Speech

Housing, leverage and stability in the wider economy

Speech given by

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Housing was at the centre of the financial train wreck of 2007-08 that has seriously damaged most rich countries. In many countries the effects of that crisis on the wider economy have been large, negative and persistent. In some cases sharp declines in house values and steep increases in defaults on mortgages were causal factors behind the problems for banks which then affected credit conditions and confidence more widely. The US, Spain and Ireland fall into this category. In other countries the fall in house values and the rise in bad debts has been less severe and was more a consequence of the catastrophic decline in confidence that came in the wake of the financial problems and which led to a reduction in incomes and higher unemployment. Perhaps France and the UK fall into this category. Some countries have experienced few problems – house prices have not fallen and arrears and defaults on home loans have not picked up significantly – Canada and Germany are in this group.

Housing is a large part of the wealth of the household sector; construction activity is a significant part of total output that contributes disproportionately to its volatility; housing transactions create work and value added for a large number of people in the real estate, banking and legal sectors. As a result turbulence in housing markets has major macroeconomic effects.[1] That is why governments, financial regulators and central banks are thinking hard about the lessons to learn from the crisis of recent years. In this paper I want to consider some of the policies – including monetary policy – that might be used to reduce the risks of turbulence in the housing market causing widespread damage. I will argue that one factor is particularly significant in accounting for the degree of volatility in housing markets and the harm that it can do – leverage: that is the fact that houses are bought with such a high proportion of debt. In that context I consider the advantages of (and obstacles to) greater use of outside equity in financing house purchases.

In the next section I briefly review the story of the past 10 years in the countries which I mentioned above and whose experience has been rather different (US, Spain, Ireland, UK, France, Germany and Canada). I then consider the use of monetary policy to reduce housing market turbulence. This is a blunt instrument. I argue that a switch in the use of equity relative to debt in housing finance is likely to be a particularly effective long-run means of reducing instability. I consider financial contracts that might allow such a switch and assess whether there are obstacles that will prevent outside equity ever becoming significant.

The scale of the recent problems

In many countries house price volatility in the six or so years either side of the financial crises of 2007-2008 has been extreme. Figure 1 illustrates the path of real house prices (that is an index of average nominal house values relative to the private consumption deflator). It is clear that there are major differences between countries. In Ireland real house prices have fallen by about 50% since the peak of early 2007. In Spain and in the US the fall has been a bit less extreme, with prices down by about 30% in real terms. In the UK prices are down by about 20%; in France they are barely down at all and in Canada and Germany

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[1] See, for example, Leamer (2007), Iacoviello (2011), Dynan (2012).

average home prices have moved on a relatively gentle trajectory not much different from the years immediately before the global banking problems.

Figure 1: Real house prices, 2007=100
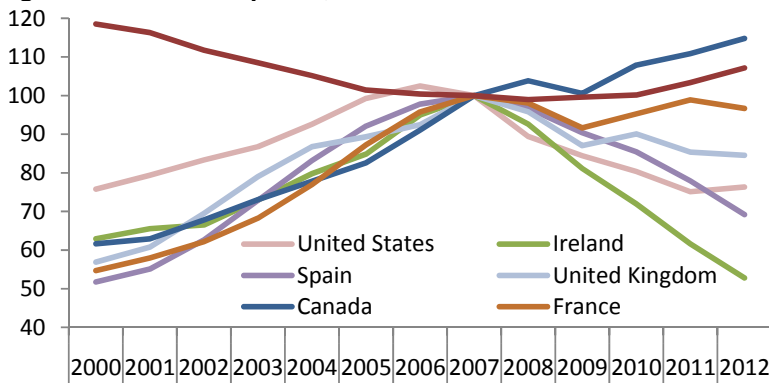
Note: The underlying data are percentage changes on previous year of house prices deflated by the private consumption deflator.

Figures 2 and 3 show what has happened to construction activity. In Spain and Ireland construction in the years before the financial crisis was high relative to GDP and rising; since 2007 it has collapsed. The picture is less dramatic in other countries though in most cases there was a substantial decline in new building in the years after the financial crisis. In the US activity fell sharply but has since revived.

Figure 2: Construction, relative to total economic activity

Figure 3: Annual growth rate of gross value added by construction
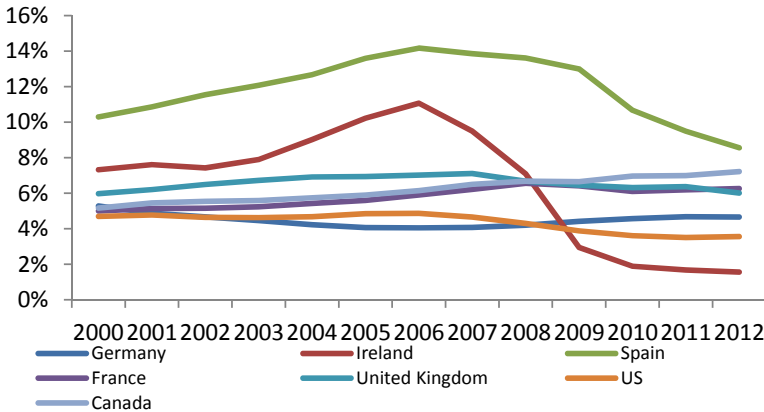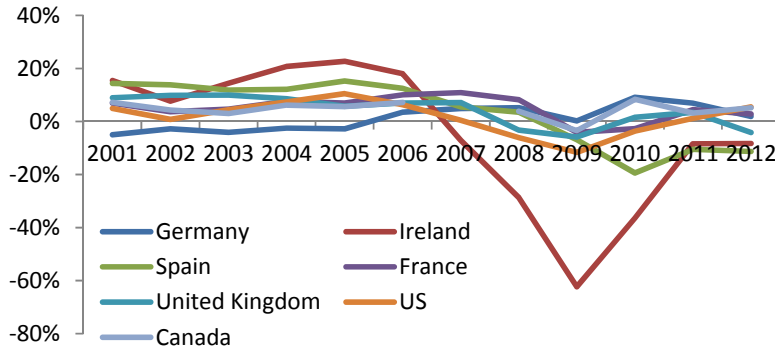
Sources: Bureau of Economic Analysis, Eurostat, Statistics Canada, Bank of England calculations.
Note: Due to a break in the value added series for Canada the 2007 data point is missing.

