have far better efficiency and redistributive properties as well as benefits for macroeconomic and financial stability (Muellbauer, 2005), are considered to be too unpopular. Interestingly enough, the considerable externalities generated by private location decisions are seen as a rationale for the great land-use planning apparatus, but not for land- or property-based taxes, which would soften their impact.[32]

The current international financial crisis has highlighted deficiencies in the system of financial regulation. The degree of self-regulation for large banks envisaged under the Basel II accords is unlikely to survive. In the UK, the Financial Services Authority has admitted serious regulatory lapses. Deficiencies in financial regulation and in fiscal and land-use policies have sharpened the policy dilemmas now faced by central banks setting interest rates. A lively debate about whether inflation targeting should be extended to include a role for house prices continues, but often ignores the wider policy context in which house prices are determined.

The failure of governments generally to grasp the nettle of reforms which would help both stabilize their economies and financial systems and reduce inequality and social exclusion has deep roots in political economy, as noted above. The widespread misunderstandings of the causes and consequences of the operation of housing and credit markets have contributed to this failure. In Muellbauer and Murphy (1997), we wrote:

> Our model suggests that, fundamentally, the potential for volatility remains, particularly since, given the low starting point for the house price/income ratio in the 1990s, momentum gathered in the upswing may exacerbate the next overshoot. The model also implies that three forces will dampen the next upturn: unfavourable demographic trends, high levels of debt and high real after tax interest rates. To this one can add the greater awareness by mortgage lenders of default risk and, by the authorities, of the UK housing market as a potential factor in macroeconomic instability. This suggests

---

[32] For example, if building more houses or locating a business at the edge of a town or village reduces property prices, those harmed by the decision would be partly compensated by lower taxes. Similarly, building a good school would raise prices and the higher taxes would automatically help fund the public expenditure involved.

that policy responses would not be lacking if any signs of overheating were again to develop.

While this illustrates nicely the hazards of long-term forecasting, we were wrong not just about population trends and real interest rates, but also far too optimistic about policy reactions.

# References

Abraham, J. M., and Hendershott, P. H. (1996), 'Bubbles in Metropolitan Housing Markets', *Journal of Housing Research*, **7**, 191–207.

Abramovitz, M. (1964), *Evidence of Long Swings in Construction since the Civil War*, New York, National Bureau of Economic Research.

Allen, F., and Gale, D. (2007), *Understanding Financial Crises*, Oxford, Oxford University Press.

Aron, J., Muellbauer, J., and Murphy, A. (2007), 'Housing Wealth, Credit Conditions and UK Consumption', Discussion Paper (forthcoming), Centre for Economic Policy Research, London.

Attanasio, O., and Weber, G. (1994), 'The UK Consumption Boom of the Late 1980s: Aggregate Implications of Microeconomic Evidence', *The Economic Journal*, **104** (427), 269–302.

— Blow, L., Hamilton, R., and Leicester, A. (2005), 'Booms and Busts: Consumption, House Prices and Expectations', Working Paper 05/24, Institute for Fiscal Studies, London.

Ayuso, J., and Restoy, F. (2006), 'House Prices and Rents: An Equilibrium Asset Pricing Approach', *Journal of Empirical Finance*, **13**, 371–88.

Ball, M. (1988), *Rebuilding Construction: Economic Change and the British Construction Industry*, London, Routledge.

Barker, K. (2003), *Review of Housing Supply: Interim Report—Analysis*, London, HM Treasury.

— (2004), *Review of Housing Supply: Final Report—Recommendations*, London, HM Treasury.

— (2006a), *Barker Review of Land Use Planning; Interim Report—Analysis*, London, HMSO.

— (2006b), *Barker Review of Land Use Planning; Final Report—Recommendations*, London, HMSO.

— (2008), 'Planning Policy, Planning Practice, and Housing Supply', *Oxford Review of Economic Policy*, **24**(1), 34–49.

Bean, C. (2004), 'Asset Prices, Financial Instability, and Monetary Policy', *American Economic Review*, **94**(2), Papers and Proceedings, 14–18.

