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Housing, Leverage, and Stability in the Wider Economy

This paper explores ways in which volatility in the housing market that has damaging impacts on the financial system and the wider economy can be reduced. Alternatives to standard debt contracts to finance house purchase are considered. A form of equity loan, where repayments are linked to the value of the house, have major advantages in terms of risk reduction. The way in which such loans can be structured is analyzed.

JEL codes: E44, G21 Keywords: Housing, Mortgages, Debt Contracts.

HOUSING WAS AT THE CENTER 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 United States, Spain, and Ireland fall into this category. In other countries, the fall in house values and the rise in bad debts have been less severe and was more a consequence of the catastrophic decline in confidence that came in the wake of the financial problems and that led to a reduction in incomes and higher unemployment. Perhaps France and the United Kingdom 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—with Canada and Germany 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;

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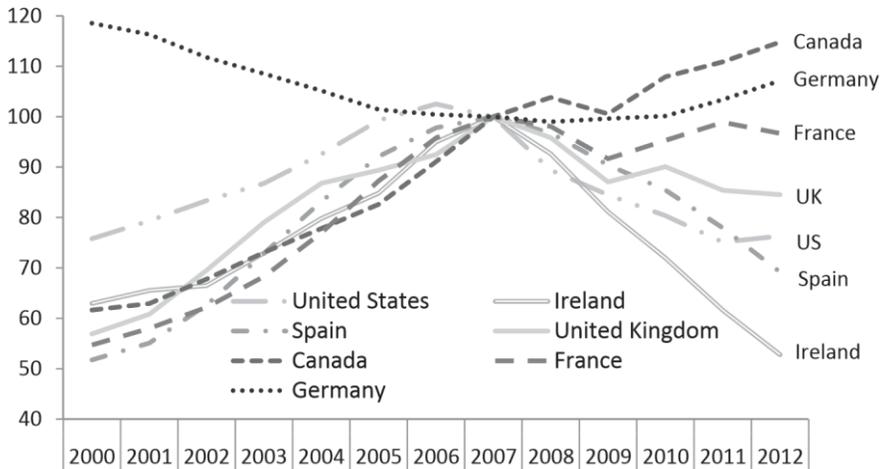


FIG. 1. Real House Prices, 2007 = 100

NOTE: The underlying data are percentage changes on previous year of house prices deflated by the private consumption deflator.

SOURCES: OECD Economic Outlook 93 (database), Bank of England calculations.

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. 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.

1. THE SCALE OF THE RECENT PROBLEMS

In many countries, house price volatility in the 6 or so years on either side of the financial crises of 2007–08 has been extreme. Figure 1 illustrates the path of real house prices (which 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.

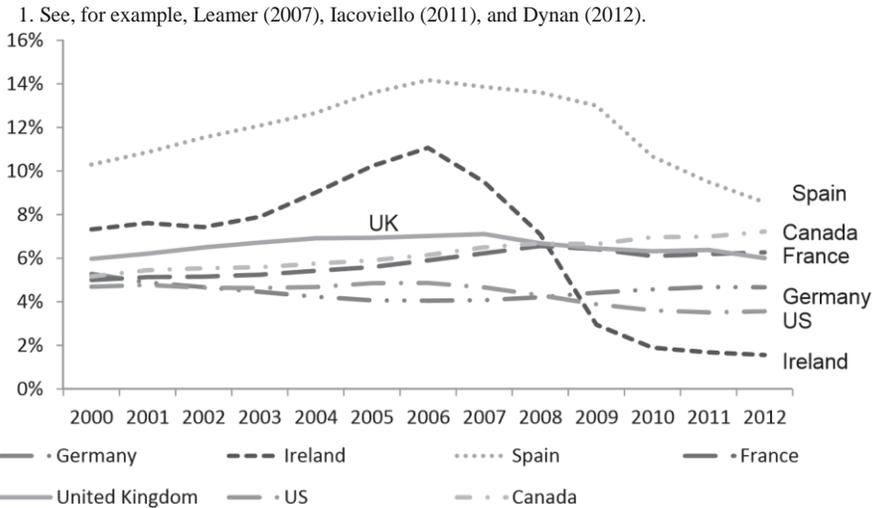


FIG. 2. Construction, Relative to Total Economic Activity.