Housing starts have fallen more dramatically than overall construction activity (figure 4) because construction includes more stable components such as repair and maintenance. In all countries the level of housing starts is below the levels in the years immediately before the crisis; in many cases it is very far below the peak. Housing market transactions have also slumped in many countries, in some cases running at far below half the level that was seen in the years before the banking crash (figure 5).

Figure 4: Housing starts, 2006 = 100
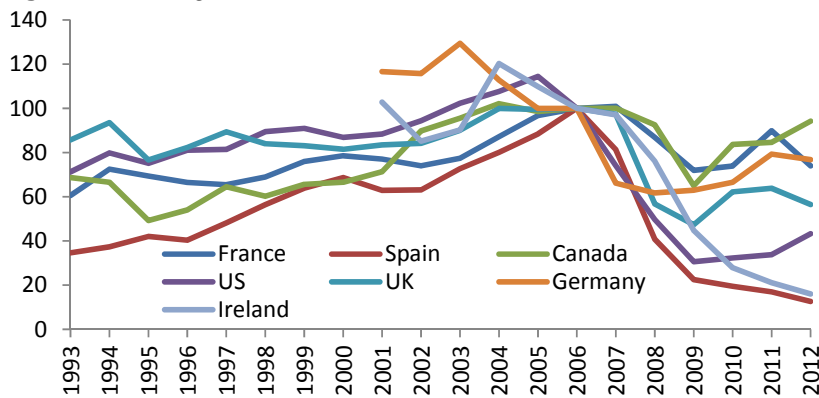
Sources: National Institute for Statistics and Economic Studies, Bloomberg, U.S. Census Bureau, German Federal Statistical Office, and Irish Central Statistics Office.
Note: France, Spain, Canada, US, UK information is for building (housing) starts during the period. Data for Germany and Ireland is for planning permissions granted

Figure 5: Transactions, 2006 = 100
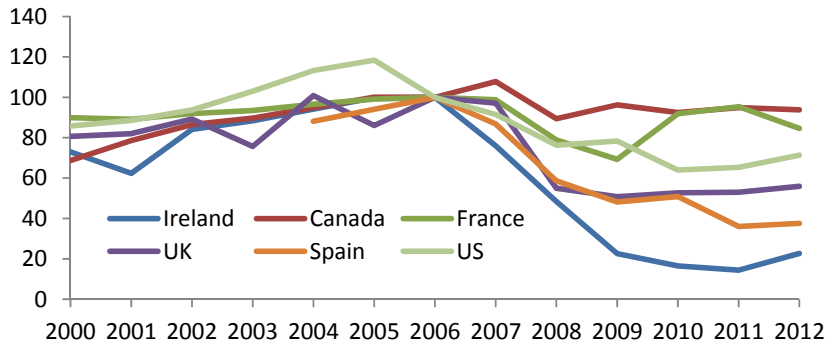
Sources: Bloomberg, European Mortgage Federation (Hypostat 2011), HMRC, Mortgage Bankers Association, ONS, Property Services Regulatory Authority, Ministère de l'Écologie, du Développement Durable et de l'Énergie, The Canadian Real Estate Association, US Census Bureau.
Note: Data obtained for Ireland from European Mortgage Federation has been spliced forward from 2011 using growth rates from Property Services Regulatory Authority. US data are based on a combination of data from the European Mortgage Federation for 2000 to 2004, and the Mortgage Bankers Association and US Census Bureau for the period 2005 to 2012. UK data from 2000 to 2003 use a count on all Particulars Delivered forms (ONS). The UK series from 2004 to 2012 is based on a count on all transactions paying stamp duty (from the ONS between 2004 and 2006 and from HMRC between 2007 and 2012).

Houses are overwhelmingly financed by a combination of equity from the owner-occupier and by debt. For new home owners debt is by far the largest component of overall funding. The big rise in house prices in the years leading up to the crisis in many countries was only feasible because the stock of mortgage debt was rising fast. Between 2000 and 2007 the stock of mortgage debt relative to GDP rose by 22 percentage points (pp) in the US, by 58pp in Ireland[2], by 36pp in Spain and by 27pp in the UK (Figure 6). Figures 7 and 8 show in more detail what happened to the stock of mortgage (and other) debt relative to household incomes in the UK and the US in the years either side of the banking crisis. There was a substantial rise in the amount of debt relative to incomes between 2000 and 2007, followed by a significant fall as new mortgage lending declined dramatically.