Benito, A., Thompson, J., Waldron, M., and Wood, R. (2006), 'House Prices and Consumer Spending', *Bank of England Quarterly Bulletin*, Summer, 142–54.

Bernanke, B. (2007), 'Opening Remarks', Housing, Housing Finance, and Monetary Policy Symposium, sponsored by the Federal Reserve Bank of Kansas City, Jackson Hole, WY, 30 August–1 September, 1–20.

— Gertler, M. (2001), 'Should Central Banks Respond to Movements in Asset Prices?', *American Economic Review*, **91**(2), 253–7.

Blanchard, O., and Watson, M. (1982), 'Bubbles, Rational Expectations and Financial Markets', in P. Wachtel (ed.), *Crises in the Economic and Financial Structure*, Lexington Books, 295–316.

Blundell-Wignall, A. (2007), 'Structured Products: Implications for Financial Markets', *OECD Financial Market Trends*, **93**(2), 27–57, Paris, Organization for Economic Cooperation and Development.

Boone, L., Girouard, N., and Wanner, I. (2001), 'Financial Market Liberalization, Wealth and Consumption', Working Paper 308, Economics Department, Paris, Organization for Economic Cooperation and Development.

Bordo, M., and Jeanne, O. (2002), 'Monetary Policy and Asset Prices: Does Benign Neglect Make Sense?', *International Finance*, **5**(2), 139–64.

Borio, C., and Lowe, P. (2002), 'Asset Prices, Financial and Monetary Stability: Exploring the Nexus', Working Paper 114, Basle, Bank for Internationa Settlements.

Bover, O., Muellbauer, J., and Murphy, A. (1989), 'Housing, Wages and UK Labour Markets', *Oxford Bulletin of Economics and Statistics*, **51**(2), 97–136.

Bramley, G. (1993*a*), 'The Impact of Land-use Planning and Tax Subsidies on the Supply and Price of Housing in Britain', *Urban Studies*, **30**, 5–30.

— (1993*b*), 'Land-use Planning and the Housing Market in Britain—The Impact on Housebuilding and House Prices', *Environment and Planning A*, **25**, 1021–51.

— Leishman, C. (2005*a*), 'Modelling Local Housing Market Adjustment in England', in D. Adams, C. Watkins, and M. White (eds), *Planning, Public Policy and Property Markets*, Oxford, Blackwell.

— — (2005*b*), 'A Local Housing Market Model with Spatial Interaction and Land-use Planning Controls', *Environment and Planning A*, **37**(9), 1637–49.

Browning, M., Gørtz, M., and Leth-Petersen, S. (2008), 'House Prices and Consumption: A Micro Study', University of Copenhagen, mimeo.

Buiter, W. (2008), available at http://blogs.ft.com/maverecon/2008/01/how-stretched-i.html#more

Cameron, G., Muellbauer, J., and Murphy, A. (2006), 'Was There a British House Price Bubble? Evidence from a Regional Panel', Discussion Paper 5619, London, Centre for Economic Policy Research, April.

Campbell, J. Y., and Mankiw, N. G. (1990), 'Permanent Income, Current Income and Consumption', *Journal of Business and Economic Statistics*, **8**(3), 265–79.

— Cocco, J. F. (2007), 'How Do House Prices Affect Consumption? Evidence from Micro Data', *Journal of Monetary Economics*, **54**(3), 591–621.

Carroll, C. D., Otsuka, M., and Slacalek, J. (2006), 'How Large Is the Housing Wealth Effect? A New Approach', Economics Working Paper 535, Johns Hopkins University.

Case, K. E., Quigley, J. M., and Shiller, R. J. (2005), 'Comparing Wealth Effects: The Stock Market versus the Housing Market', *Advances in Macroeconomics*, **5**(1), Article 1, available at http://www.bepress.com/bejm/advances/vol5/iss1/art1

Catte, P., Girouard, N., Price, R., and André, C. (2004), 'Housing Markets, Wealth and the Business Cycle', Working Paper 394, Economics Department, Paris, Organization for Economic Cooperation and Development.

