WHEN IS A HOUSING MARKET OVERHEATED ENOUGH TO THREATEN STABILITY?

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When is a housing market overheated enough to threaten stability?

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Abstract:

In many countries, house prices are subject to boom/bust cycles and in some these are linked to severe economic and financial instability. Overheating can have both a price and a quantity dimension, but it is likely that they are linked by common drivers. However, much depends on the land-use planning regime which profoundly affects the supply response. It is helpful to make the distinction between overshooting of house prices due to extrapolative expectations and ‘frenzy’, given fundamentals, and shifts in possibly fragile fundamentals. The contribution of careful econometric modelling to estimating the effects of the former is demonstrated: central banks or other policy makers should institute quarterly surveys of house price expectations of potential housing market participants to help assess the first type of overshooting.

Assessing the fragility or otherwise of the economic fundamentals is more complex. Credit supply conditions in the mortgage market are the ‘elephant in the room’. Without taking a credit conditions measure into account, one simply cannot understand the behaviour of house prices, household debt and consumption in countries such as Australia, the UK, the US, South Africa or France or understand vulnerability of some economies to high levels of household debt. Other financial and economic indicators of vulnerability are discussed, including high bank leverage ratios, high ratios of loans to deposits, debt, deficit and current account to GDP ratios. Models of early warning of financial and economic crises estimated on large country panels need to be quite complex, for example, including some important interaction effects since shock transmission is very institution dependent.
1. Introduction

In many countries, house prices are subject to boom/bust cycles and in some these are linked to severe economic and financial instability. In the decade 1997 to 2007, the rise in real house prices was unprecedented in many countries, though absent in a few, notably Japan and Germany. The four panels of Figure 1 illustrate with real house price data from the OECD. The first panel, Figure 1a is for four Anglo-Saxon economies: the US, UK, Canada and Australia. These are all economies with liberal credit markets and independent monetary policies. The UK shows the highest appreciation in real house prices since 1970, followed by Australia, Canada and the US, though from 1970 to 2005, appreciation was similar in the US and in Canada. The US pattern is smoother than that of the other economies, reflecting averaging over heterogeneous regional markets, a generally more elastic housing supply, and the nature of the FHFA data there illustrated. Of these four economies, the US has experienced the greatest fall in real house prices since 2006 while house prices in Australia and Canada rose to new highs after the global financial crisis.

![Figure 1a: Log real house prices in four Anglo-Saxon economies (base 1997:1)](image-url)
Figure 1b shows an alternative US house price index, the Core-Logic index, based on prices for a wider range of homes financed with prime and nonprime mortgages and its log ratio to the FHFA index, which tracks home sales financed with prime, conforming mortgages. The Core-Logic index shows greater appreciation during the sub-prime boom and also rises more sharply during the 1980s. It also declines more in the early 1990s and after 2006. Indeed, the similarity of the US with other Anglo-Saxon economies is greater for the Core-Logic index than for the FHFA index.

Figure 1c illustrates prices for a group of Eurozone economies, France, Spain, the Netherlands and Ireland, where mortgage credit appears to have been relatively freely available over the last decade. Spain and Ireland experienced a similar rise in real prices from 1970 to 2007, and all four economies went through large appreciations from the late 1990s to 2007, with the largest subsequent declines in Ireland followed by Spain. A

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1 This version of the index excludes “distressed” sales stemming from actual or imminent foreclosures.

2 The house price index for Spain which begins in 1987 is linked to a house price index for Madrid for earlier years. This undoubtedly biases up the pre-1987 rise in real house prices reported for Spain.
remarkable fact is that from 1997 to the end of 2007 Spain and France had almost the same rise in real house prices. Yet Spain’s housing and mortgage markets and wider economy are now in deep crisis while France’s are not.

Figure 1c: Log real house prices in the liberal Eurozone (base 1997Q1)

Figure 1d covers Germany, Italy, Japan and Korea where mortgage credit availability has long been restricted with little evidence of major shifts in the last decade. Japan experienced a great rise in real house prices (actually housing land prices) in the 1980s but real house prices have been in almost continuous decline since their 1991 peak.

The differences between the economies illustrated in the above charts are so extreme as to call into question the ‘one size fits all’ tendency of conventional modern macroeconomics. Clearly institutional differences as well as different types of economic shocks matter greatly.

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3 In Korea, the experience of the 1980s house price boom and later bust led the authorities to take systemic action to forestall repeated occurrences, see Igan and Kang (2011).
Over the years, the IMF has regularly pointed to risks posed by house price bubbles and developed a methodology for judging the degree of overvaluation, as in the analysis subtitled, ‘Assessing Overvaluation in House Prices’, in IMF (2008, p.11). This study was published shortly after house prices peaked in many countries and before the most severe stage of the global financial crisis. For each country, house price growth is modelled as a function of the lagged ratio of house prices to per capita personal disposable income (PDI), growth in per capita PDI, short-term interest rates, long-term interest rates, credit growth, and changes in equity prices and working-age population. The unexplained increase in house prices from 1997-2007 defines the “house price gap”, a measure of overvaluation and Figure 2 displays the results.

The relationship between these estimated gaps and subsequent falls in real house prices is poor, apart from Ireland. The US, ranked thirteenth, has experienced a sharper fall in real house prices than all countries ranked as higher risks, except for Ireland and Spain. Australia, France, Norway, Belgium, Sweden, and Finland had all experienced rises in real house prices by the third or fourth quarter of 2010 relative to the first quarter of 2008 despite their supposed over-valuations, though prices in Australia have slipped a little since then.
The 2008 IMF study lacks a clear theoretical foundation. The omission of the supply side is a fundamental problem – making no distinction, for example between Ireland and the US where there were large expansions of housing supply, and the UK where there was not. The imposition of a long run income elasticity of one for house prices without any justification is another serious problem. Permanent shifts in credit conditions and shifts in the age-structure of the working age population play no role in the analysis, the former being a particularly crucial omission. Further, no distinction is drawn between temporary overshooting conditional upon fundamentals and the fragility of the fundamentals themselves. Finally, no account is taken of feedback loops between the housing market and the wider economy. These issues will be addressed in the course of the paper.

Section 2 introduces the connection between housing and economic and financial
stability. The feedback loops operate via construction and its impact on income and employment as well as on house prices, via consumption and via the financial system, all of which proved important in the banking crises and the GDP declines suffered by the US, Ireland and Spain in recent years. Section 3 discusses problems of modelling house prices, comparing alternative approaches and discussing the measurement of user cost, with emphasis on the treatment of expectations of capital appreciation and of the risk-premium. I contrast overvaluation arising from extrapolative expectations, conditional on economic fundamentals, from overvaluation due to unsound fundamentals such as unsustainable levels of income, interest rates or credit architecture. Since overheating in housing markets can involve quantities as well as prices, as recently demonstrated in the US, Ireland and Spain, section 4 turns to possible drivers of construction booms and busts. As we shall see, econometric research on these questions still has far to go.