Figure 6: Mortgage debt to GDP ratios
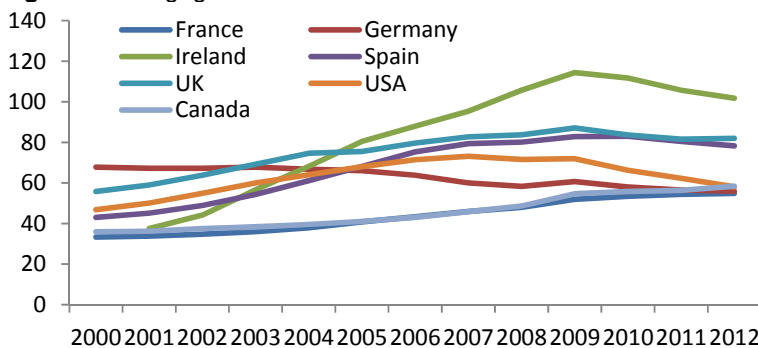
Sources: Bureau of Economic Analysis, Eurostat, Federal Reserve Economic Data, Statistics Canada, Bank of England calculations.
Note: The series for Canada is constructed as household mortgage debt, which includes all mortgage debt, not only residential. Data for France, Germany, Ireland, Spain and the UK are based on households' long term liabilities supplied by Eurostat. US data are households' home mortgage liabilities relative to GDP.

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[2] relative to 2001, data not available for 2000.

Figure 7: Mortgages and other household liabilities in the UK – percentage of disposable income
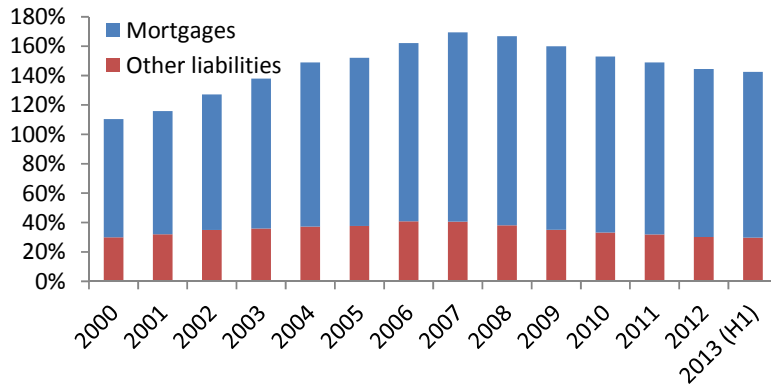
Sources: ONS, Bank of England calculations.
Note: Data cover households and non-profit institutions serving households. ONS's gross disposable income figures (QWND), which excludes taxes on income, social contributions and other transfers. Other liabilities are the difference between households' total financial liabilities and loans secured on dwellings. 2013 H1 data are second quarter liabilities over the annualised sum of seasonally adjusted first and second quarter gross disposable income data.

Figure 8: Mortgages and other household liabilities in the US – percentage of disposable income

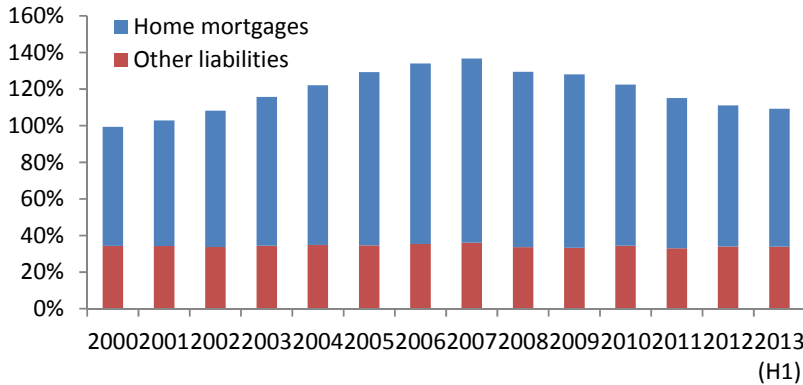Sources: Bureau of Economic Analysis, Federal Reserve, Bank of England calculations.
Note: Liabilities of households and non-profit organisations relative to disposable personal income (net of taxes and contributions for government social insurance). Other liabilities calculated as the difference between total liabilities and home mortgages. 2013 H1 data are second quarter liabilities over second quarter disposable income data seasonally adjusted at annual rates.

Those countries where mortgage debt rose fastest were those where the subsequent falls in house prices, in transactions and in housing starts were greatest.

The fact that houses are bought with large amounts of outside debt is one reason why housing market outcomes over the past ten years have been so volatile. In an upswing when expectations are that house values will continue to rise, the returns from using debt to finance house purchase look very high – gearing scales up those returns. And supplying mortgages will be a low risk business *if* house values continue to rise. All those forces go into reverse once the expectation that house prices will rise evaporates and the perceived probability that prices might fall substantially becomes significant. That is why transactions, new home starts and mortgage lending fell so very sharply after 2007 in the countries where lending and prices had risen so fast in the years that came before.

High leverage (or gearing) – given the other features of housing (in particular the relative fixity in the total stock of housing over a short period) – can create all sorts of problems: it creates highly volatile paths for the net wealth of home owners; it creates incentive problems at close to zero equity; it increases affordability issues for borrowers because the servicing cost of debt is unrelated to changes in the value of their home or to their income. The affordability issues are not solved by changing the extent to which the interest rate on mortgage debt is variable or fixed – affordability issues still arise because whether the future interest rate is known or not, it is not indexed to the value of the house or to the income of the home owner. In terms of reducing volatility and uncertainty about the cost of mortgage debt neither fixed nor variable interest rates on mortgage debt are sensitive in the right way to house price or income risk, because those risks are significantly idiosyncratic (or at least regionally specific within a common monetary policy area).

