Financial Innovation and European Housing and Mortgage Markets

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Introduction

House prices have increased dramatically across most of Europe in recent years. It is far from easy to work out whether this is very largely a reflection of shifts in fundamental economic factors or, to a significant extent, driven by more speculative and transient forces. Changes in population, incomes and interest rates have caused movement in the relative position of demand and supply curves for housing that are likely to be persistent; for that reason a substantial part of higher real house prices is itself likely to be persistent.

But whatever have been the main drivers of higher prices — and whatever the role that speculative, and more volatile, forces might have played — it means that people across much of Europe now have to borrow more to buy houses. Their increasing ability and willingness to do that has in many countries been a factor in driving demand.

In this paper we first describe the changing structure of lending, home ownership and house prices and then consider types of mortgage that are most suitable in an environment where house prices – either permanently or temporarily – are much higher relative to incomes. Whether those mortgages are available and what obstacles exist to their being offered will affect the sustainability of home ownership and of house prices.

We start by briefly documenting what has happened across Europe to house prices and to lending and at some of the trends in the quantity and the types of mortgage available. We then analyse the changes in real house prices over the last decade across Western Europe and use a simple economic framework to estimate the likely contributions of fundamental factors such as changes in real incomes and population growth. We also try to quantify how much of price rises might have been driven by rising expectations of future capital gains. We estimate that this might have played a significant role in several countries, including Spain, Sweden, Belgium and the UK.

In the final section, we consider what different types of mortgage arrangement might become attractive in a world of higher house prices. We analyse what types of mortgage are likely to prove more suitable in a world where prices are higher relative to incomes and where house prices may be volatile and cannot be assumed to carry on rising.

Overwhelmingly across Europe a mortgage remains a nominal contract with repayments unrelated to movements in consumer or house prices. We consider alternative, indexed mortgages where repayments can depend on consumer prices and also, to an extent, on house prices. We analyse such products and consider their cost and risk characteristics. Indexed linked mortgages have the twin benefit of generating a flatter real burden of repayments and also a less volatile one.

There are strong reasons to believe that innovation will come because indexed mortgages create financial assets that should suit borrowers and investors.

I: Mortgage and Housing Markets Today

Figure 1 shows an estimate of how much mortgage debt there is now, relative to GDP, across European countries. There is huge diversity. In the Netherlands, Denmark, Switzerland and the UK, mortgage debt is above 70% of GDP, in some cases very substantially. But in France, Greece and Belgium, debt is only around 30% of GDP. In Italy, it is lower still. In eastern and central European countries, debt is lower again.

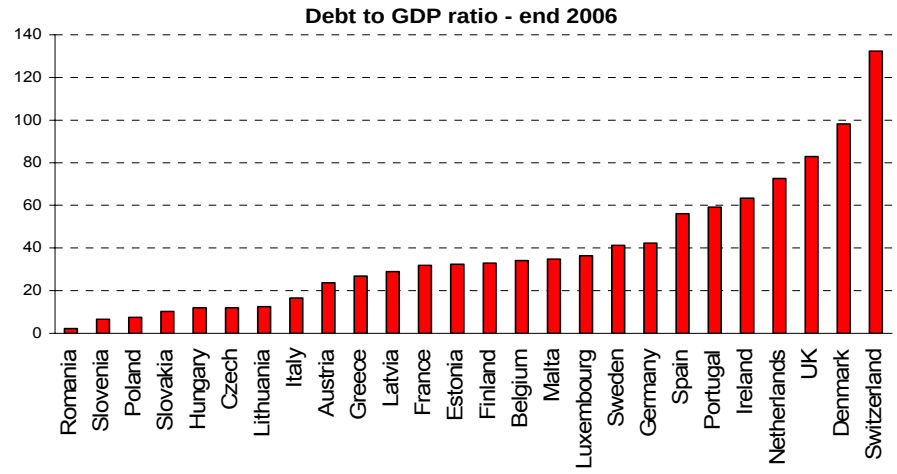
Table 1 shows that in nearly all countries the stock of debt has risen very much faster than GDP in recent years, Germany being a notable exception.