Since consumption accounts for around 70 percent of GDP in these economies, it is important to quantify/gauge the linkages between consumption and housing, which vary with the nature of credit market architecture across countries and over time. The multi-equation approach pioneered by my colleagues and myself treating credit supply conditions as a latent variable provides sophisticated answers and is outlined in section 5I also suggest some simple single equation tests that indicate whether housing has important effects on consumption and whether shifts in credit availability have had important effects on the relationships between consumption, income and wealth portfolios. Feedbacks via the financial system are discussed in Section 6. Most obviously they occur when mortgages to households and loans to developers go bad, or when regulation fails to prevent unsustainable credit practices from spawning real and financial bubbles. Since mortgage data tend to be far more systematic, I focus more attention on residential mortgages. Section 7 draws some conclusions.
2. Housing and financial stability

Figure 3 presents some of the mechanisms and feedbacks which operated in this crisis in the US.\(^4\) From left to right, it illustrates the linkages via construction, whose collapse amounted to about 3.5 percentage points of GDP after three years (see Duca, Muellbauer, and Murphy, 2010), and secondly, via consumption, as collateral values dropped and credit contracted. The third and fourth channels track the negative feedback loops via credit markets and the banking sector more generally, through credit contraction triggered by rising bad loan books, risks of bank insolvencies and risk spreads. In turn, the decline in economic activity feeds back negatively on home values, amplifying the initial shocks.

![Figure 3: The financial accelerator operating in the US sub-prime crisis](image)

This second channel played a central role in the US crisis. Indeed, in the Great Recession, the saving rate rose by four percentage points, as consumption fell four percent more than\(^4\) This figure was designed by John Duca and is taken from Duca and Muellbauer (2012).
income, in sharp contrast to a rather flatter saving rate in prior U.S. recessions. Consumption also plays a key role in economic upswings of the business cycle, where negative feedbacks become positive feedbacks. As suggested by the contrast between Spain and France discussed below, recognizing differences between countries in whether this channel is operative, can substantially improve our understanding of whether a house price boom is likely to be followed by an economic and financial crisis.

Countries where this channel is absent almost certainly include Germany, Italy, France, Japan and China. In China, there may, however, be another channel with consequences for GDP which operates via the budget constraint of local governments. According to a 2012 report from the British Consul General in Chongqing, the China Real Estate Information Centre (CRIC) reported that city income for the first 11 months of 2011 from land transfer fees was down in 50 out of 66 cities studied. 17 cities had a drop of income from land transfers totalling RMB500 Billion (approximately £50 Billion). Provincial governments also receive tax revenues from real estate and construction companies and some collateralise their debt (or that of the local government financial vehicles) with land under the assumption of increasing prices. A decline in land prices and revenues could have consequences for health and other local expenditures and for the quality of local government debt, currently thought to be around 25 percent of GDP.

The fall-out in the US on credit availability from the financial system after the financial crisis despite strenuous policy efforts to soften the impact is well-known, see Duca et al., 2010, for example. Mortgage delinquency and the proportion of mortgages entering foreclosure proceedings reached unprecedented levels in 2009-10. The average loan-to-value ratio for first time home buyers as recorded in the American Housing Survey in 2009 fell to 1990s levels, see Duca et al. (2012a). The net percentage of domestic respondents tightening standards for residential mortgage loans in the FRB’s Senior Loan Officer survey reached unprecedented heights in 2008-9. All of these negatively affected the real economy.

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3. What can be learned from house price models?

There are two basic theories of house price determination. The first is based on supply and demand functions, and a price adjustment process which brings supply and demand into balance. The second is based on finance and assumes that arbitrage brings house prices and rents into an equilibrium relationship, again after a price adjustment process towards equilibrium. In both approaches, interest rates as well as shifts in access by households to credit provide an important link between the macro-economy and house prices.

(a) The supply and demand approach

In this approach, the supply – the stock of houses – is given in the short run. Then prices are determined by the inverted demand curve, i.e. by the stock of housing and the factors driving demand. Let log housing demand be given by

\[ \ln h = -\alpha \ln hp + \beta \ln y + z \]

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:

\[ \ln hp = \frac{\beta \ln y - \ln h + z}{\alpha} \]

Note that forecast simulations of house prices for this model would need a residential investment equation as well as assumptions on income, interest rates and credit availability. 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). 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. \( \ln y - \ln h \). But the elasticity of house prices w.r.t. income, given the stock is \( \beta/\alpha \), which is typically substantially above 1 since the own-price elasticity is below
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:

$$uc = hp(r + \delta + t - \Delta hp^\epsilon / hp) = hp(uch)$$  \hspace{1cm} (3)$$

where $r$ is the real after-tax interest rate of borrowing, $\delta$ is the deterioration rate plus a risk premium, $t$ is the property tax rate, and $\Delta hp^\epsilon / hp$ is the expected real rate of capital appreciation. Before discussing user cost further, consider the other basis for modelling house prices.

**(b) The rent-arbitrage approach**

House prices have also been modelled using the house price-to-rent approach, particularly in the U.S. where rental markets are well-developed, and rents are generally market-determined, in contrast to the more heavily regulated rental markets of some European countries. This approach is grounded in finance and assumes that, in the absence of substantial frictions and credit restrictions, arbitrage between owner-occupied and rental housing markets implies the house rent-to-price ratio equals the real user cost of capital term $uch$ defined as, in equation (3), by the cost of mortgage finance minus expected appreciation:

$$\frac{rent}{hp} = uch$$  \hspace{1cm} (4)$$

A similar result also obtains when agency costs make renting housing services more expensive than owning a home. Inverting and taking logs of equation (4), implies:

$$\ln(hp/rent) = - \ln(uch)$$  \hspace{1cm} (5)$$

where the elasticity of the price-to-rent ratio w.r.t the user cost term $uch$, equals -1.
However, in a 2008 paper, Kim showed, in an equilibrium model, that when rental agency costs are accompanied by binding, maximum LTV ratios on marginal home buyers, the equilibrium log price-to-rent ratio is more complicated:

\[
\ln(hp/rent) = f(\ln(uch), \text{max } LTV)
\]  

(6)

where the size of the negative real user cost elasticity can be smaller than 1, in line with empirical results, see Duca, Muellbauer and Murphy (2011) for evidence and discussion. Kim’s result is close in spirit to Meen (1990) who considers the result of relaxing mortgage credit constraints. He shows that when there is a binding credit constraint, the user cost term in the optimal house price to rent ratio includes the shadow price of the credit constraint (such as a maximum LTV bound), which will be related to the pervasiveness of such constraints.

Note that forecast simulations for house prices from a model of this kind require an equation for rents and assumptions on the path of the loan to value ratio ceiling. Our research, see Duca et al. (2009)\(^7\), suggests that US rents adjust relatively slowly to their long run determinants which are the general price level, the level of house prices, the nominal mortgage rate and user cost.

(c) User cost and expectations

Both the inverse demand and the arbitrage approach depend heavily on the user cost concept. An important practical issue for the modeller is how to measure expected house price appreciation. One might have thought that regularly monitoring household expectations of house prices would be a high priority for central banks and other policy makers. However, actual surveys of house price expectations are unfortunately sparse and intermittent, likely a consequence of the ‘pretence of knowledge syndrome’ (Caballero, 2010, Hayek, 1974) which has long plagued conventional macroeconomics. Bracke (2010) analyses some of the sparse survey information for the US and UK and finds strong evidence that expectations of future appreciation are linked with past observed appreciation and cannot be reduced to a combination of other macroeconomic predictions. He also finds a high dispersion of

\(^7\) This is a longer version, including forecast simulations, available on the 2010 AEA meetings website, of our published 2011 paper.
responses across households. He interprets these findings in a sticky information or epidemic framework of spreading information. Hamilton and Schwab (1985), Case and Shiller (1989, 1990), Poterba (1991) and Meese and Wallace (1994) find house price changes are positively correlated and past information on housing fundamentals forecasts future excess returns. Capozza and Seguin (1996), and Clayton (1997) also find evidence against rational home price expectations.