Asset prices and transactions volumes in asset markets should not be expected to be constant in an efficient market. But to believe that the very volatile outcomes we briefly reviewed above are consistent with an efficient allocation of resources is not plausible. It is very hard to believe that the volatility in housing market outcomes, and the rise in defaults on mortgages (figure 9), we have seen in recent years in many rich countries is anything other than harmful.

So how could the housing market become less volatile in a way which does not create substantial distortions? I want to consider two ways in which that might happen: through the use of monetary (and possibly macro-prudential) policy and as a result of house purchases being financed with some outside equity and less debt.

Figure 9: Mortgage arrears
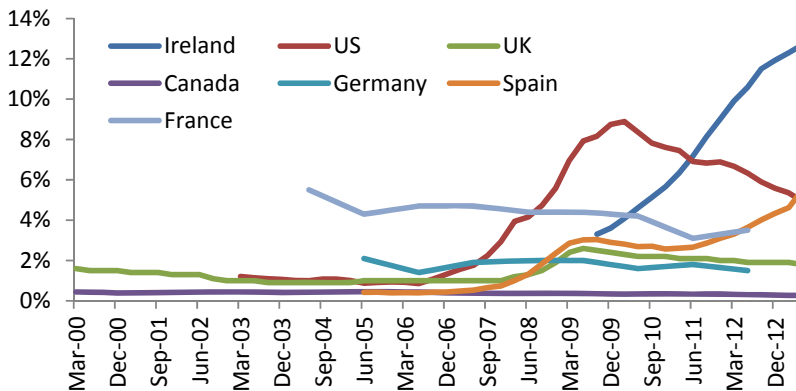
Sources: Bank of Ireland, Bank of Spain, Canadian Bankers' Association, CML, Eurostat, Federal Reserve Bank of New York.
Note: Data for Canada, Ireland, Spain and the UK are the number of mortgages in arrears for more than 3 months as a proportion of total mortgage accounts. Data for the US are the proportion of mortgage balance 90+ days delinquent. Data for France and Germany are the proportion of population who are in arrears on both mortgages and rent. Underlying data for Canada are monthly; the chart plots end-quarter figures. Data for France and Germany are annual. The rest of the data is quarterly.

Monetary Policy

Because a high proportion of house purchases – especially for marginal buyers – are financed through debt, changes in the level of interest rates can have a substantial impact upon the housing market. But variations in interest rates that central banks can control are rather a blunt instrument to stabilise the housing market. Indeed the impact on assets other than houses, and the effects on borrowing and spending unrelated to housing, may well be far greater than the impact on housing. Changes in interest rates have an effect on a high proportion of people throughout the economy and impact the value of a wide range of assets. The majority of non financial companies are affected; most savers will be; anyone who has borrowed at a variable rate will feel an impact. In a country like the US with predominantly longer term fixed rate mortgages variations in the short term nominal rates of interest set by the central bank might have a rather small effect on the housing market (Figure 10).

Even in an economy like the UK, where most mortgages are variable rate, or fixed for a very short period, the expected rate of return on houses in an expectations-driven housing boom may be much higher than any level of interest rates that can be sustained for more than a very short period. That problem with using monetary policy to stabilise the housing market would be acute if housing markets were overheating when the wider economy was not and consumer price inflation was low even though house price inflation was high. Unless one gave a weight to house prices in a measure of consumer prices that was very high – and far higher than could be justified by an ideal price index – this tension between using monetary policy to control general price inflation and stabilise housing markets is unavoidable. (The weight on owners' equivalent rent in the US PCE deflator is around 11.5% which is just a little lower than the weight in the UK's CPIH, an index which includes costs for owner-occupiers. With those weights, if house prices were rising at 10% – and assuming that drove up owners' equivalent rent by the same amount – while all other prices rise at 2% the overall rate of inflation would still be under 3%.)

A set of policy instruments more precisely targeted at the housing market can be helpful in dealing with situations where the level of interest rates that might be best suited to the wider economic situation is not the same as the rate that might be needed to stabilise the housing market. A range of macro-prudential policy levers could be used to mitigate risks to financial stability emanating from housing markets, graduating from more intensive supervision of underwriting standards through variations in capital requirements on mortgage lending to limits on loan to income (LTI) and loan to value (LTV) ratios. Monetary policy can be retained as a 'last line of defence' against risks to financial stability. Indeed this is essentially the position taken in the UK today. The Financial Policy Committee of the Bank of England has macro-prudential levers to help maintain financial stability. The FPC can ask the Monetary Policy Committee (MPC) to adjust its policy (specifically to modify its forward guidance) should it judge that the stance of monetary policy poses a significant threat to financial stability that cannot be contained by the policy actions available to it.

Central to volatility in housing markets, and the impacts that has on the wider economy and upon welfare, is leverage, or debt gearing. Variations in permitted loan to value ratios, in loan to income ratios, in capital

requirements and in interest rates set by the central bank are all likely to have some impact on leverage which is why they can help stabilise housing market outcomes. But a world in which people could rely less upon standard debt contracts to finance house purchases would probably be one in which both individual household risk and aggregate housing market volatility was lower. In that sense developments that increased the scope for non-debt funding and which permanently reduced the average level of gearing might much reduce the need to rely on macro-prudential or monetary policy levers to be pulled hard in cyclical upswings because those upswings, and their consequences, would be less severe.

In the rest of this paper I want to consider ways in which households could come to rely less upon debt, and more on equity, to finance house purchase. Can we expect this to happen and if so how?