SOURCES: Bureau of Economic Analysis, Eurostat, Statistics Canada, Bank of England calculations.

In Spain and in the United States, the fall has been a bit less extreme, with prices down by about 30% in real terms. In the United Kingdom, prices are down by about 20%; in France, they are barely down at all; and in Canada and Germany, average home prices have moved on a relatively gentle trajectory not much different from the years immediately before the global banking problems.

Figure 2 shows 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. Housing starts have fallen more dramatically than overall construction activity (Figure 3) 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.

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 United States, by 58 pp in Ireland,² by 36 pp in Spain, and by 27 pp in the United Kingdom (Figure 4). Figures 5 and 6 show in more detail what happened to the stock of mortgage (and other) debt relative to household

2. The figure for Ireland is relative to 2001, as data are not available for 2000.

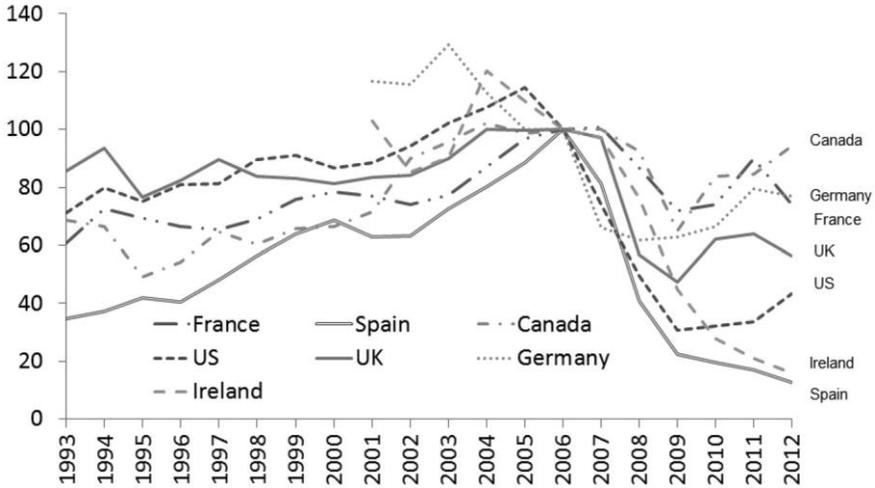


Fig. 3. Housing Starts, 2006 = 100.

NOTE: France, Spain, Canada, U.S., UK information is for building (housing) starts during the period. Data for Germany and Ireland are for planning permissions granted.

SOURCES: National Institute for Statistics and Economic Studies, Bloomberg, U.S. Census Bureau, German Federal Statistical Office, and Irish Central Statistics Office.

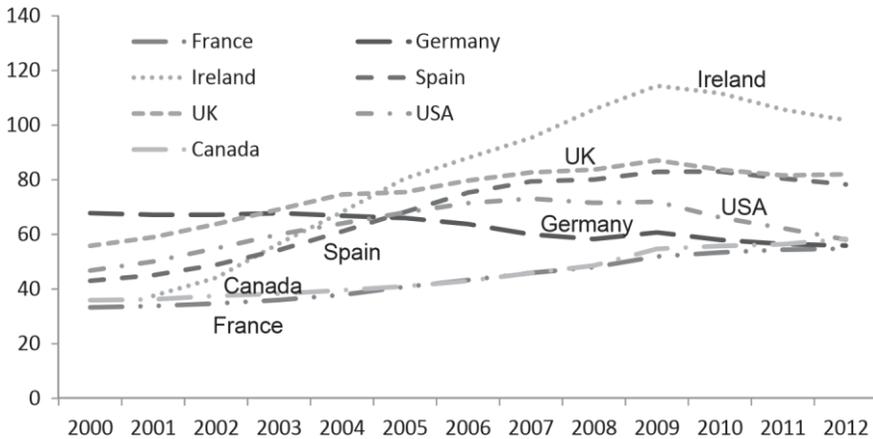


FIG. 4. Mortgage Debt-to-GDP Ratios.