Variability in the cost of mortgage debt is much lower than is the variability in the stock of lending. Indeed within the euro area, there is relatively little variability across countries in the cost of mortgages, especially once we adjust for some of the differences in the features of mortgages popular in different countries (differences in the period for which interest rates are fixed and differences in the flexibility about repaying mortgages early).

Research by Oliver Wyman on behalf of the European Mortgage Federation revealed that across Western Europe there was, even by spring 2003, a fairly narrow spread in effective mortgage prices. The range of prices remains very narrow today. Figure 2 shows the Oliver Wyman estimates of pricing for Autumn 2006. The spread of effective prices across Western Europe was small — in effective terms, not much more than 50 basis points.

Figure 1

Debt to GDP ratio — end 2006



Source: European Central Bank, Swiss National Bank, Bank of England, National Bank of Romania, International Monetary Fund, Eurostat, Morgan Stanley Research

Table 1

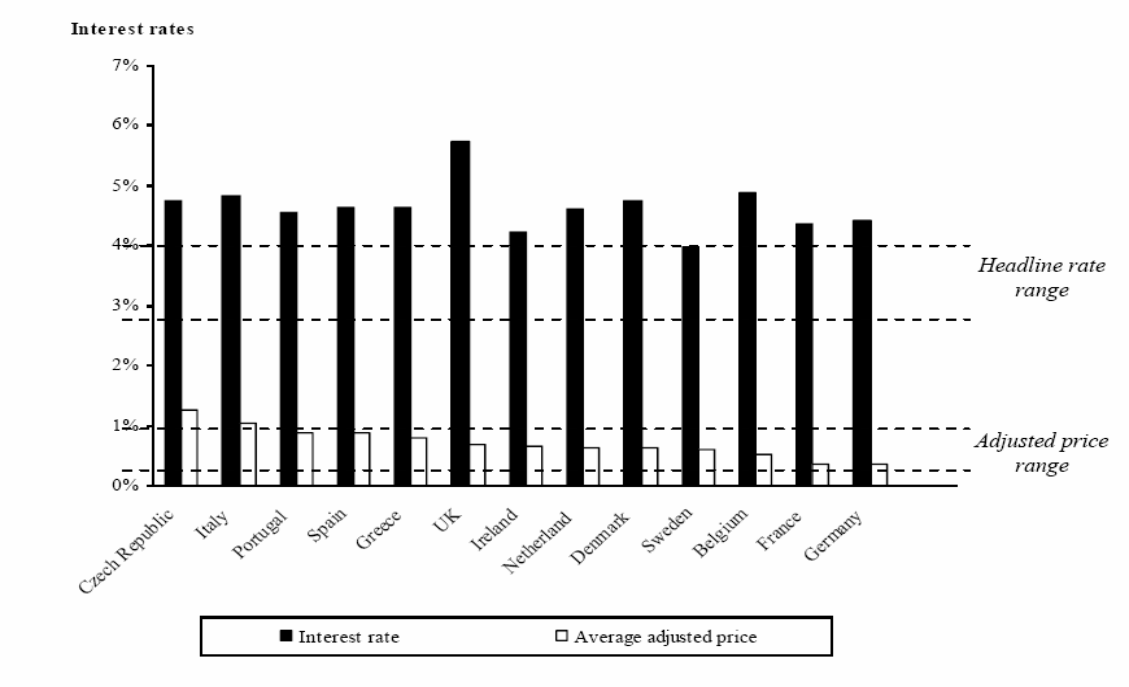
Mortgage debt to GDP ratio

	2002	2003	2004	2005	2006
Austria	16.3	17.6	20.4	22.0	23.6
Belgium	23.8	26.1	27.8	31.7	34.2
Bulgaria	0.7	1.2	2.6	4.7	n/a
Croatia	6.9	8.6	10.5	12.7	n/a
Cyprus	7.9	10.0	12.0	16.0	n/a
Czech Republic	4.4	5.9	7.8	9.7	12.0
Denmark	82.2	81.0	85.4	92.1	98.1
Estonia	-	-	15.9	23.4	32.4
Finland	21.5	24.7	27.3	30.9	32.9
France	22.5	24.1	26.0	28.8	31.8
Germany	43.0	43.4	43.0	42.9	42.3
Greece	14.7	16.9	19.6	23.7	26.8
Hungary	n/a	7.7	9.4	10.2	11.9
Iceland	88.0	86.3	88.8	102.1	n/a