In our research on aggregate US house prices, (Duca, et al., 2011, 2012a,b), we find evidence that a user cost taking the average rate of appreciation over the previous four years produces the best fit for both the inverse demand and the rent arbitrage approaches. In econometric work on house prices in Norway using the inverse demand approach, Anundsen (private communication 2012) finds that the four-year average rate of appreciation also gives the best fit in an expression for user cost. In our UK regional house price model (Cameron et al., 2006), we test for an asymmetry between appreciation and depreciation and find the four-year memory of depreciation produces the best fit. In current research on France with Valerie Chauvin we find that an average of one-year and four-year lagged appreciation gives the best fitting user cost measure. While there is probably not a universal law of precisely how house price expectations are formed, there is at least a hint from this set of evidence that econometric modellers should treat the lagged four-year rate of appreciation as an important candidate for measuring user cost. This horizon is close to the five-year window used by Himmelberg, et al. (2005).

A four-year memory has important implications for overshooting of house prices: it implies that a series of positive shocks such as the sub-prime mortgage boom and fall in interest rates experienced in the US, which cause house prices to appreciate, will cause further appreciation over a considerable period even if the fundamentals do not change further or mean-revert. An estimate of the importance of this phenomenon can be derived from our 2012 US study of the FHFA house price index (Duca, et al., 2012a,b). Scale the log user cost term by its estimated coefficient in the long run solution for real house prices. Figure 4 plots this value against an alternative which uses the average historical appreciation from 1982 to 2011. The difference of around 35 percent averaged over the peak four quarters in 2005Q2-2006Q1 is a measure of overshooting due to extrapolative expectations.8 Our

8 It seems likely that adding a time-varying risk premium to user cost, as we do for France, see below, would bring down the estimated peak effect in 2005, but would not greatly alter the overall conclusions.
model suggests that this was a very important component of the overshooting in US house prices. Of course, given sluggish adjustment, house prices never got to the peak implied by this long-run solution: the equilibrium correction towards the other fundamentals was already offsetting the pull from extrapolative expectations and before long the other fundamentals turned sour. Mortgage interest rates drifted up from the 2005 lows and, in 2007, loan-to-value ratios started to fall. Thus, there was an important role of extrapolative expectations in the overshooting of house prices. This is consistent with the snap-shot surveys by Case and Shiller in 2004 which suggested that many households had absurdly positive expectations of appreciation. Shiller (2007) emphasises the psychological element in expectations. But since we can account for the other drivers and quantify the adjustment process, we can understand the series of positive economic shocks that ultimately drove expectations. This is extremely helpful in quantifying the degree of overvaluation and the time path for likely corrections.

A sceptic might argue that estimated dynamics from modelling aggregate house price indices could be distorted because of aggregation bias. In other words, different regions might exhibit different dynamics, and none might be like the aggregate. One test of our model is the predictions it generates. In the 2009 version of the paper on the AEA 2010 website, we simulated the time path of future house prices using the rent-arbitrage approach. We correctly forecast that there would be a second leg to house price declines after the tax credit for first time home buyers was withdrawn in June 2010. We also forecast that 2012 would see the bottom of nominal house prices and obtain the same result with the inverse demand approach in Duca et al. (2012a,b). At the time of writing, the Case-Shiller 20-city house price index had risen significantly by May from its low reached in February 2012. The FHFA index lags several months behind the Case-Shiller index so our forecast made in December 2009 of lows in the second half of 2012 is plausibly on track. A range of other housing market indicators are also improving, lending credibility to our conclusion.9

Other approaches to modelling expectations of capital appreciation are also possible. One might, for example, model future house prices appreciation in a semi-rational model using data households would have some knowledge of such as lagged house price changes, income, mortgage interest rates and growth of mortgage debt as a simple proxy for changes in credit

9 Pessimists who point to the continued high levels of stocks of housing in foreclosure tend to forget that house prices reflect both the owner-occupied and rental markets and vacancies in the latter are at the low of the decade.
availability. The fitted value could then serve as a proxy for expected appreciation. But over what horizon is future appreciation likely to be relevant? Obviously, one quarter ahead, given transactions costs and delays is not a plausible horizon. One year ahead is more plausible but also seems arbitrary. If some average with declining weights of future appreciations is to be taken, what weights should be used? These are relevant research questions.

Figure 4: Contribution to long-run log real FHFA house prices of log user cost with last four years’ appreciation vs. contribution of log user cost with long-run appreciation.

There is evidence that in countries with volatile house prices non-linear ‘frenzy’ effects can operate. Hendry (1984) first used the cubic of recent appreciation to model this phenomenon. Muellbauer and Murphy (1997) found supporting evidence for the UK and Muellbauer and Williams (2011) do so for Australia. One interpretation is that if house price rises exceed thresholds given by transactions costs and costs of finance, the potential speculative gains become so attractive that the number of bidders in the housing market rises sharply, accelerating house prices. This can be an over-shooting mechanism additional to the one discussed above. The cubic has the property that ‘frenzy’ can also operate on the downside so that the fear of capital losses might also raise transactions volumes leading to sharp price
declines. An alternative interpretation is that in periods of falling prices, defaults rise, leading to a rise in the proportion of auction sales, and so more rapid price movements.

The user cost approach itself suggests an intrinsic source of non-linearity in house price dynamics. Equations (5) and (6) suggest that the log of the user cost term \( uch \) is the right functional form for explaining log house prices. The log function has the property that \( \log x \) tends to minus infinity as \( x \) tends to zero. The log function therefore amplifies the effect of user cost as user cost becomes small – which can happen in house price booms as Figure 4 above, based on log user cost, amply illustrates.

(d) Coping with ‘negative user cost’

The ex-post user cost, neglecting the risk premium, 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. Since the log of a negative number cannot be defined, this is a problem. We can write

\[
uch_t = r_t + \delta_t + \tau_t - E, \Delta \log hp
\]  

(6)

where \( E, \Delta \log hp \) is the expected annualised rate of change of real house prices over the relevant horizon. While the last 4 quarters of appreciation or, if relevant, the annual rate over the last four years can be large enough to make the expression in (6) negative, this may not be a problem if expectations, averaged over households, have the form

\[
E, \Delta \log hp = \lambda \text{const} + (1 - \lambda) \text{av} \Delta \log hp
\]  

(7)

where \( \lambda \) is positive and less than one, and \( \text{av} \Delta \log hp \) is the relevant annualised historical rate of appreciation. Equation (7) clearly reduces fluctuations in the implied expected house price appreciation.

Another possibility is to assume that annualised transaction costs and the risk premium are large enough always to make the expression in (6) positive. Some transactions costs are monetary and there is considerable variation across countries in the size of such costs. But since there are typically costs of moving and costs of fine-tuning the decorative state of one’s
new dwelling as well as non-monetary costs associated with disruptions of social networks and learning about new environments, it may be reasonable to suppose that these costs are always large enough.

However, it also seems likely that the risk premium is time-varying and could increase with recently experienced volatility and with the deviation of prices from perceived economic fundamentals. One might have thought that such a specification would pose challenging problems of non-linear estimation and identification. However, for our French house price data, it is possible to go quite far. Our simple version of $uch$ is defined as

$$uch_i = 0.12 + 0.85 mr / 100 - \Delta_d \log p_c_i - 0.5(\Delta_d \log hp_i + \Delta_{16} \log hp_i / 4)$$

which assumes that total annualised transaction costs of all kinds plus a constant risk premium is 12 percent and that the appropriate average rate of tax relief on mortgage interest is 15 percent, giving an after tax mortgage interest rate of 0.85 $mr/100$, where $mr$ is the nominal percentage rate of interest rate on mortgages. We then subtract the annual inflation rate to obtain the real after-tax interest rate. Finally, we subtract the annual rate of increase of real house prices averaged over the last 4 quarters and the last 16 quarters, respectively. The user cost term $uch$ is positive throughout the sample. A plot of $\log uch$, scaled to measure its long run impact on log real house prices, is shown in Figure 5. It reaches its minimum in 2005Q3.