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 United Kingdom are based on households' long-term liabilities supplied by Eurostat. U.S. data are households' home mortgage liabilities relative to GDP.

SOURCES: Bureau of Economic Analysis, Eurostat, Federal Reserve Economic Data, Statistics Canada, Bank of England calculations.

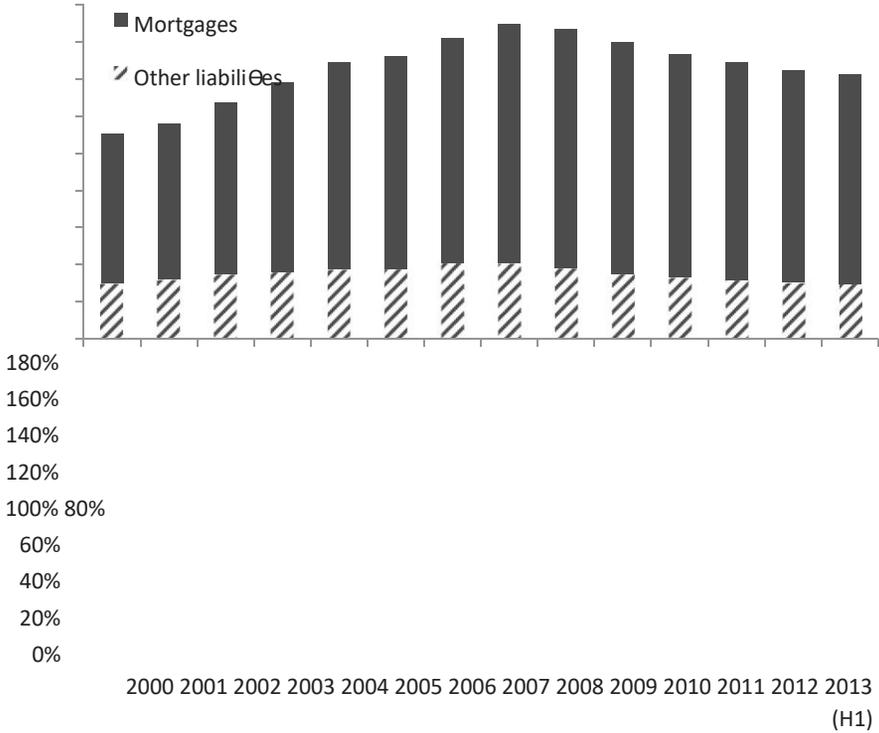


FIG. 5. Mortgages and other Household Liabilities in the United Kingdom—Percentage of Disposable Income.

NOTE: Data cover households and nonprofit 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 annualized sum of seasonally adjusted first- and second-quarter gross disposable income data.

SOURCES: ONS, Bank of England calculations.

incomes in the United Kingdom and the United States 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.

The fact that houses are bought with large amounts of outside debt is one reason why housing market outcomes over the past 10 years have been so volatile—those countries where mortgage debt rose fastest were those where the subsequent falls in

house prices and housing starts were greatest. 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. These 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 housing 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) 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