Ireland	34.0	39.6	50.0	58.8	63.4
Italy	10.2	11.6	13.3	15.3	16.6
Latvia	n/a	7.3	11.8	19.3	28.9
Lithuania	n/a	n/a	5.5	9.1	12.6
Luxembourg	29.3	32.4	34.6	36.0	36.4
Malta	19.7	23.9	27.5	31.7	34.8
Netherlands	60.8	63.4	67.7	72.9	72.6
Norway	48.0	52.5	54.1	55.1	n/a
Poland	3.4	4.5	4.3	5.4	7.5
Portugal	48.0	48.0	49.3	53.4	59.2
Romania	n/a	n/a	n/a	1.8	2.3
Slovakia	3.9	4.8	6.7	8.2	10.4
Slovenia	0.8	1.1	3.1	5.0	6.6
Spain	32.4	35.5	40.0	49.5	56.1
Sweden	31.4	31.2	34.8	37.3	41.3
Switzerland	n/a	112.6	115.5	119.0	132.3
Turkey	0.2	0.4	1.0	2.5	n/a
UK	63.9	69.2	73.9	78.2	82.8

Source: European Central Bank, Swiss National Bank, Bank of England, National Bank of Romania, International Monetary Fund, Eurostat, Morgan Stanley Research

Figure 2

Mortgage rates adjusted for risk characteristics (Autumn 2006)



Source. Mercer Oliver Wyman analysis based on questionnaires completed by European lenders and market date. Note that these numbers are averages across all products and so do not represent the characteristics of any single product. The adjusted price is comparable across markets as it adjusts for differences in product mix, interest rate risk, credit risk and prepayment risk and so represents a comparable price to the borrower. Note that adjusted price analysis does not adjust for product cross-subsidies or government subsidies and so comparisons across countries are distorted by these factors.

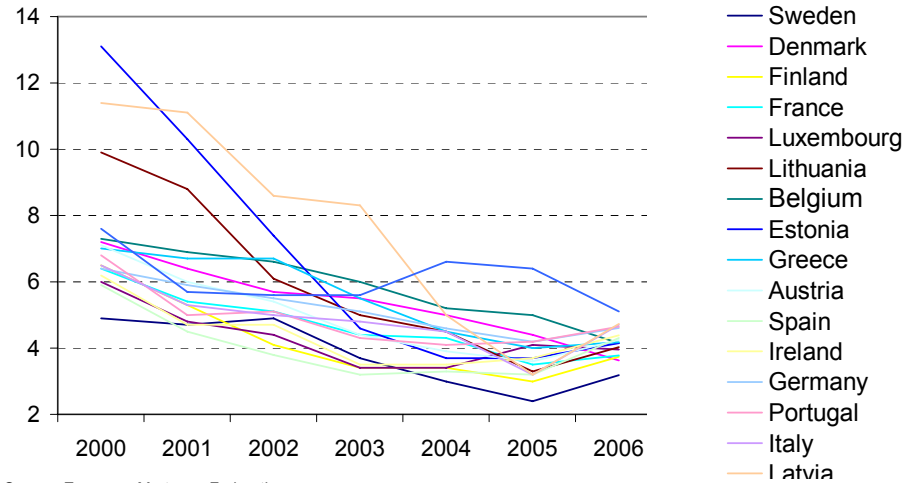
Until very recently, nominal mortgage interest rates[1] in most eastern European countries were very much higher than further west. But recent convergence has been dramatic (see Figure 3).