We can then test a linear versus a log-linear specification. For data from 1980Q4 to 2003Q4, linearity is strongly rejected against log linearity. For the full sample to 2011Q1, linearity is marginally preferred. However, by raising the composite transactions cost/risk premium term from 0.12 to 0.20, log-linearity again does better for the full sample. This finding and the shift in parameter estimates are consistent with the hypothesis of a time-varying risk premium. We now model such a risk premium in terms of a measure of house price volatility, $hpvol$, defined as a moving average of the absolute deviation of changes in log real house prices from their mean as follows:

$$hpvol_i = \text{abs}(\Delta_d lhp_i - m) + 0.7 \text{abs}(\Delta_d lhp_{i-4} - m) + 0.7^2 \text{abs}(\Delta_d lhp_{i-8} - m)$$
$$+ 0.7^3 \text{abs}(\Delta_d lhp_{i-12} - m) / (1 + 0.7 + 0.7^2 + 0.7^3)$$

(9)
Here \( \text{abs}(x-m) \) denotes the absolute value of \( x-m \), where \( m \) is the mean of \( x \).

We now add this measure of the risk premium to the previous user cost term with a coefficient \( \beta \) to be estimated. Thus define

\[
\log uch2_t = \log(\beta h p v o l_{t-1} + uch_t)
\]  

(10)

For French data, the estimate of \( \beta \) is highly significant at 0.63 (\( t=5.1 \)) and parameter stability and fit both improve with this risk adjustment of the user cost term. Figure 5 compares the time profile of the risk adjusted log user cost term with the unadjusted log user cost term measured in terms of the long run impact on the log of the French real house price index. Figure 5 makes clear that risk adjustment substantially lowers the peak impact of the log user cost term relatively to values over the rest of the period.\(^\text{10}\)

\[\text{Figure 5: Long-run impact on log real house prices in France of risk-adjusted log user cost vs. unadjusted log user cost.}\]

\(^\text{10}\) For simplicity, the coefficient of -0.37 (\( t=-4.5 \)) estimated for the log risk adjusted user cost term has been applied to both measures. Omitting the time varying risk adjustment results in a substantially smaller coefficient (in absolute value) on log user cost even if a small constant is added to user cost to prevent it falling into a negative range.
As for the US, it is possible to estimate the impact of extrapolative expectations of house price appreciation. We do so in Figure 6, which compares the long-run impact of the log risk adjusted user cost term on the log of real house prices with a log user cost term where recent experience of house price appreciation is replaced by the historical mean and where last quarter’s risk premium is replaced by its historical mean. At the peak in 2005, the difference between the two is around 0.22, representing ‘overvaluation’ of around 25 percent in the level of real house prices. While this is a substantial amount, it is a lower figure than the US estimate reported above, in part probably because the US estimate does not take into account a time-varying risk premium. However, the main reason is likely to be that the positive shocks from financial innovation in the US during the 2000s were a lot stronger, so that US house prices deviated more from sustainable long-run fundamentals than was the case in France.

Figure 6: Contribution to long-run log real house prices in France of log user cost with recent appreciation and risk premium vs. contribution of log user cost with long-run appreciation and average risk premium.

(e) Overshooting due the decline of fragile fundamentals
Overshooting due to extrapolative expectations, given economic fundamentals, is one aspect of overvaluation. Another, sometimes even more important reason for overshooting is if the ‘fundamentals’ which include income, credit supply, interest rates, and the housing stock themselves overshoot. There are many examples of this. First, consider Finland. After the credit liberalisation of the 1980s (without reducing generous tax relief on mortgage interest) and a huge house price and consumption boom, Finland faced a great reduction in exports in the early 1990s when the former Soviet Union collapsed. At the same time, German unification led to a rise in interest rates. The decline in income, employment and credit came on top of a housing market which would have been overvalued even if fundamentals had held constant. In the resulting crisis, GDP fell 14 percent and unemployment rose from 3 percent to almost 20 percent.

The UK too experienced a decade of credit liberalisation in the 1980s and a boom in credit, consumption, house prices and the balance of payments deficit. We argued: “Our empirical evidence on the determination of house prices suggests an important extrapolative component in expectations, giving rise to bouts of speculative frenzy. With the sharp rise in house prices, residential property became more than half of personal sector wealth. Financial liberalization allowed households to cash it in as consumer expenditure financed by borrowing. In our view, in contrast to that of at least one of our discussants, liberalization of housing finance had important effects on personal wealth, consumption and hence the trade deficit” (Muellbauer and Murphy, 1990, pp.349-350).

The discussion by Mervyn King summarised our policy recommendation for the demand side as follows: “First, they would increase capital adequacy requirements on mortgage loans in the balance sheet of firms in the financial-services industry. Second, they would introduce a national tax on residential property and restrict the scope of mortgage interest relief. Both their diagnosis and proposed cure raise the question of how far developments in the housing market can be blamed for the recent emergence of large balance of payments deficits.” (King (1990), p.383). He then dismissed both the diagnosis and cure, arguing that the more likely explanation for the boom in credit, house prices and consumption was that income growth expectations had become more optimistic.

Soon after this 1989 debate (published 1990), domestic inflation rose sharply. The UK had entered the Exchange Rate Mechanism with an overvalued exchange rate. Base rates were raised from 7.5 percent in 1988 to 15 percent in 1989 in an attempt to curtail domestic inflation and curb balance of payments deficits. House prices fell from 1991 to 1995 and
mortgage arrears and foreclosures rose to all-time records in 1991-2. In 1992 the Bank of England launched a (secret) life-boat of liquidity to support the financial system and given the pressure of high interest rates within the ERM, and a severe domestic recession, the UK was forced to exit the ERM in September 1992.

In the more recent UK crisis, what proved most unsustainable were the extreme levels of leverage of the banking system, the maturity mis-match between short-term money market financing of mortgages and these mortgages, and the structural deficits run by the government. The exchange rate too was overvalued, given crowding out of capacity in the non-financial sector of the economy by the long boom in the financial sector which now faced an unprecedented contraction.

In our 2011 US house price paper based on the rent arbitrage approach, the most obvious way fundamentals shifted was through the decline in the LTV for first-time buyers to levels last experienced in the 1990s. In the inverse demand approach, the house-building boom in 2002-2006 also plays a role since the housing stock had risen significantly relative to income and population by 2007, adding to downward pressure on prices.

![Figure 7: Contrasting current account-to-GDP ratios in France and Spain.](image-url)
The contrast between Spain and France is also instructive. My research with Valerie Chauvin at Banque de France suggests that the housing collateral effect on consumption is absent in France, but micro-evidence by Bover (2005) suggests that it is positive in Spain. Spain almost certainly experienced a rather greater expansion of credit availability than France but its effect on real house prices was offset by a far greater construction boom. Lending to companies, many in the construction business, was certainly part of this expansion in Spain and part of the problem Spanish banks currently face. Spain also experienced very high levels of immigration, which added both to labour working in construction and to demand for housing. In economic fundamentals, Spain’s international competitiveness measured in relative unit labour costs declined more than France’s. Together, these effects largely account for the far greater ballooning of Spain’s balance of payments deficit shown in Figure 7. The figure contrasts the current account to GDP ratio of the two countries since 1995 which in Spain reached minus 10 percent in 2008 while France’s never fell below minus 2.5 percent.