Figure 10: Mortgage product interest variability
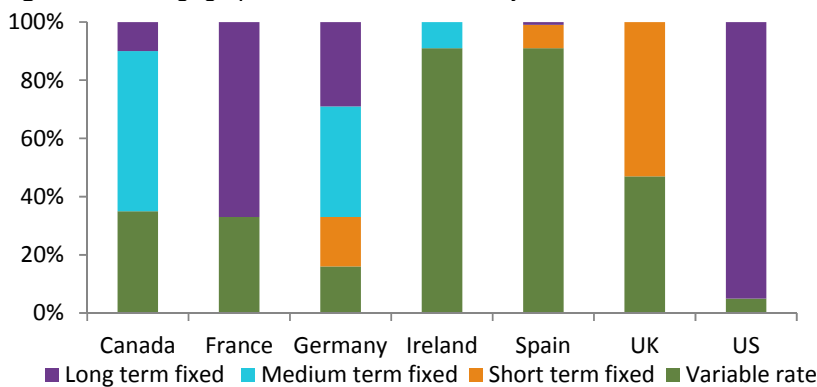
Source: Lea, M. (2010), "International comparison of mortgage product offerings", Report, Research Institute for Housing America, Washington, September, available at www.housingamerica.org/RIHA/RIHA/Publications/74023_10122_Research_RIHA_Lea_Report.pdf (accessed 23 October 2013).

Lower Leverage through greater use of outside equity

One answer is just to have people provide more own equity; that is to use more of their own funds and less debt to buy houses. This could be achieved by direct controls; more-or-less permanent limits on LTV ratios. But if the only source of equity is from the potential home owner the impact of much higher equity funding on home ownership could be dramatic and unwelcome. In many countries average house prices are around 4 or 5 times average annual incomes – in some countries the ratio is higher.[3] Suppose the typical price to income ratio is 5 and it is desirable to have 30% of own equity at purchase (which would still be a high gearing rate for most non-financial companies). If potential home owners can save 10% of income from age 25 it would take close to 15 years to get the equity assuming they can earn a return on savings close to the

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[3] The median sale price for new houses sold in the US (from St. Louis Fed) relative to nominal gross disposable income per household (population/average household size) is about 3. In comparison, taking data from Numbeo.com, which is a database of user contributed data, for the 20 largest US cities (excluding El Paso as data are not available) and weighting by population yields a figure close to 5. For the UK, Land Registry data gives an estimate of around 4. But dividing average UK house prices (published by the DCLG) by the average disposable income per household gives a figure of 6.7 for 2010. Numbeo.com also puts the UK ratio at close to 7 based on user supplied data. The Numbeo data implies the typical house price to income ratio for Germany Ireland and Canada is around 5; for France and Spain it appears to be rather higher. According to a study recently published by the Reserve Bank of Australia on Dwelling Prices and Household Income (see Graph 5 in http://www.rba.gov.au/publications/bulletin/2012/dec/2.html), average dwelling prices are 4-5 times of the average household disposable income in many developed countries.

average rate of house price increase. That would mean that the date of becoming an owner occupier gets driven back to around 40, which would mean that owner occupation rates would need to look much more like those in Germany than in the US or the UK.

But if outside equity (or equity-like funding) were more readily available gearing might be significantly reduced yet have a limited impact on home ownership patterns. It is the scope for different types of outside equity type funding that I consider in the rest of this paper.

The idea of equity type funding of house purchase which shares risk between owner-occupiers and outside providers of funding is not a new one. There have been several attempts to develop markets for types of shared equity funding – most notably in Australia, and to a lesser extent in the UK and the US (See Whitehead (2010), Caplin et al (1997, 2007, 2008), and Shiller (1998, 2003)). But outside equity funding remains a very small part of the financing of house purchase. I want to explore the type of contracts that – in principle – might be feasible and their potential advantages. The main point I make is that a continuum of contracts – where home owners face a menu of choices over how much house price risk (much of which is idiosyncratic) they want to take – could be envisaged. Practical issues with the implementation of such idealised contracts are significant and I will briefly discuss them too. I start by describing a particular type of flexible, risk-sharing funding.

Risk sharing funding[4]

Saving by the prospective home owner – the provision of internal equity – has historically been the dominant form of equity. But there are feasible sources of external equity where the financial contracts are analogous to home owners issuing equity (shares) in their own home.

I take the key feature of outside equity financing to be that it is a form of funding where the repayment value is explicitly linked to the value of the home. From the point of view of the funder this means that their rate of return depends on the value of the property whose purchase they help finance. I consider a type of contract where the return to the funder comes in the form of a final payout which is linked to the value of the property at the relevant horizon (which might be the point at which a property is sold). A periodic payment – which is analogous to a dividend and in this context could be considered a rental payment from the occupier for that part of the property which is funded by external equity – can be zero so long as the expected overall return from the contract is equal to the required rate. The Help to Buy equity loan scheme recently launched by the UK government is something of a hybrid in this respect. It is a loan whose repayment value is a given proportion of the value of the property and on which no regular payments are needed for 5 years, after which a regular payment is paid until the property is sold. This scheme, where up to 20% of the value of a property can be financed with external equity, is only available for the purchase of newly built houses and apartments.

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[4] This section draws upon Miles (2012).