Many of the mortgages offered in Eastern Europe are foreign currency loans and their increasing availability has brought even more dramatic convergence in the nominal interest rate on debt between Eastern and Western Europe. For example, Latvian and Polish mortgage rates are only just over 1% above their German equivalent. In Poland mortgage lending denominated in foreign currency accounted for approximately 60% of the stock of mortgages by mid-2005. Lending in foreign currency has been rising very rapidly in Hungary, from a low base, and reached almost 30% of the stock of lending by early 2006, up from only 1% in 2003. The overwhelming majority (88% in 1Q 2005) of *new* mortgages in Hungary have recently been in foreign currency — often denominated in Swiss francs. The popularity of foreign-currency-denominated mortgages reflects their lower interest rates compared to domestic currency mortgages.

[1] If there are no credit restrictions and households can control the rate at which they repay debt, then it is likely that the real (inflation adjusted) mortgage rate is the relevant measure of the cost of debt. But when households have less control over the timing of debt repayments, the nominal rate can be more important. This is particularly true with repayment mortgages with a flat repayment profile where the front end loading problem can be acute if inflation and nominal interest rates are high.

Figure 3

Typical mortgage interest rates



Source: European Mortgage Federation

Loan to Value ratios. Across a large range of countries, it is now typical for borrowers to have available loans worth 70-80% of the house value, and often more. (See Table 2).

A more relevant limit for many households is the maximum loan relative to income; often limits are expressed as a maximum mortgage repayment relative to household income (adjusted for other regular commitments). Our impression from a search across major lenders in various countries is that the limits on debt repayments as a share of income are fairly similar across countries, with lenders often reluctant to see repayments exceed 30-35% or so of available income.

Owner occupation rates: Owner occupation rates vary markedly across the euro area, ranging from over 80% in Italy and Spain to 44% in Germany. In CEE, owner occupation rates vary even more widely, from over 90% in Romania and Croatia to under 50% in the Czech and Slovak Republics. But because of mass privatizations of formerly state-owned rented properties in recent years, the average owner occupation rate in Eastern Europe is above the Western European average.

This rise in owner occupation in CEE is a relatively recent phenomenon and one where the impact upon mortgage lending has yet to come. With relatively widespread home ownership but very low mortgage debt, most Eastern and Central European countries now have a stock of owner-occupied housing wealth which is very large relative to the small amount of debt.

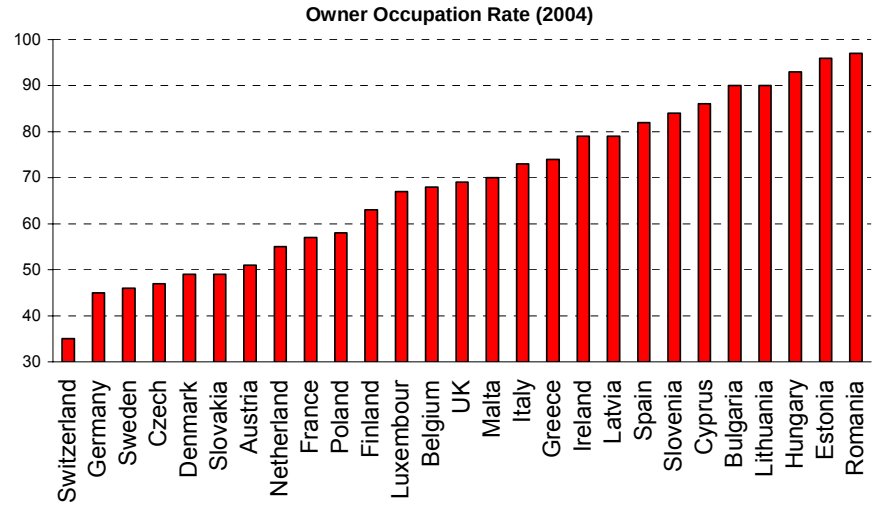
Table 2

LTV ratios (typical, on new mortgages for 2005)

Austria	70-85
Belgium	80-85
Bulgaria	70 to 80
Croatia	60 to 70
Cyprus	80
Czech Republic	70
Denmark	80
Estonia	75
Finland	70-85
France	66
Germany	70
Greece	60
Hungary	40
Iceland	80-90
Ireland	91-95
Italy	80
Lithuania	70-90
Luxemburg	max80
Malta	68
Netherlands	112
Norway	60-80%
Poland	60
Portugal	70-80
Romania	75
Russia	70
Slovak Republic	70
Spain	83
Sweden	90
Switzerland	65-80
Ukraine	70
UK	80