4. Modelling residential construction: what scope for overshooting?

The three panels of Figure 8 show the ratio of residential housing investment to GDP for the same three sets of countries examined in the Introduction. Figure 8a most strikingly contrasts the collapse of house-building in the US and the UK since 2006 and 2007 with the steady performance in Australia and Canada. In the US the peak to trough decline accounts for around 3.5 percent of GDP, and about 2 percent in the UK. In the UK, construction volumes in 2009-10 fell from low levels to even lower levels, so that the UK built fewer homes in 2010 than in any year since 1923. The boom in 2002-2006 in the US contrasts with 15 years of little fluctuation in the UK.

The corresponding Figure 8b for Spain and other countries in the Eurozone with more liberal credit markets suggests that the collapse of house building in Ireland accounted for around 9 percent of GDP and around 3.5 percent in Spain, while France and the Netherlands had far more modest declines in the share of residential investment in GDP. The building boom in Ireland and Spain seems to have begun in the mid-1990s but these OECD data indicate a more extreme boom in Ireland. The impact of excess supply on the house prices in Ireland displayed in Figure 1c is most plausible.

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11 In a parallel to recent problems in Spain, U.S. bank failures during the recent crisis largely owed to bank lending to construction and land development companies.
Figure 8a: Ratio of residential housing investment to GDP for four Anglo-Saxon economies
(Data from OECD Economic Outlook data base.)

Figure 8b: Ratio of residential housing investment to GDP in the liberal Eurozone
Finally, the corresponding picture in Figure 8c for Germany, Italy, Japan and Korea throws light on the fall in real house prices experienced by Germany after the late 1990s and by Korea in the 1990s: the expansion of the housing stock from high levels of investment seems to have been part of the explanation in each case.

But what determines residential investment? The determinants of the supply of housing are extraordinarily complex. The literature on the econometrics of new house building is correspondingly 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 buildings 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 differ, while among owners, owner-occupiers may behave differently from landlords. New construction can be for owner-occupation, the private rental sector, or for the social rental sector, each with different drivers. Housing is heterogeneous and the available data on numbers of units usually ignore this heterogeneity by type and location.

![Figure 8c: Ratio of residential housing investment to GDP in Germany, Italy, Japan and Korea.](image-url)
Government intervention in some countries had or has been 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 the taxation of developers (see Muellbauer and Murphy (2008) for further references and Quigley (2007) for a review of the US literature).

Wide disagreements on details remain. 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) 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. Stripped to the essentials 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 co-integrated relationship cannot exist explaining the former by the latter. The second is 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 in the long run. Land, however, is non-reproducible. Builders effectively sell on 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. To be more precise, because builders also need to take the cost of capital into account, a user cost concept analogous to that which influences household demand for housing, should help explain variations in residential investment.

The relevant interest rate will be the rate at which builders can borrow, which will be correlated with but not identical to mortgage interest rates. Furthermore, access to borrowing by large and small construction companies may sometimes move differently from access to mortgages by households. It is also possible that builders may have better informed capital gains expectations than households. Nevertheless, it is likely that an extrapolative element governs these expectations. Hence it is likely that quite similar factors, namely extrapolative expectations of capital gains, low interest rates and easier access to borrowing, explain both
the over-shooting of residential construction volumes in housing booms and the overshooting of house prices in, for example, Ireland, Spain and the US. User cost together with an ageing population could also help explain the declining levels of residential construction in Japan, illustrated in Figure 8c.

Most housing economists asked before 2005 would have argued that economies where the supply responsiveness of housing is relatively high, as in Ireland, Spain and the US, should experience lower house price volatility than economies where housing supply is unresponsive as in the UK. The evidence since strongly contradicts this hypothesis. Part of the explanation lies in the lags in the response of the stock of housing which is still rising when house prices may already be falling, and part in the common drivers of over-shooting noted above – clearly if supply overshoots, then the subsequent fall in home prices to restore equilibrium will be greater. The argument here is similar to the classic ‘hog cycle’. The common drivers would include the greater relaxation of credit conditions and poorer lending standards, and hence greater reversal after 2007, in at least Ireland, Spain and the US. Another reason for greater volatility in countries with high supply elasticities lies in the macro-economic feedback on unemployment and incomes which occurs when residential construction volumes collapse.

5. How can we tell if the consumption channel operates?

There has been much disagreement among economists on whether variations in housing wealth matter for consumption. The pre-crisis view of Mervyn King and the Bank of England, that house-price fluctuations reflect shifts in income expectations and play no causal role for consumption, has long been popular. In a number of papers I have explained that

12 Here pig farmers respond to high prices by breeding more pigs in year t, but these take two years to reach maturity. Supply in year t+2 then overshoots and excess supply reduces prices at t+2 which then reduces the supply of pigs at t+4, causing prices to rise once more.

13 Attanasio and Weber (1996) and Attanasio et al. (2009) are among the adherents, but Attanasio (2011) represents a pronounced shift away from this position. In the latter paper, the authors set up a micro-simulation with a realistic representation of credit constraints in the UK mortgage market and simulate consumption implications of house price shocks with these frictions.
classical theory, in which credit constraints and buffer stock saving play no role, suggests that there could be a small housing wealth effect on non-housing consumption but that on the standard national accounts’ concept of consumption, including imputed rent from housing, the housing wealth effect was likely to be negative.

Moving beyond classical theory to take credit constraints into account, the conclusions are quite different: a liberal credit market tends to result in a positive effect of 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. However, in the long-run, the accumulation of higher debt will eventually reduce consumption. 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. Institutional differences between countries therefore matter greatly, and so does properly controlling for changing credit conditions in econometric work.

With proper controls for shifting access to credit, income growth expectations, interest rates and the change in the unemployment rate, empirical estimates of the shifting marginal propensity to consume out of housing wealth tend to be lower but more accurately determined than estimates widely found in the literature, such as Case et al. (2005).

To meet the King/Bank of England view with evidence, it is necessary to have a quantitative measure of shifts in credit conditions as well as of consumers’ permanent income. In the Latent Interactive Variable Equation System (LIVES) approach we extract an index of credit conditions from a system of equations typically including consumption and other credit related variables such as mortgage debt, house prices, home equity withdrawal, mortgage refinancing rates and potentially other components of household flow of funds.

\[\text{Refer to page 27 for further details.}\]
data. Such a system is also a major step towards developing a general equilibrium analysis in which household portfolios, on the basis of which consumers make consumption decisions, are themselves endogenised. It is a key component of modelling efforts to understand the links between finance and the real economy.

A starting point for understanding consumption is the canonical form of the life-cycle/permanent income consumption function. The best log-linear approximation to this is

$$\ln c_t = \alpha_0 + \ln y_t + \gamma A_{t-1}/y_t + \ln \left( y_t^p/y_t \right)$$

(10)

Where $c$ is real per capita consumption, $y$ is real per capita non-property income and the $p$-superscript denotes the permanent version of this income concept, and $A$ is real per capita net worth. $\gamma$ is a close approximation to the marginal propensity to consume out of net worth.