The UK government's Help to Buy scheme is an example of what has been called an equity loan. Unlike with shared ownership schemes – which has been the more common form of external equity financing – with equity loans the buyer retains the ownership of the entire property. Equity loans share an important characteristic with an outright equity stake taken by an outside funder, namely that the outside funder takes on some of the risk of a fall in the value of the house, which becomes a risk shared with the owner. This is different from Shared Appreciation Mortgages (SAMs) in which the home-owner shares any appreciation with the lender but does not get any insurance against house price falls. (For discussion of SAMS and other ways of sharing house price risk see Sanders and Slawson (2005)). Equity loans are comparable to Home Appreciation Participation Notes (HAPNs) in creating true risk sharing (for details of HAPNs see Cassidy et al (2008)).

With an equity loan the interest rate on the funding is effectively tied to the evolution of the value of the house. Equity loans are hybrid instruments, with characteristics somewhere between straightforward debt and equity.

The nature of equity loans

I consider a funding contract with the following features: the outside provider of funds provides some proportion, g, of the purchase price of the house. When a property is sold the outside funder receives a single (final) payment which is equal to the original amount provided plus a proportion of the capital gain or loss on the property. The proportion of the gain or loss need not equal g (and in fact to generate an expected return equal to the required rate it will be very unlikely that the portion could be g). Furthermore the proportion that is taken of a positive capital gain may be different from the proportion of a capital loss that is taken. In general there will be an infinite set of combinations of a share of any capital gain and a share of a capital loss that will generate a given expected rate of return on the equity loan.

The shares in the upside (rises in house values) and the downside (falls in house values) that the provider of an equity loan would need to take to make it a reasonable deal – given that the loan pays no regular interest – depends on the probabilities of house price changes over long periods. There are a continuum of contracts that could be acceptable to lenders; those which have smaller shares of the upside also have smaller shares of the downside.

To show what type of contracts might be feasible I will assume that house price changes follow a log normal distribution and are generated by:

$$\ln(P)t = a + b \ln(P)t\text{-}1 + e$$

e is a random shock that follows a normal distribution. We should think of this as a model for the evolution of the price of a single property and so e is a house-specific shock. Some element of house specific shocks

may be common across a region or a whole country. But a significant element of such shocks is likely to be house (or at least neighbourhood) specific.

If (as seems likely) b is very close to unity then a is the expected rate of house price inflation. We will assume from here that b is 1.

I denote the proportion of any house value appreciation that is paid to the provider of an equity loan by u (u for upside share). Let the proportion of any house price fall that is taken by the equity loan be d (d for downside share). I denote the percentage change in house prices by p and the level of house prices by P. Let the required expected rate of return on the equity loan be Re. As noted above the value of the equity loan as a proportion of the value of the house when purchased is denoted by g.

The rate of return (ex post) on an equity loan is then given by:

$$p u/g \qquad \text{if } p > 0$$
$$p d/g \qquad \text{if } p < 0$$

The equilibrium condition is that:

$$Re = E(p u/g | p > 0).\text{prob} (p>0) + E(p d/g | p < 0).\text{prob} (p<0)$$

where $E(p u/g | p > 0)$ is the expectation of $p u/g$ conditional on p > 0
 and $E(p d/g | p < 0)$ is the expectation of $p d/g$ conditional on p < 0

I calibrate the simple model of house prices by reference to UK and US experience.

Based on quarterly data of regional house price indices[5] for the UK over the period 1990-2013(Q3) the average (across regions) of the mean and standard deviation of quarterly changes in log (nominal) house prices are 1.1% and 3.3%. Based on Case-Shiller data for house prices in major US cities over the period 1990-2013(Q2) the averages of mean and standard deviation of quarterly changes in log house prices are 0.8% and 2.9%.

The mean changes aggregate easily for different time periods – so the average return over 5 years is simply 20 times the average quarterly return. This is not true for standard deviations – only under the assumption that the quarterly random shocks (e) are independent and of constant volatility will the five year return variance be 20 times the quarterly variance. (In fact the UK data suggest that the 5 year variance is rather more than 20 times the quarterly variance.) That variance is only a guide to the volatility of regional house prices – the volatility of specific house prices will almost certainly be significantly greater. Initially I will use that lower bound on the variability of the price of property – but then show the impact of using significantly higher variability.

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[5] The Nationwide regional house price indices.

I initially will assume that 5 years is the relevant horizon for contracts – though as I shall show below the key parameters u and d are not sensitive to varying the investment horizon.

Table 1 shows combinations of upside (u) and downside (d) shares due to an equity lender where the 5 year percentage change in the value of a house follows a normal distribution with an assumed mean of 15% and a standard deviation of 20%. (As a point of comparison Shiller and Weiss (2003) estimated that the standard deviation of the change in US citywide log prices over an 8 year horizon was 25.2%; scaling by the square root of 5/8 gives a 5 year estimate of exactly 20%). The assumed mean rate of change of house prices is slightly lower than the realised average across UK regions and the US cities over 5 year horizons since 1990 – which are between 22% and 16%. But that period includes the massive run up in prices in the years before the financial crash which was only partially unwound in the period since 2007. As a basis for an expected increase in nominal house price growth from now onwards that historic mean is probably a bit high. The standard deviation of 20% is around the sample standard deviation of UK regional house prices in the past and somewhat higher than the US standard deviation based on prices in major cities. I will initially assume that the required expected (or average) nominal return is 25% over five years – which with a 2% inflation rate is about a 3% average annual real return. This might seem quite low for a required rate of return, but house price inflation is not well correlated with changes in stock and bond prices and so an investor with a diversified portfolio might not require much of a risk premium for an asset with returns linked to house prices[6]. I consider a loan worth 20% of the value of a property (g=0.2):

Table 1: Equity loan – equilibrium combinations of upside and downside shares of investor[a]

Share of upside	29%	30%	32%	33%	35%	36%	38%	39%	41%	42%
Share of downside	0%	10%	20%	31%	43%	57%	68%	78%	92%	100%

(a) Assumptions: Equity loan is 20% of house value. Percentage change in house price value over 5 years follows a normal distribution with mean of 15% and standard deviation of 20%. Required rate of return on equity loan is 25% over five years.