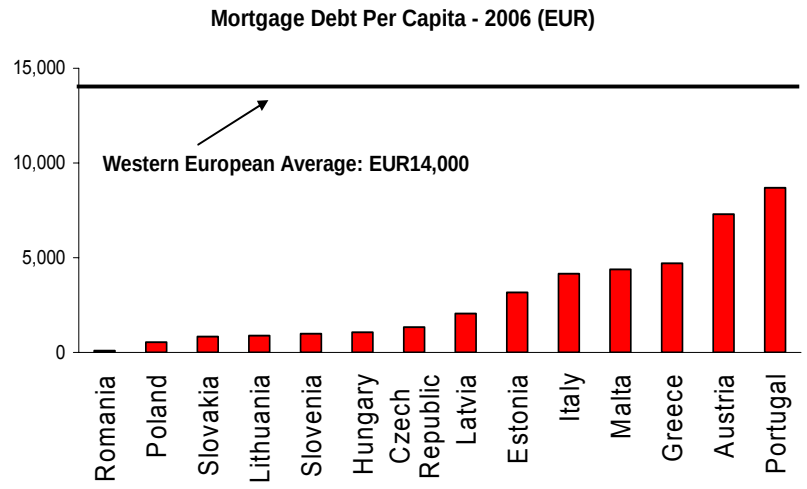
Source Housing Statistics in the European Union (2005/06) - Italian Ministry of Infrastructure, Bank for International Settlements, European Mortgage Federation, Consumer Association of Iceland, Morgan Stanley Research

Figure 4



Source: Housing Statistics in the European Union (2005/06) - Italian Ministry of Infrastructure, United Nations, Morgan Stanley Research

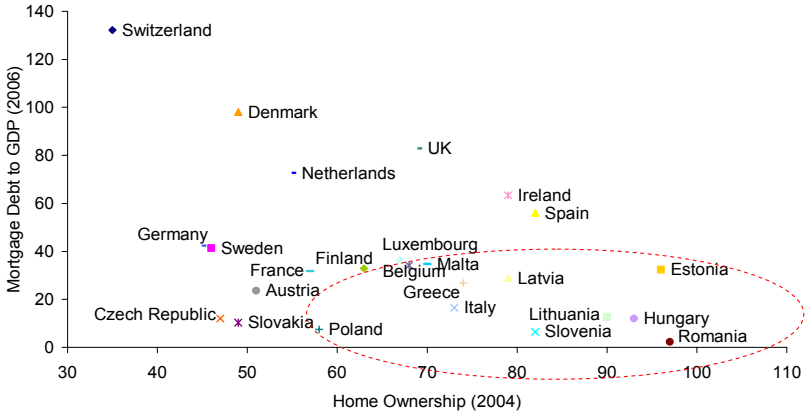
Figure 5



Source: European Central Bank, Swiss National Bank, Bank of England, National Bank of Romania, International Monetary Fund, Eurostat, United Nations, Morgan Stanley Research

Figure 6

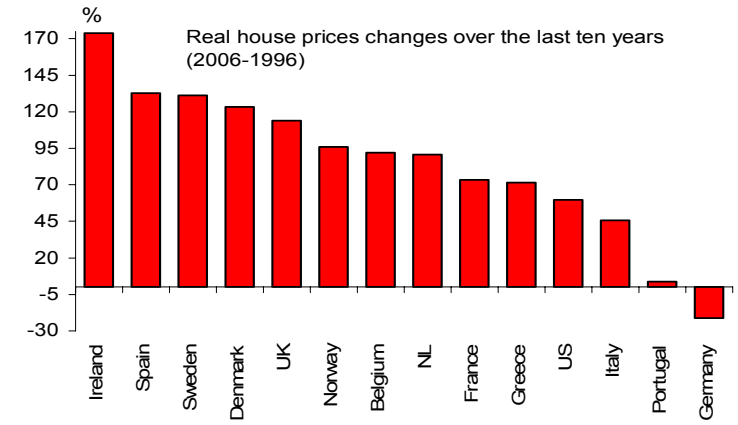
Debt and home ownership:



Source: European Central Bank, Swiss National Bank, Bank of England, National Bank of Romania, International Monetary Fund, Eurostat, Housing Statistics in the European Union (2005/06) - Italian Ministry of Infrastructure, United Nations, Morgan Stanley Research

Figure 7

House prices have increased significantly across much of Europe



Source: See Appendix 1

Figure 6 shows that debt to GDP ratios in Eastern Europe are rarely much above 10% and generally well below it. Yet owner occupation rates are high. Amongst western European countries with comparable owner occupation rates, the average mortgage debt to GDP ratio is around 60%.

So we still have big differences in amount of mortgage debt across Europe, especially when we include Eastern Europe; but there has been much more convergence in the availability and, particularly, the price of mortgages. Figure 3 showed the very significant convergence in the nominal cost of mortgage debt; it also showed the powerful downward movement in rates over the past few years. Both the real and nominal cost of mortgage debt has come down quite significantly over the course of the past ten years. However, with both the ECB and Bank of England having raised rates in recent quarters the period of falling cost of mortgage debt has come to an end in most countries, and the cost of debt is starting to rise.

House price trends

The overall fall in the cost of debt over the past decade has been one powerful, and common, factor in driving house prices up across most of Europe. It is one reason why prices have risen strongly in many countries at roughly the same time. Figure 7 shows changes in the level of real house prices over the past ten years for several European countries.

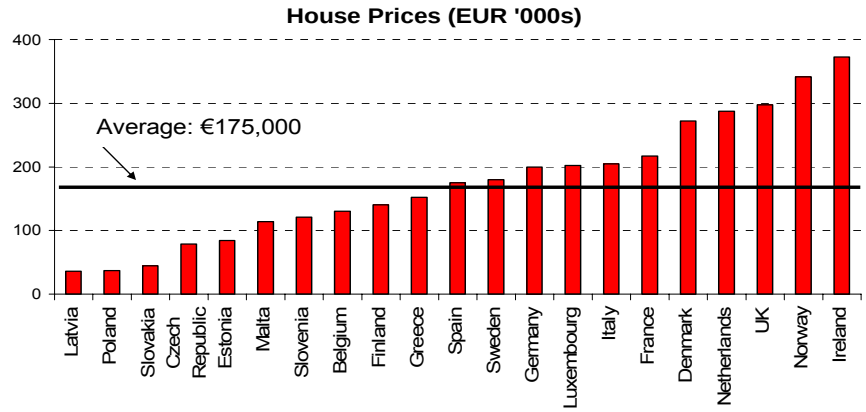
Figure 8 shows estimates of the level of house prices. (Appendix 2 describes the sources and methods used in constructing these estimates). Cross country comparisons of the level of house prices are not very reliable. Typical houses differ in size and quality across countries, which makes comparisons problematic. But the ranking of countries in terms of the price of a typical house are probably fairly robust.

House prices relative to typical incomes are a better guide to the affordability of homes in different countries than are comparisons of absolute prices. Not surprisingly there is less variation between countries in average house price to income ratios than in the average level of house prices. Across Europe the typical ratio of house prices to per capita GDP is about 7. The typical ratio of prices to average household income is now around 5. Because house prices have risen so much faster than incomes in many European countries these ratios are significantly higher now than they were even a few years ago.

House price rises mean that in most European countries people need to borrow much more relative to incomes than they did in the recent past. This should have an effect on the most suitable types of mortgage. The extent to which recent price movements are due to fundamentals (many of which are common) or due to more speculative and potentially transitory factors has a potential impact on the optimal type of mortgage. So we briefly explore that issue before turning to the design of mortgage contracts.