The following is a generalisation, with partial adjustment, of this canonical permanent income model of consumption in equation (10):

$$\Delta \ln c_t \approx \lambda (\alpha_0 + \alpha_1 r_t + \alpha_2 \theta_t + \ln y_t + \alpha_3 E_t \ln \left( y_t^p/y_t \right) + \gamma A_{t-1}/y_t - \ln c_{t-1}) + \epsilon_t$$

(11)

where $\lambda$ measures the speed of adjustment. This version relaxes the constraint on the coefficient for permanent income (since not all consumers may be so forward looking) and allows the real interest rate $r$ and income uncertainty $\theta$ (typically proxied by changes in the unemployment rate) to affect consumption.

There are two reasons why even this is not general enough. First, the net worth constraint that all assets are equally spendable should be regarded as absurd by any banker.

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15 Our initial attempt to measure shifts in mortgage credit conditions in Muellbauer and Murphy (1993) estimated an equation for the loan to value ratio for first time buyers to 1979 and took the post 1979 residuals as the indicator of shifts in mortgage credit availability. This proved to be highly significant as a measure of the rise in the marginal propensity to consume out of illiquid assets (including housing) in the UK consumption function. The method was later extended to a system of regional loan to value data extracting the residual as a common factor, and in Fernandez-Corugedo (2006) to a 10-equation system including proportions of LTVs and loan to income ratios exceeding traditional thresholds. In Aron and Muellbauer (2000, updated 2012), we applied the LIVES method to a 2-equation system of consumption and debt.

Obviously liquid assets should be more spendable than illiquid assets and economic theory implies that housing and financial assets are not equivalent. It follows that net worth should be disaggregated into at least 3 components: we find that net liquid assets (defined as liquid assets minus debt, illiquid financial assets and housing assets) is the minimal set for useful empirical work. Secondly, credit market liberalisation shifts some of the key parameters. Most importantly, it likely raises the average consumption to income ratio, given household portfolios, and if access to home equity loans increases, the marginal propensity to consume out of housing wealth should also rise.

A typical symptom of omitting important shifts in credit conditions when estimating extended versions of equation (11) with wealth split into its main components is that the coefficients on these wealth components are unstable over time and the speed of adjustment is typically low or unstable. For quarterly data, any speed of adjustment below about 0.2 is, in our experience, a symptom of mis-specification. For US quarterly data from 1966 to 2011 one can find a great variety of adjustment speeds for 25 year sub-periods ranging from less than 0.1 to 0.35, and hugely unstable coefficients on net worth components, ranging from sometime negative for liquid assets to sometimes positive for debt, and similarly for housing wealth.

The Bank of England investigated the housing wealth to consumption linkage in Benito et al.. (2006). In a consumption equation estimated for 80 quarters in a rolling window from 1998 to 2006Q1, they report a significant decline in the relationship. Few details of the model are available except that it was in an equilibrium correction form with a long-run solution linking consumption with income and net financial wealth and that only the change in housing wealth, and not the level, is allowed to influence the change in log consumption. No information is given on whether the controls included the change in the unemployment rate, interest rates or on the size of estimated adjustment speeds. Omission of such controls and of the radical credit market liberalisation that began at the end of 1979 would undoubtedly affect the empirical estimates. In research with Janine Aron and Anthony Murphy reported in Muellbauer (2007) and Aron et al.. (2012), we find that the coefficient on the level of housing wealth/income interacted with the credit conditions index of Fernandez-Corugedo and Muellbauer (2006) 17 is highly significant (t-ratio around 6) and stable. Since the credit

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17 Incidentally, to obtain approval for this paper to appear as a Bank of England working paper we had to remove three passages. The first suggested that the level of UK household debt might pose a threat to future
conditions index rose from the mid-1990s into the 2000s, this indicates that, in the relevant period, housing wealth actually had a rising influence on consumption, the opposite of the Bank of England conclusion.

Estimates from our research for the UK, US, Australia, South Africa and France all point to quarterly adjustment speeds between 0.3 and 0.4, shifts in the ratio of consumption to income with credit market conditions, the marginal propensity to consume (MPC) for net liquid assets between around 10 and 16 percent, MPCs for illiquid financial assets between around 2 and 4 percent and highly variable MPCs out of housing wealth ranging from slightly negative to around 5 percent. For these countries, credit market liberalisation had an important impact on consumption. Once this impact is controlled for, the remaining parameters are stable and well-determined, while tests confirm both co-integration and that consumption is the main variable adjusting to the co-integration vector. The combination of wealth and credit effects, in conjunction with accounting for how financial innovation has shifted key financial-real linkages, is necessary to understand the behaviour of consumption in these economies.

6. Non-linearities from the bad-loans feedback loop: understanding payment delinquencies and foreclosures.

The banking channel is the third of the major macro channels involving the housing market. This can be illustrated by comparing the differing experiences of the US, Spain, Ireland, and the UK in the financial crisis beginning in 2007.

financial stability. The second referred to academic research on herd behaviour by banks. The third argued that there were sometimes delays in the reporting of bad loans on bank balance sheets. This all reflects the Bank of England’s earlier neglect of financial stability issues.

18 See Aron et al. (2012), Aron and Muellbauer (2011), Duca, Muellbauer, and Murphy (2012a), Muellbauer and Williams (2011) and Chauvin and Muellbauer (in progress). Japan is the only country where there appears to have been no break in consumption behaviour emanating from credit market liberalisation.

19 This is exactly the opposite conclusion from the influential work of Lettau and Ludvigson (2001, 2004, 2011) who claim that assets, and not consumption, do the adjusting to a co-integration vector defined on consumption, income and net worth. Their work implicitly assumes that the vast changes in US credit market architecture since the 1950s had no impact on the relationships between consumption, income and household portfolios.
Banks in Ireland were caught both by contagion from the US and by a double domestic lending problem: reliance on funding from short-term money markets which seized up in August 2007, and over-extension and poor quality of lending both to property developers and households, see Kelly (2009). The overwhelming bad loan problem led to a massive bank bail-out by the government, and a credit crunch with sharply tighter loan conditions. The hastily given guarantee of the Irish banks by the Irish government and the collapse of tax revenue contributed to a more than doubling in two years of the government debt-to-GDP ratio and to a sovereign debt crisis in 2010-11.

UK banks were far less exposed to UK mortgage markets and UK property developers, but similar Irish banks, were overly dependent on short-term funding and were also hit by contagion. Indeed, by 2010, bad domestic mortgage loans accounted for only a small part of the bad loan book of UK banks. Bad loans that financed highly leveraged take-overs and risky commercial and unsecured borrowers impaired the balance sheets of domestic UK banks far more. However, without unprecedented monetary policy actions, including dramatic reductions in the policy rate and ‘quantitative easing’, there would have been far more severe problems in the UK mortgage market also.

As is well-known, the sub-prime crisis in the US triggered major falls in US house prices, a surge in mortgage defaults and a wider banking and credit market crisis spreading contagion among over-leveraged banks and financial institutions globally. There is a large literature on US mortgage foreclosures since a number of micro data sets are in the public domain. Variants of ‘double trigger’ models where negative equity and cash flow problems are both causes of foreclosure are now generally accepted (see Bhutta, et al., 2010, *inter alia*). The ‘ruthless default’ alternative based on options theory under which rational households simply default if negative equity goes beyond a threshold even if they can still service their mortgage has been found empirically defective.