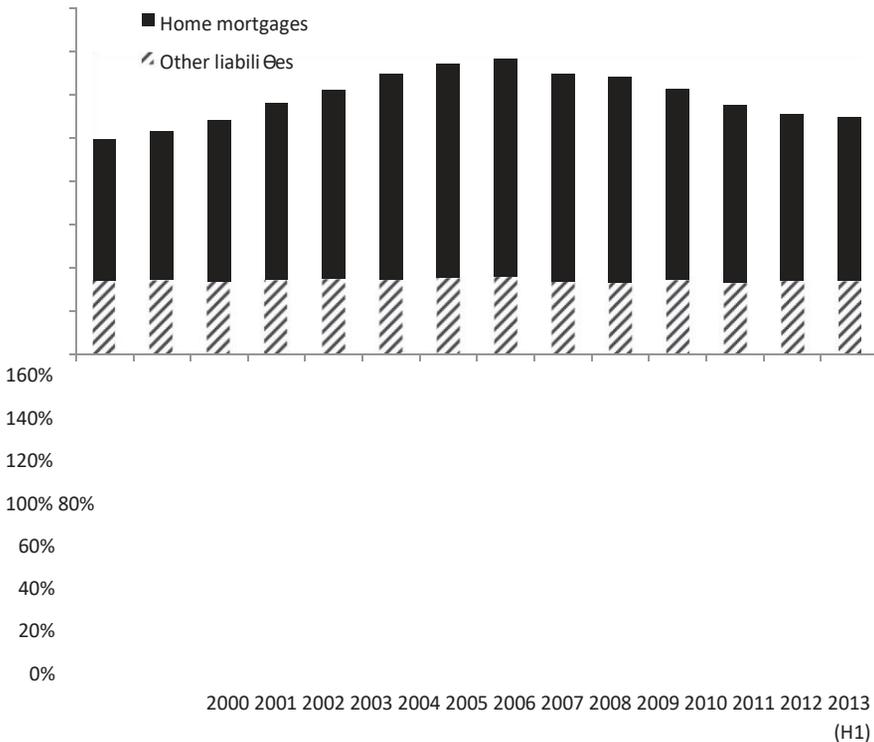


FIG. 6. Mortgages and other Household Liabilities in the United States—Percentage of Disposable Income.

NOTE: Liabilities of households and nonprofit organizations 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.

SOURCES: Bureau of Economic Analysis, Federal Reserve, Bank of England calculations.

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 7), 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 that does not create substantial distortions? I want to consider two ways in which that might happen: through the use of monetary (and possibly macroprudential) policy and as a result of house purchases being financed with some outside equity and less debt.

2. 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

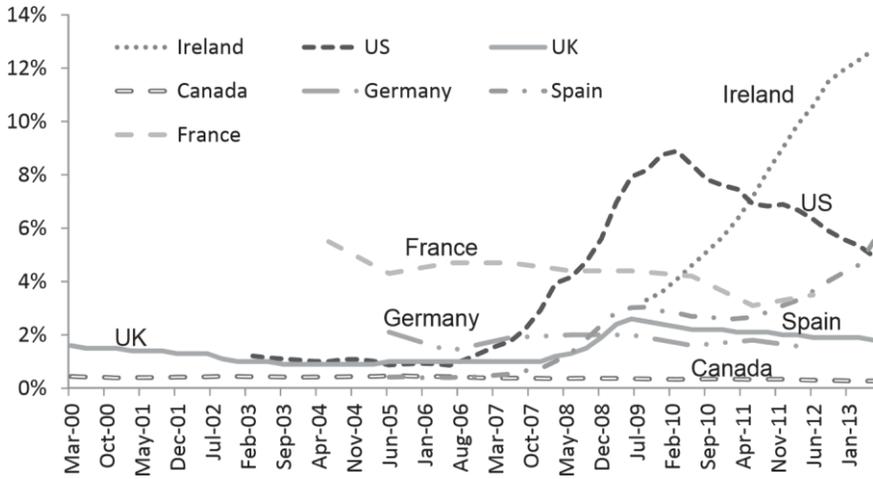


FIG. 7. Mortgage Arrears.

NOTE: Data for Canada, Ireland, Spain, and the United Kingdom are the number of mortgages in arrears for more than 3 months as a proportion of total mortgage accounts. Data for the United States 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 are quarterly.

SOURCES: Bank of Ireland, Bank of Spain, Canadian Bankers' Association, CML, Eurostat, Federal Reserve Bank of New York.

can control are rather a blunt instrument to stabilize 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 wider range of assets. The majority of non-financial companies are affected, most savers will be, and anyone who has borrowed at a variable rate will feel an impact. In a country like the United States 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 8).