Cecchetti, S., Genberg, H., Lipsky, J., and Wadhwani, S. (2000), *Asset Prices and Central Bank Policy*, Geneva Reports on the World Economy 2, International Centre for Monetary and Banking Studies and Centre for Economic Policy Research.

Cheshire, P. (2008), 'Reflections on the Nature and Policy Implications of Planning Restrictions on Housing Supply. Discussion of "Planning Policy, Planning Practice, and Housing Supply" by Kate Barker', *Oxford Review of Economic Policy*, **24**(1), 50–8.

Cristini, A., and Sevilla, A. (2007), 'Do House Prices Affect Consumption and Why? A Replication and Comparison Exercise', University of Bergamo, mimeo, July.

De Graff, T., and van Leuvensteijn, M. (2007), 'The Impact of Housing Market Institutions on Labour Mobility', CPB Netherlands Bureau for Economic Policy Analysis, Discussion Paper No. 82.

DeLong, J. B., Shleifer, A., Summers, L. H., and Waldmann, R. J. (1990), 'Noise Trader Risk in Financial Markets', *Journal of Political Economy*, **98**, 703–38.

Demery, D., and Duck, N. (2007), 'The Theory of Rational Expectations and the Interpretation of Macroeconomic Data', *Journal of Macroeconomics*, **29**(1), 1–18.

DiMartino, D., and Duca, J. V. (2007), 'The Rise and Fall of Subprime Mortgages', *Federal Reserve Bank of Dallas Economic Letter*, **2**(11), November.

Di Pasquale, D. (1999), 'Why Don't We Know More about Housing Supply?', *Journal of Real Estate Finance and Economics*, **18**(1), 9–23.

Disney, R., Bridges, S., and Gathergood, J. (2006), 'Housing Wealth and Household Indebtedness: Is there a Household "Financial Accelerator"?', University of Nottingham, mimeo.

Evans, A. W. (1996), 'The Impact of Land-use Planning and Tax Subsidies on the Supply and Price of Housing in Britain', *Urban Studies*, **33**, 581–85.

Fernandez-Corugedo, E., and Muellbauer, J. (2006), 'Consumer Credit Conditions in the UK', Bank of England Working Paper 314.

Garino, G., and Sarno, L. (2004), 'Speculative Bubbles in UK House Prices: Some New Evidence', *Southern Economic Journal*, **70**(4), 777–95.

Gibbons, S. and Machin, S. (2008), 'Valuing School Quality, Better Transport, and Lower Crime: Evidence from House Prices', *Oxford Review of Economic Policy*, **24**(1), 99–119.

Goodhart, C., and Hofmann, B. (2008), 'House Prices, Money, Credit, and the Macroeconomy', *Oxford Review of Economic Policy*, **24**(1), 180–205.

Green, R., and Hendershott, P. (2001), 'Homeownership and Unemployment in the US', *Urban Studies*, **38**, 1509–20.

— Wachter, S. (2007), 'The Housing Finance Revolution', paper presented at Housing, Housing Finance, and Monetary Policy Symposium, sponsored by the Federal Reserve Bank of Kansas City, Jackson Hole, WY, 30 August–1 September.

— Malpezzi, S., and Mayo, S. K., (2005), 'Metropolitan-specific Estimates of the Price Elasticity of Supply of Housing, and their Sources', *American Economic Review*, **95**(2), 334–9.

Greenspan, A. (2002), 'Opening Remarks', in Rethinking Stabilization Policy, symposium sponsored by the Federal Reserve Bank of Kansas City, Jackson Hole, WY.

— Kennedy, J. (2008), 'Sources and Uses of Equity Extracted from Homes', *Oxford Review of Economic Policy*, **24**(1), 120–44.

Gross, D. B., and Souleles, N. S. (2002), 'Do Liquidity Constraints and Interest Rates Matter for Consumer Behavior? Evidence from Credit Card Data', *Quarterly Journal of Economics*, **117**(1), 149–85.