Table 1 reveals several things: First in principle it is possible for home owners to sell **all** downside risk – with the base parameters it is possible for providers of an equity loan to insure against 100% of house price falls in exchange for taking about 42% of all gains in house value[7]. With the calibration above the chance that house prices will be lower at the end of 5 years is about 23% so this insurance is of value. Second, there is a big range of risk sharing that is feasible: with home owners taking no insurance against the loss in house value they would give up just under 30% of any capital appreciation in exchange for 20% of funding; if they wanted insurance against 50% of house price losses they would need to give up about 36% of any house price appreciation. Third, providers of equity loans need to receive more of any house price appreciation than the share of funding they provide: even with no downside protection for the homeowner the providers of

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[6] In the UK there is a negative correlation between monthly changes in house prices and in stock and bond indices in the period since 1990.
[7] But as I discuss below moral hazard becomes serious when so much of downside or upside house price risk is passed on to outside providers of equity.

loans need to get almost 1.5 times as much of any appreciation as they provide of the funding (29% of upside, or capital gain, for 20% of funding).

Table 2-5 below show how the characteristics of the equilibrium shares of upside risk taken by the provider of equity loans varies as we use different assumptions for: the volatility of house prices (Table 2); the time horizon of the investment (where we multiply the base line means and variances of house price returns by the time horizon, which is appropriate for the random walk with drift model – Table 3); the required rate of return on the loans (Table 4) and for the mean expected rate of house price appreciation (Table 5). Tables 2-5 show how the upside share to the equity investor (their share of any capital gain) varies for a given downside share as we vary various features of the economy. In each of the tables we assume the equity loan is 20% of the house value and that the share taken of any house price fall is also 20%. For the base case (Table 2, using a 20% standard deviation of house prices over 5 years) that generated an equilibrium share of any upside gain of 32%.

Table 2: Varying house price volatility – equilibrium upside share of investor[a]

Share of upside	33%	32%	32%	31%	30%	30%	29%	28%
Standard deviation house price change	5%	15%	20%	25%	30%	35%	40%	45%

(a)   Assumptions: Equity loan is 20% of house value. Percentage change in house price value over 5 years follows a Normal distribution with 15% mean. Required rate of return on equity loan is 25% over five years.

Table 2 shows that varying very substantially the volatility of house price changes has a rather small impact on the share of the upside that needs to be paid to the provider of an equity loan. At exceptionally low volatility (a 5% standard deviation over 5 years) that share is one third. The share is close to 30% for volatilities between 20% and 40%. A volatility range of between 20% and 40% is likely to cover the plausible range for most properties: the lower point of that range is where there is little idiosyncratic house price risk beyond the level of regional variability; the upper point is where idiosyncratic risk is as large as regional risk. Table 2 shows that over that range there is very little variability in the upside share required. That is very useful because a risk neutral provider of outside equity would then not need to know at all precisely the volatility of house prices in order to offer feasible contracts to home owners.

Table 3: Varying time horizons – equilibrium upside shares of investor [a]

Share of upside	30%	31%	32%	32%	33%	33%	33%
Time horizon (years)	3	4	5	7	10	20	25

Table 4: Varying required rates of return on the loan – equilibrium upside share of investor[a]

Share of upside	20%	26%	32%	37%	43%	49%	55%
Required return on the loan	15%	20%	25%	30%	35%	40%	45%

Table 5: Varying average house price changes– equilibrium upside share of investor[a]

Share of upside	67%	51%	42%	32%	25%	20%	17%
Mean house price change over 5 years	3%	7%	10%	15%	20%	25%	30%

(a) Assumptions: Equity loan is 20% of house value. Percentage change in house price value over 5 years follows a
     Normal distribution with 20% standard deviation. The share taken of any house price fall is 20%.
     Required rate of return on equity loan is 25% over five years, except in Table 4 where it is varied.
     Average house price change is 15% over 5 year horizon, except in table 5 where it is varied;
     in table 3 the average house price change is assumed to be 3% a year.

Changing the time horizon has an impact on the nature of sustainable contracts. (This is a point that Caplin et al (2007) make). The share of the upside needed to be paid to the equity provider does rise gradually with the time horizon. But when log house prices follow the random walk model the variability in the required share is very small (from 30% to 33% as horizons vary from 3 to 25 years). This is important because if the equity loan is settled at the time of sale the provider will not know the relevant time horizon and so the fact that the upside share needed to generate a given average rate of return is not sensitive to time horizon is very useful. Not surprisingly varying the expected rate of house price change has a very substantial effect, as does varying the required rate of return.

It is important to stress that in principle there are an infinite number of combinations of upside and downside shares that generate the required rate of return for any given economic environment. In tables 2-5 we have fixed the downside share to isolate the affect of changing features of the economy upon the upside share. Table 1, in contrast, showed a number of combinations of upside and downside shares for a given economy.