Even in an economy like the United Kingdom, 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. The problem with using monetary policy to stabilize 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

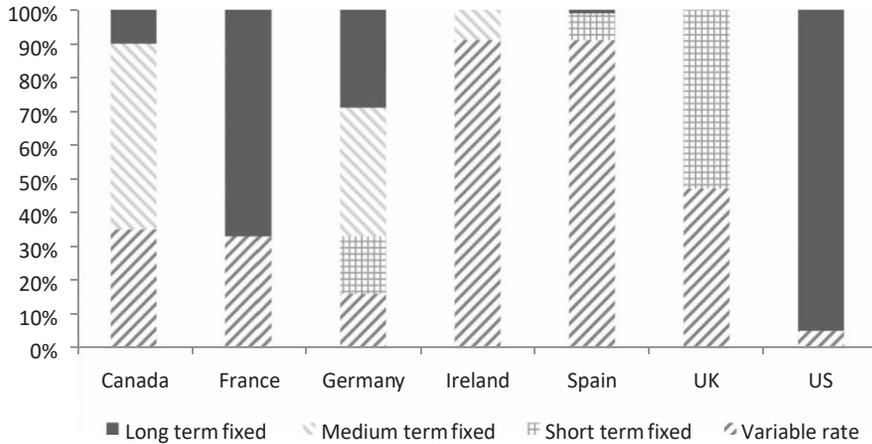


FIG. 8. Mortgage Product Interest Variability.

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 October 23, 2013).

monetary policy to control general price inflation and stabilize housing markets is unavoidable.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 stabilize the housing market. A range of macroprudential 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 defense" against risks to financial stability. Indeed, this is essentially the position taken in the United Kingdom today. The Financial Policy Committee of the Bank of England has macroprudential levers to help maintain financial stability. The FPC can ask the Monetary Policy Committee 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 LTV

3. The weight on owners' equivalent rent in the U.S. PCE deflator is around 11.5%, which is just a little lower than the weight in the United Kingdom's CPIH, an index that 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%.

ratios, in LTI 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 stabilize 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 nondebt funding and that permanently reduced the average level of gearing might much reduce the need to rely on macroprudential or monetary policy levers to be pulled hard in cyclical upswings because those upswings, and their consequences, would be less severe.

3. LOWER LEVERAGE THROUGH GREATER USE OF OUTSIDE EQUITY

How might households be made to rely less upon debt and more upon equity to finance house purchases? One answer is just to have people provide more own equity, that is, 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 four or five times average annual incomes—in some countries the ratio is higher.⁴ 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 nonfinancial companies). If potential home owners can save 10% of income from age 25 it would take close to 15 years to accumulate the equity assuming they can earn a return on savings close to the 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 United States or the United Kingdom.

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. The idea of equity type funding of house purchase, which shares risk between owneroccupiers 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 United Kingdom and the United States (see

4. The median sale price for new houses sold in the United States (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 U.S. cities (excluding El Paso as data are not available) and weighting by population yields a figure close to 5. For the United Kingdom, Land Registry data give 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 imply 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 four to five times of the average household disposable income in many developed countries.

Caplin et al. 1997, 2007, 2008, Shiller 1998, 2003). But outside equity funding remains a very small part of the financing of house purchases.

The remainder of this paper considers types of outside equity contracts that, in principle, might be feasible and have 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 idealized contracts are significant and I will briefly discuss them too. I start by describing a particular type of flexible, risk-sharing funding.

4. RISK-SHARING FUNDING⁵

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 for which the financial contracts are analogous to home owners issuing equity shares in their own home.

The key feature of outside equity financing is that 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.

The 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,

5. This section draws upon Miles (2012).

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, Dennis, and Yang 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. 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 is a continuum of contracts that could be acceptable to lenders; those that 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:

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

where 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 P 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 neighborhood) 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.

Denote the proportion of any house value appreciation that is paid to the provider of an equity loan by u (u for upside share), the proportion of any house price fall that is taken by the equity loan be d (d for downside share) and the percentage change in 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

$$\begin{aligned} & pu/g \text{ if} \\ & p \\ & > \\ & 0, \\ & \text{if} \\ & p \\ & > \\ & \underline{pd/g} \text{ 0.} \end{aligned}$$

TABLE 1
EQUITY
LOAN—
EQUILIBRIUM
COMBINATIONS
OF UPSIDE AND
DOWNSIDE
SHARES OF
INVESTOR

Share of
upside

29%	
30%	
32%	
33%	
35%	
36%	
38%	39%41% 42%

Share of 92% 100%
downside

0%

10%

20%

31%

43%

57%

68% 78%

NOTE: 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 5 years.