Harrison, J. M., and Kreps, D. M. (1978), 'Speculative Investor Behavior in a Stock Market with Heterogeneous Expectations', *Quarterly Journal of Economics*, **92**, 323–36.

Hatzius, J. (2006), 'Housing Holds the Key to Fed Policy', Goldman Sachs Global Economics Paper No. 137, 3 February, available at https://portal.gs.com

Himmelberg, C., Mayer, C., and Sinai, T. (2005), 'Assessing High House Prices: Bubbles, Fundamentals and Misperceptions', *Journal of Economic Perspectives*, **19**(4), 67–92.

Honohan, P. (2008), 'Discussion of "Financial innovation and European housing and mortgage markets", by David Miles and Vladimir Pillonca', *Oxford Review of Economic Policy*, **24**(1), 176–79.

Hughes, G., and McCormick, B. (1987), 'Housing Markets, Unemployment and Labour Market Flexibility in the UK', *European Economic Review*, **31**(3), 615–41.

— — (2000), *Housing Policy and Labour Market Performance*, report prepared for Office of the Deputy Prime Minister, London..

Iacoviello, M. and Neri, S. (2007), 'Housing Market Spillovers: Evidence from an Estimated DSGE Model', Boston College and Bank of Italy, mimeo.

IMF (2005), 'An Error Correction Model of House Prices', *United Kingdom: Selected Issues*, IMF Country Report No. 05/81, Washington, DC, International Monetary Fund.

Kearl, J. R. (1979), 'Inflation, Mortgage and Housing', *Journal of Political Economy*, **87**(5), 1115–38.

Kennedy, N., and Andersen, P. (1994), 'Household Saving and Real House Prices: An International Perspective', Bank for International Settlements Working Paper No. 21.

Keys, B., Mukherjee, T., Seru, A., and Vig, V. (2008), 'Did Securitization Lead to Lax Screening? Evidence from Subprime Loans 2001–2006', mimeo, available at http://ssrn.com/abstract = 1093137

Leamer, E. (2007), 'Housing and the Business Cycle', paper presented at Housing, Housing Finance, and Monetary Policy Symposium, sponsored by the Federal Reserve Bank of Kansas City, Jackson Hole, WY, 30 August–1 September..

Lehnert, A, (2004), 'Housing, Consumption, and Credit Constraints', Board of Governors of the Federal Reserve System, Finance and Economics Discussion Paper No. 2004–63.

Leunig, T., and Overman, H. (2008), 'Spatial Patterns of Development and the British Housing Market', *Oxford Review of Economic Policy*, **24**(1), 59–78.

Pryce, G. (1999), 'Construction Elasticities and Land Availability: A Two-stage Least Squares Model of Housing Supply using the Variable Elasticity Approach', Urban Studies, **36**(13), 2283–304.

McCormick, B. (1997), 'Regional Unemployment and Labour Mobility in the UK', *European Economic Review*, **41**, 581–9.

Maclennan, D., Muellbauer, J., and Stephens, M. (1998, 2000), 'Asymmetries in Housing and Financial Market Institutions and EMU', *Oxford Review of Economic Policy*, **14**(3), 54–80. Revised version in T. Jenkinson (ed.), *Readings in Macroeconomics*, Oxford, Oxford University Press, 2000.

Malpezzi, S., and Maclennan, D. (2001), 'The Long-run Price Elasticity of Supply of New Residential Construction in the United States and the United Kingdom', *Journal of Housing Economics*, **10**(3), 278–306.

Mayer, C. J., and Somerville, C. T. (2000*a*), 'Residential Construction: Using the Urban Growth Model to Estimate Housing Supply', *Journal of Urban Economics*, **48**(1), 85–109.

Mayer, C. J., and Somerville, C. T. (2000*b*), 'Land Use Regulation and New Construction', *Regional Science and Urban Economics*, **30**(6), 639–62.

Mayo, S., and Sheppard, S. (1991), 'Housing Supply and the Effects of Stochastic Development Control', Oberlin Discussion Paper in Economics, Oberlin University, USA.