In the UK, mortgage loans are full recourse loans and defaulting borrowers can be pursued for up to seven years for the short-fall between the loan and what the lender receives from the sale of the foreclosed property. This makes it more likely that foreclosure (mortgage possession or repossession) involves both a weak debt/equity position and a cash-flow problem with debt service. Moreover, with most mortgages at adjustable interest rates, shocks to the debt-service ratio from variations in interest rates can be an important cause of both foreclosure and payment delinquencies (mortgage arrears), together with negative net equity and with income loss, for example, due to unemployment. The UK, like most
countries, has no micro-data in the public domain on representative samples of foreclosures. But it does have aggregate time series data back to the early 1980s. In our analysis of UK arrears and possessions, these factors are analysed together with estimates of the effects of lower loan quality in the late 1980s and the 2005-7 period, the subsequent tightening of access to refinancing possibilities, and government policies. These policies included increasing forbearance on lenders through the enforcement of a code of practice and increasing the generosity of income support for those with payment difficulties. The UK government also took other policy measures to support those at risk of defaulting.

Figure 8 shows the estimated long-run contributions to explaining the log possessions or foreclosure rate in the UK (ZPOSS) from the debt-service ratio (the mortgage interest rate multiplied by average mortgage debt and divided by income, ZPDSR), the proportion of mortgages in negative equity (ZPNEGEQ), and the unemployment rate (ZPUP). The outcomes from 2010 onwards are based on an assumed economic scenario in which interest rates start a return to more normal levels only at the end of 2013. The figure shows the contribution of higher interest rates in 1989-1992 in driving up foreclosures, the contribution of dramatically lower rates over 2008-10 in preventing a larger rise in foreclosures and the effects of simulated interest rate normalisation after 2013. Increases in the proportion of homeowners with negative equity explain why foreclosures did not fall more rapidly in the mid-1990s and accounted for much of the rise in the foreclosure rate from 2004 to 2010.

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20 Aron and Muellbauer (2010), updated in 2012, see http://www.communities.gov.uk/publications/housing/forecastmortgagearrears..

21 The proportion in negative equity is based on a theoretical relationship between the mean and the tail of the distribution of log debt/equity ratios, calibrated to a few survey-based estimates of the proportion in negative equity.
Our research also suggests that the policy of increasing lender forbearance on delinquent borrowers reduced the foreclosure rate by about 12 percent from where it would otherwise have been both in the mid-1990s and since late 2008. Models of mortgage arrears (payment delinquencies) give a somewhat larger relative weight to the debt service ratio and the unemployment rate, but the negative equity share remains highly significant. Complete identification of the effects of previous weak lending standards and of policy responses is not possible, though sign restrictions in the 3-equation system of foreclosures and two measures of arrears are helpful. This aggregative approach would be more accurate if data were available on foreclosures and arrears rates by vintage of issue. Then vintage effects associated with quality of lending at the time could be identified and provide early warning of stresses to come.

Also very useful are the type of data on mortgages published quarterly since 2005 by the UK’s Financial Services Authority. These report key characteristics of distributions of loan-to-value and loan-to-income ratios and other mortgage descriptors such as interest rates and terms of rate adjustments, loan duration, whether securitised or not, low documentation or not, owner occupier or landlord. Unfortunately, the new survey data cannot be matched well with previous survey data, precluding continuity with pre 2005 history. Nevertheless, the
pioneering efforts of the FSA deserve to be copied by all mortgage market regulators and will be very useful in future.

Models for mortgage arrears and foreclosures can be linked to the bad loan books of mortgage lenders used for stress-testing the stability of the financial sector of the economy under different scenarios. The models should contain an important non-linearity or amplification in the transmission of shocks via the housing market to the financial sector and so the economy. This arises because of the non-linear link between house prices and the incidence of negative equity. In the distribution of log debt/equity the area under the right tail of Figure 10 shows the fraction of mortgages with negative equity (with home equity less than debt). If average house prices fell by 10 percent say, the distribution shifts to the right and the area under the tail would increase by much more than 10 percent. Thus, beginning in ‘normal’ times, even a large rise in house prices has little effect in reducing further the already low level of foreclosures. But a moderate fall in house prices, moderately raises the level of foreclosures while a larger fall in prices leads to disproportionately sharper increases in foreclosures. This is an important asymmetry which helps account for the fact that business cycle contradictions are often far sharper than business cycle expansions.

![Probability distribution of log debt equity ratio](image)

**Figure 10: The impact of an increase in the average debt equity ratio on the proportion of mortgages in negative equity**

Bad loans, which could arise from corporate lending to construction companies, as well as from household mortgages coupled with general business conditions affect bank profits,
given the structure of trading income and expenses. The pricing structure of each bank’s balance sheets, especially the mismatch between assets and liabilities, influences each bank’s vulnerability to shocks to interest rates, spreads and default probabilities. This influences the ratings banks receive from ratings agencies, which can affect funding costs and liquidity and possibly even induce bank failure. Banks may engage in fire sales to boost liquidity. Interactions between banks with network externalities (where counter-party risk constrains behaviour) generates the possibility of further losses which, in turn, reduces funding liquidity and thereby increases the possibility of bank failure. Survivors bear credit losses which impair their balance sheets and assumptions need to be made about the portfolio/risk strategies pursued by the survivors. At the end of each period, balance sheets, loan and trading books are set for the beginning of the next period. Bank lending determined in a period also feeds into the macroeconomic picture for the beginning of the next period, when new macro or financial shocks arrive.22

This gives a good flavour of the kinds of realistic feedbacks and shock amplification which arose in the global financial crisis and which potentially could arise again. It highlights the risks associated with higher interest rates in the aftermath of the financial crisis and the role played by housing and mortgage markets in transmitting and amplifying these risks.

7. Policy conclusions.

For assessing whether a housing market is overheated enough to threaten financial and economic stability policymakers should avoid relying on analysis from a ‘sausage machine’ approach to large multi-country data sets which skates over data quality, a proper treatment of the supply side and of credit markets, and over institutional variation across countries and over time. That said, there is much to be learned from comparative cross country analysis of historical experience. My bias is that careful econometric modelling on individual country data sets, but in a comparative perspective, can make a huge contribution.

Overheating can have both a price and a quantity dimension, but it is likely that they are linked by common drivers. However, much depends on the land use planning regime which profoundly affects the supply response: there is at least one country, the UK, where private

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22 A model for risk assessment with broadly these features under the RAMSI acronym has been designed at the Bank of England, see Aikman et al (2009).
sector house-building appears not to respond to price signals, whether house prices or user cost.

It is helpful to make the distinction between overshooting of house prices due to extrapolative expectations and ‘frenzy’, given fundamentals, and shifts in possibly fragile fundamentals. The contribution of careful econometric modelling to estimating the effects of the former was demonstrated and evidence provided that this type of overshooting was large in 2005 in the US and to a lesser extent in France. However, it is high time that central banks and other policy makers conduct regular quarterly surveys of house price expectations of potential housing market participants to help assess the first type of overshooting.

Assessing the fragility and evolution of the economic fundamentals is a more complex task. Our experience has been that credit supply conditions in the mortgage market are the ‘elephant in the room’. Without taking them into account, one simply cannot understand the behaviour of house prices, household debt and consumption in countries such as Australia, the UK, the US, South Africa or France. Although central bank surveys of mortgage market conditions have been run by the US Federal Reserve since 1990 (with improvements since 2007), the ECB since 2002 and since 2007 by the Bank of England, precise interpretation of the results is difficult until a long track record is available. In part, this is because the survey responses tend to be affected by other economic conditions, as well as by longer-term shifts in credit supply.