The equilibrium condition is that

$$Re = E(pu/g | p > 0) \text{prob}(p > 0) + E(pd/g | p < 0) \cdot \text{prob}(p < 0),$$

where

$E(pu/g | p > 0)$ is the expectation of pu/g conditional on $p > 0$ and

$E(pd/g | p < 0)$ is the expectation of pd/g conditional on $p < 0$.

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

Based on quarterly data of regional house price indices⁶ for the United Kingdom 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 U.S. 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 (ϵ) are independent and of constant volatility will the 5-year return variance be 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. (In fact, the UK data suggest that the 5-year variance is rather more than 20 times the quarterly variance.) 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.

I initially will assume that 5 years is the relevant horizon for contracts—although 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

6. The Nationwide regional house price indices.

deviation of 20%. (As a point of comparison, Shiller and Weiss 2000 estimate that the standard deviation of the change in U.S. citywide log prices over an 8-year horizon is 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 realized average across UK regions and the U.S. 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 onward 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 U.S. standard deviation based on prices in major cities. I will initially assume that the required expected (or average) nominal return is 25% over 5 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.⁷ I consider a loan worth 20% of the value of a property ($g = 0.2$).

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.⁸ 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 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).

Tables 2–5 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 (Table 3, where we multiply the baseline means and variances of house price returns by the time horizon, which is appropriate for the random walk with drift model), the required rate of return on the loans (Table 4), and the mean expected rate of house price appreciation (Table 5). These tables show how the upside share to the equity investor

7. In the United Kingdom, there is a negative correlation between monthly changes in house prices and in stock and bond indices in the period since 1990.

8. 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.

TABLE 2

VARYING HOUSE PRICE VOLATILITY—EQUILIBRIUM UPSIDE SHARE OF INVESTOR

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

NOTE: 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. Required rate of return on equity loan is 25% over 5 years, except in Table 4 where it is varied. In Table 3 the average house price change is assumed to be 3% a year.

TABLE 3

VARYING TIME HORIZONS—EQUILIBRIUM UPSIDE SHARES OF INVESTOR

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

NOTE: 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. Required rate of return on equity loan is 25% over 5 years, except in Table 4 where it is varied. In Table 3 the average house price change is assumed to be 3% a year.

TABLE 4

VARYING REQUIRED RATES OF RETURN ON THE LOAN—EQUILIBRIUM UPSIDE SHARE OF INVESTOR

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

NOTE: 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. Required rate of return on equity loan is 25% over 5 years, except in Table 4 where it is varied. In Table 3 the average house price change is assumed to be 3% a year.

TABLE 5

VARYING AVERAGE HOUSE PRICE CHANGES—EQUILIBRIUM UPSIDE SHARE OF INVESTOR

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

NOTE: 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 5 years.

(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), this generated an equilibrium share of any upside gain of 32%.

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, which 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.

Changing the time horizon has an impact on the nature of sustainable contracts. (This is a point made by Caplin et al. 2007.) 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, the downside share is fixed to isolate the effect

of changing features of the economy upon the upside share. Table 1, in contrast, shows 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 (2000) 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 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. As discussed by Shiller and Weiss (2000), these incentive and information problems are not side issues. Nonetheless, equity type funding of house purchase has major attractions—at both the micro and macro levels. 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, which could be a stabilizing force.

5. 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 (2000) suggest that equity loans that represent much more than 20% of funding would probably create very poor incentives for home owners because 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 one-third 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, nonamortizing (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 5 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 that, 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 United States, 14.5% of mortgaged homes are estimated to have been in negative equity in the first half of 2013.⁹ (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.¹⁰ Fewer people would have had incentives to walk away from debt. Mortgage servicing costs would have been lower as mortgage loans

9. CoreLogic (2013), *Equity Report*, Q2.

10. 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, U.S. house prices are down from their peak by about 20%. CoreLogic (2013) estimates 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 distributed,

would have been smaller and rates charged on them lower. As a result, foreclosures would have been less prevalent. Losses would have been borne 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 provided by the UK government for those buying newly built homes (under its Help to Buy scheme) has proved popular. In the first 6 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 macroprudential 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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- 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 an LTV ratio of 100% as opposed to an 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.
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