Mayo, S., and Sheppard, S. (1996), 'Housing Supply under Rapid Economic Growth and Varying Regulatory Stringency: An International Comparison', *Journal of Housing Economics*, **5**(3), 274–89.

Meen, G. (2001), *Modelling Spatial Housing Markets*, Boston, MA, Kluwer Academic.

— Andrew, M. (1998), *Modelling Regional House Prices: A Review of the Literature*, Report Prepared for the Department of the Environment, Transport and the Regions, Centre for Spatial and Real Estate Economics, University of Reading.

— — (2008), 'Planning for Housing in the Post-Barker Era: Affordability, Household Formation, and Tenure Choice', *Oxford Review of Economic Policy*, **24**(1), 79–98.

Mian, A., and Sufi, A. (2008), 'The Consequences of Mortgage Credit Expansion: Evidence from the 2007 Mortgage Default Crisis', NBER Working Paper 13936.

Miles, D. (1992), 'Housing Markets, Consumption and Financial Liberalization in the Major Economies', *European Economic Review*, **36**, 1093–136.

— (1994), *Housing, Financial Markets, and the Wider Economy*, New York, Wiley.

— Pillonca, V. (2008), 'Financial Innovation and European Housing and Mortgage Markets', *Oxford Review of Economic Policy*, **24**(1), 145–75.

Mishkin, F. S. (2007), 'Housing and the Monetary Transmission Mechanism', paper presented at Housing, Housing Finance, and Monetary Policy Symposium, sponsored by the Federal Reserve Bank of Kansas City, Jackson Hole, WY, 30 August–1 September, 359–413.

Mohlo, I. (1984), 'A Dynamic Model of Inter-regional Migration Flows in Great Britain', *Journal of Regional Science*, **24**(3), 317–37.

Muellbauer, J. (2005), 'Property Taxation and the Economy after the Barker Review', *The Economic Journal*, **115**(502), C99–117.

— (2007), 'Housing, Credit and Consumer Expenditure', paper presented at Housing, Housing Finance, and Monetary Policy Symposium, sponsored by the Federal Reserve Bank of Kansas City, Jackson Hole, WY, 30 August–1 September, 267–334.

— Lattimore, R. (1995), 'The Consumption Function: A Theoretical and Empirical Overview', in M. H. Pesaran and M. R. Wickens (eds), *Handbook of Applied Econometrics: Macroeconomics*, Oxford, Blackwell.

— Murata, K. (2008), 'Consumption, Land Prices and the Monetary Transmission Mechanism in Japan', paper presented at ESRI and the Center on Japanese Economy and Business (CJEB) at Columbia Business School, workshop on 'Japan's Bubble, Deflation and Long-term Stagnation', Columbia University, 21 March.

— Murphy, A. (1989), 'Why has Personal Saving Collapsed?', *Credit Suisse First Boston Research*, July, 26–77.

— — (1990), 'Is the UK's Balance of Payments Sustainable?', *Economic Policy*, 348–95, with discussion by Mervyn King and Marco Pagano, 99–113.

— — (1991), 'Regional Economic Disparities: the Role of Housing', in A. Bowen and K. Mayhew (eds), *Reducing Regional Inequalities*, London, NEDO and Kogan Page.

— — (1994), 'Explaining Regional House Prices in the UK', Department of Economics Working Paper 94/29, University College Dublin.

— — (1995), 'Explaining Regional Consumption.' paper presented at the Bank of Portugal Conference on the Microeconomics of Saving, Lisbon, available at www.housingoutlook.co.uk

— — (1997), 'Booms and Busts in the UK Housing Market', *The Economic Journal*, **107** (November), 1701–27.

— — Cameron, G. (2006), 'Housing Market Dynamics and Regional Migration in Britain', Centre for Economic Policy Research (CEPR), Discussion Paper No. 5832.

Nickell, S. (1998), 'Unemployment: Questions and Some Answers', *The Economic Journal*, **108**, 802–16.

— (2005), 'Practical Issues in UK Monetary Policy, 2000–2005', Keynes Lecture in Economics, British Academy.