The systems approach my co-authors and I have pioneered to measure a credit conditions index is extremely helpful. But the results need careful interpretation. For example, the Muellbauer-Williams (2011) estimate of a credit conditions index for Australia shows a fairly spectacular rise in the 1980s and from the late 1990s to 2007, and on estimates up to 2008, a modest decline in 2008. From circumstantial evidence on financial regulation in Australia, the relatively modest leverage and continued profitability of its banking system, as well as skillful counter-cyclical policies of its central bank, one would conclude that these credit fundamentals are more robust in Australia than in US, Ireland, the UK and Spain. Australia’s dependence on exporting to China and more generally it reliance on a permanent improvement in its international terms of trade does point to a potential vulnerability in other economic fundamentals. If these fundamentals turned negative, the high levels of household debt in Australia could seriously constrain growth even though the appropriate exchange rate

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23 The mortgage module was added in 1990 to a survey which began in 1966.
adjustment could very likely be managed without a rise in interest rates and fiscal policy would also be available given low levels of government debt.

The vulnerability of consumption to high levels of household debt has been hidden by analysis that relies on aggregate net worth in modelling consumption rather than on a more accurate but simple three-component disaggregation of wealth as has been revealed by our work. With estimates in different countries of the marginal propensity to consume out of liquid assets minus debt of between 0.10 and 0.16, it is clear that credit market liberalisation—which boosts consumption and debt—can leave households vulnerable to a credit crunch and asset price declines, as demonstrated by the long and painful process of household deleveraging in the UK, the US, Ireland and Spain. Assessing the fragility or otherwise of credit conditions is critical for accurately judging the fragility of economic fundamentals in economies with high levels of household debt relative to income. In turn, since credit conditions themselves depend on the bad loan book of the banking sector, they depend on multiple financial and economic influences.

The size of the housing collateral effect on consumption is another aspect of this potential fragility since the absence of such an effect in, for example, France or Japan, means that part of the potentially amplifying feedback loop is missing, implying less economic instability. In the UK, the US, Australia and South Africa, this feedback loop is powerful. Distinguishing between economies where most mortgage debt is at fixed rates as in the US or France and where most mortgage debt is on floating rates as in the UK is also useful since interest rate risk can be important in the latter. However, one should avoid over-generalizing the implications. For example, in the UK the rise in interest rates in 1988-91 was a powerful crisis trigger, but the ability of the Bank of England to cut rates rapidly in 2008-9 and the large impact of these cuts on cash flows of indebted households, greatly softened the impact of the recent financial crisis. In this aspect, monetary policy in the UK in 2008-9 was more powerful than in the US.

Since housing supply is crucial for understanding long-run developments in house prices, it is important to include it among the economic fundamentals. Fortunately, this is easy since the capital stock evolves fairly slowly even with high rates of investment. However, residential investment is potentially highly volatile as the staggering chart for Ireland demonstrated. The implications for employment and income and further negative feedbacks of a nine percent fall in the proportion of GDP in residential construction in Ireland have been all too obvious. Falls in population growth in economies with high levels of
international migration as in Ireland and Spain can also contribute to housing market declines when economic conditions worsen.

Among financial indicators, the bank leverage ratio and the ratio of loans to domestic deposits are likely to be important. The first is a clear indicator of the stability of the banking system and extreme levels of the second typically indicate potential maturity mismatches between loans and sources of funding. In Ireland and the UK, the resort to short maturity money market borrowing was a crucial source of vulnerability when these markets dried up in 2007, though in Australia, where lending practices were far more cautious and banks remained profitable, it was not. The level and nature of securitisation of loans through asset backed securities can also be a source of vulnerability as the US sub-prime crisis amply illustrates. There are well-regulated, low risk, and transparent forms of this form of finance such as securitizing prime mortgages, but also unstable forms, such as special investment vehicles that funded subprime mortgages, junk bonds, and even private equity investments with short-term debt. So it is not securitisation in general, but the form it takes that can reduce financial and macroeconomic stability.

Clearly, the quality of financial regulation and the general policy stance of the central bank is another important factor in judging the fragility of the fundamentals. In Australia, the Reserve Bank has long had a pragmatically cautious respect for the risks posed by credit and house price booms, has been decisive in raising rates to head off incipient booms and has always been tough on bank supervision. Before 2007, the Bank of England’s views were quite different, as the discussion of the article by Benito et al (2006) and footnote 17 reveals. In 2006, the financial stability division of the Bank had little influence on the Bank’s policies and the Bank only introduced its survey of credit conditions in 2007. Lack of appreciation of the power of the financial accelerator by the Bank’s leadership combined with the light-touch regulation pursued by the government in the game of competitive advantage with New York and other financial centres left the UK ill-prepared when the global financial crisis arrived.

The history of financial and exchange rate crises suggests that foreign currency denominated loans can be a serious source of instability if the exchange rate is on a potentially movable peg. The lessons of the Asian economic crisis of 1997-8 in this respect seem not to have been learned in countries such as Latvia and Hungary, now suffering the consequences of high levels of such loans.

In the more standard real economy sphere, useful signals are public and private sector debt and deficit–to-GDP ratios and current account-to-GDP ratios, which tend to be good
indicators of whether a country is living beyond its means and also may be indicative of a potentially overvalued exchange rate. Spain, Ireland, the UK and the US are all cases in point. However, overly simplistic interpretations need to be avoided. Australia has run current account deficits continuously for decades partly because of the flow of foreign investment to its resources sector. As the inter-temporal balance of payments theory in Muellbauer and Murphy (1990) implies, it can be rational to run sustained deficits if future productivity growth will be higher or if the economy has the capacity to generate higher income, for example, from the exploitation of natural resources.

The role of taxation should also not be ignored. I have long advocated using national property taxes linked to recent market valuations as an automatic stabiliser in economies where housing and mortgage markets play an important role as shock transmitters and amplifiers, see Muellbauer (2005). Such a system raises the tax burden in house price booms and lowers it when house prices fall. It worked well for many years in Denmark until the automatic link with market values was abandoned for short term political gain in 2001. The politics of property are very sensitive, and wealthy elites have a powerful influence. Even now, UK politicians seem unwilling to reform a regressive property tax system linked to 1991 valuations, in which zero marginal tax rates apply to properties above around £1.5m in current price terms. In Australia, where the tax system has long favoured buy-to-let investors, it can be argued that tax reform could do more to discourage high levels of gearing and risk taking in this sector.

This list of potential influences and this brief discussion of their complexities suggests that models of early warning of financial and economic crises estimated on large country panels would need to be quite complex. For example, such models should include some important interaction effects based on detailed institutional understandings of each economy. Obvious dummies for interaction effects would include whether home equity loans are common as a simple proxy for the consumption-housing channel, typical loan to value ratios for first-time buyers, and whether mortgage rates float or are fixed. This is a very active research area, with recent examples including the IMF’s Global Financial Stability reports and the report of the ECB’s team examining macro-financial linkages (Hubrich et al., 2011).

As is now widely accepted, in addition to the standard stabilisation tools, instruments of macro-prudential policy are needed and are under active discussion, see Bank of England (2011). One of these, very closely connected with mortgage markets is the maximum permissible loan-to-value ratio, which appears to have been rather effective in Hong Kong
(see Wong et al., 2011) and other countries. The Bank of England seems to regard this as politically too sensitive to be regulated by the Bank (see Tucker, 2012), but this is all the more reason why such regulation should not be left to politicians. Cyclical variations in capital requirements to tighten standards in booms are clearly beneficial. History suggests that at least a tri-partite sectoral division of such requirements is needed for the financial sector, the real estate connected corporate sector and the rest of the corporate sector. There seems no sensible alternative to managing the commercial real estate sector since activity is so very heterogeneous and measurement so difficult that no standard model such as loan to cash flow or loan to value is likely to work.

References


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