The useful thing about there being a continuum of contracts is that home-owners could, in principle, decide how much house price risk they wanted to sell and how asymmetric a contract they were prepared to accept

to reduce the monthly servicing cost of the overall debt on a property. But although in theory there is a continuum of contracts that can generate the required return to providers of equity loans there are incentive reasons why some contracts with very high insurance against loss (high downside shares) or very high shares of capital gains handed to providers of equity loans might not be feasible. Moral hazard can rule out such extremes. Providers of equity loans might not wish to choose combinations of upside and downside shares which mean they take a very high share of any downside (in which case home owners have little incentive to maintain properties if they do start to slip in value) or a very high share of the upside (in which case home owners have little incentive to maintain properties once their prices have risen substantially). Shiller and Weiss (2003) show that these incentive effects are very serious if outsider providers of finance take a share of the upside or downside that is high – say 50% or more.

There are also practical issues to do with the timing of people moving house and making sure that home-owners understand contracts they have entered to. And adjusting the ownership shares if homeowners make home improvements (adding bedrooms, converting attics and such) is not in practice trivial. (Shiller and Weiss (2003) discuss the incentive and information issues).

The incentive and information problems are not side issues. Nonetheless equity type funding of house purchase has major attractions – at both the micro and macro level: at the micro level they have the potential to allow more efficient sharing of house price risk. The purchase of a very expensive asset by means of high leverage is not – to put it mildly – self evidently the optimal contract (Shiller (1998, 2003)). At the macro level a useful feature of equity loans is that effectively the interest rate paid on the loan is linked to the rate of house price inflation – the higher is house price inflation the higher is the effective interest rate on a portion of the funding of houses. That could be a stabilising force.

Conclusions

There are problems with greater use of outside equity in funding house purchase. For example, where interest payments on mortgage debt are tax deductible there is an inherent bias against equity financing of house purchase. The moral hazard issues of linking repayments on outside funding to the house value are also serious. Calculations by Shiller and Weiss (2003) suggest that equity loans that represent much more than 20% of funding would probably create very poor incentives for home owners since outsiders might then need to take the majority of capital gains or losses. But switching even 20% of funding from debt to outside equity very substantially reduces leverage – from 10 to 3 1/3 for a home owner that provides 10% of equity themselves. And greater use of such funding does get to the heart of many recent housing market problems which stem from very high leverage in house purchase, particularly for new buyers. Someone who took out a 90% LTV ratio non-amortising (interest only) mortgage will have negative equity if house prices fall by 10%. At the end of a 5 year horizon – with a mean rate of price rise of 15% and a standard deviation of 20% – the chances of negative equity using the log price model used above is then about 10%. If the home owner took a 70% mortgage, had 20% of funding from an equity loan (sharing 20% of any downside loss) and used the saving on interest payments to pay down the loan then the balance at the end of five years would be around 64% of the loan (at an interest rate of 5%). It would now take a fall in house prices of 20% to create negative equity. If the house fell in value to 80 (from an initial 100) the equity loan of 20 would have a repayment value of 16 which, together with the debt of 64, would just equal the home value of 80. The chances of such a fall in price are just under 4%.

In the US, 14.5% of mortgaged homes are estimated to have been in negative equity in the first half of 2013.[8] (This is already a substantial improvement from 2012, where over 20% of mortgages were probably in negative equity.) Had 20% of funding for these properties come from outside equity, debt might have exceeded house values in slightly less than 10% of mortgaged homes – a fall of one third in the numbers with negative equity[9]. Fewer people would have had incentives to walk away from debt. Mortgage servicing costs would have been lower as mortgage loans would have been smaller and rates charged on them lower. As a result, foreclosures would have been less prevalent. Losses would have been born less by highly levered banks, and more by less levered providers of outside equity. The Great Recession could have been less severe.

Getting a market in equity loans established is not easy and various shared equity products in the past (most of which were not equity loans) have a patchy success rate. But the recently launched equity loan product

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[8] CoreLogic (2013), *Equity Report*, Q2
[9] This is based on the same comparison of pure mortgage debt finance versus combined mortgage debt and equity finance as in the previous paragraph. Based on the Case-Shiller national index, US house prices are down from their peak by about 20%. CoreLogic (2013) estimate that this fall left 2.6% of mortgaged residential properties with an LTV ratio between 100% and 105%, and 6.1% with an LTV ratio between 105% and 125% in 2013 Q2. If we assume that those in the latter group were evenly distrusted, then about 2.25% had an LTV between 105 and 112.5. That would mean that about 4.85% (=2.6% + 2.25%) of properties were in negative equity by less than 12.5%, following the 20% drop in house prices. Someone who would have used outside equity to finance 20% of the purchase instead of taking out a 90% LTV ratio mortgage would be in positive equity following a fall in house prices of up to 20%. If house value falls by exactly 20% they would have a LTV ratio of 100% as opposed to a LTV ratio of 112.5% if they had taken out a 90% LTV ratio mortgage. This is the basis for the crude estimate that the proportion of properties in negative equity might have fallen from 14.5% to a bit under 10% had home owners used 20% equity loans.

provided by the UK government for those buying newly built homes (under its Help to Buy scheme) has proved popular. In the first six months of the scheme (April – October 2013) around 15,000 reservations to buy new homes were made, a rate that is around 25% of the level of all newly built homes over that period.

High leverage is at the heart of problems in housing market. Monetary policy and macro prudential policy can influence leverage. But more fundamentally use of outside equity might be a way of permanently bringing down reliance upon debt financing. Switching just 10% or 20% of funding from debt to outside equity very substantially reduces leverage. The moral hazard at that scale of outside equity funding might be low enough to make such contracts commercially feasible.

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