Notarpietro, A. (2007), 'Credit Frictions and Household Debt in the US Business Cycle: A Bayesian Approach', Bocconi University, mimeo.

OECD (2005), 'Recent House Price Developments: The Role of Fundamentals', *OECD Economic Outlook*, **78**, 193–234, Paris, Organization for Economic Cooperation and Development.

Oswald, A. J. (1997), 'The Missing Piece of the Unemployment Puzzle', Inaugural Lecture, University of Warwick.

Otsuka, M. (2006), *Essays on Household Portfolio and Current Account Dynamics*, ProQuest/UMI.

Price, S. (2008), 'Discussion of "House Prices, Money, Credit, and the Macroeconomy" by Charles Goodhart and Boris Hofmann', *Oxford Review of Economic Policy*, **24**(1).

Quigley, J. M. (2007), 'Regulation and Property Values in the United States: The High Cost of Monopoly', in G. K. Ingram and H. Yu-Hung (eds), *Land Policies and Their Outcomes*', Cambridge, MA, Lincoln Institute, 46–66.

Rajan, R. G. (2005), 'Has Financial Development Made the World Riskier?', paper presented at The Greenspan Era: Lessons For The Future, symposium sponsored by the Federal Reserve Bank of Kansas City, Jackson Hole, WY, 25–27 August, Federal Reserve Bank of Kansas City, 313–69.

Roche, M. (2001), 'The Rise in House Prices in Dublin: Fad or Just Fundamentals?', *Economic Modelling*, **18**, 281–95.

Royal Town Planning Institute (2007), 'Opening up the Debate: Exploring Housing Land Supply Myths', RTPI Evidence to the Callcutt Review, available at http://www.rtpi.org.uk/cgi-bin/item.cgi?id = 913

Saiz, A. (2008), 'On Local Housing Supply Elasticity', Wharton School, University of Pennsylvania, mimeo.

Scheinkman, J. A., and Xiong, W. (2003), 'Overconfidence and Speculative Bubbles,' *Journal of Political Economy*, **111**(6), 1183–219.

Shiller, R. (2007), 'Understanding Recent Trends in House Prices and Home Ownership', paper presented at Housing, Housing Finance, and Monetary Policy Symposium, sponsored by the Federal Reserve Bank of Kansas City, Jackson Hole, WY, 30 August–1 September, 89–124.

Slacalek, J. (2006), 'What Drives Personal Consumption? The Role of Housing and Financial Wealth', German Institute for Economic Research, DIW Berlin, mimeo.

Stein, J. C. (1995), 'Prices and Trading Volume in the Housing Market: A Model with Down-payment Effects', *Quarterly Journal of Economics*, **110**(2), 379–406.

Swank, J., Kakes, J., and Tieman, A. F. (2002), 'The Housing Ladder, Taxation and Borrowing Constraints', DNB Report No. 9, Amsterdam.

Taylor, J. B. (2007), 'Housing and Monetary Policy', paper presented at Housing, Housing Finance, and Monetary Policy Symposium, sponsored by the Federal Reserve Bank of Kansas City, Jackson Hole, WY, 30 August–1 September, 463–76.

Theil, H. (1976), Theory and Measurement of Consumer Demand, Studies in Mathematical and Managerial Economics, Vol. **21**, Amsterdam, North-Holland.

Tirole, J. (2005), *The Theory of Corporate Finance*, Princeton, NJ, Princeton University Press.

Titman, S., (1985), 'Urban Land Prices Under Uncertainty', *American Economic Review*, **75**, 505–14.

Vermeulen, W., and Rowendal, J. (2007), 'Housing Supply and Land Use Regulation in the Netherlands', Tinbergen Institute Discussion Paper, TI 2007–058/3.

Weale, M. (2007), 'Commentary: House Price Worries', *National Institute Economic Review*, **200**, April, 2–4.

Weeken, O. (2004), 'Asset Pricing and the Housing Market', *Bank of England Quarterly Bulletin*, Spring, 32–41.

Wolf, M. (2008) 'Why It is So Hard to Keep the Financial Sector Caged', *Financial Times*, 5 February.