Figure 8

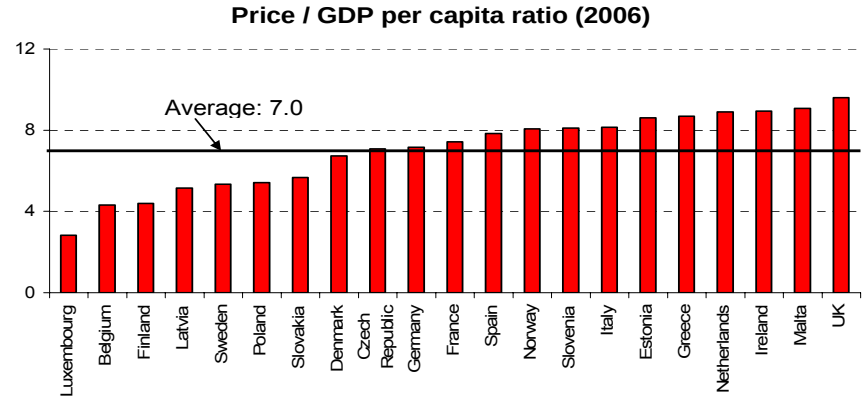
Estimates of average house prices in 2006



Source: See Appendix 2

Figure 9

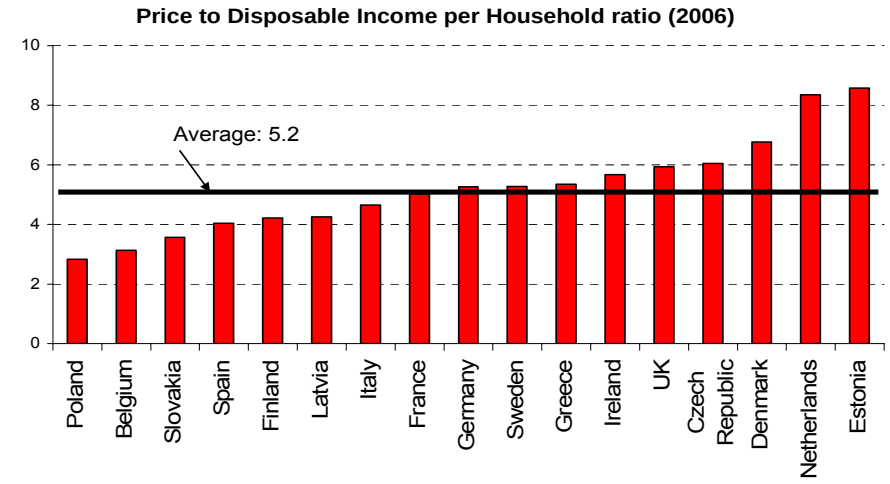
House prices to GDP ratios



Sources: See Appendix 2

Figure 10

house prices to disposable income ratios



Source: See Appendix 2

II. Explaining House Price Movements

We have seen that across the majority of European countries there has been rapid growth in real house prices over the past ten years. That growth has usually been far faster than the growth in average real incomes.

We have got to where we are today because the evolution of the demand for housing and shifts in the stock of houses has meant that the price that matches demand to supply in several European countries is about twice as high, in real terms, as it was ten years ago.

How much of this rise in house prices in different countries has been due to fundamental drivers of demand that are likely to be fairly persistent ——rising populations, changes in the cost of debt, and higher incomes — and how much by factors likely to be more transitory — optimism about future price rises driven by the past increase in house values — is hard to judge. But it can have an effect upon the most suitable types of mortgage.

In this section we use a simple framework to give some rough idea of the likely contributions of persistent, fundamental factors driving demand and supply to the rise in house prices. We use this framework to assess how much of the change in prices in different countries looks hard to explain in terms of fundamental drivers of demand and supply.

The model is really very simple. We assume that the demand for housing depends on three factors:

- average per capita incomes;
- the population
- the real cost of home ownership.

The third factor — the real cost of home ownership (or the user cost of housing) — depends on several things. It reflects the level of real house prices, interest rates and other costs (depreciation, repairs, house insurance, taxes). The cost of home ownership is also affected by anticipated changes in house prices. If house prices are expected to rise, this reduces the effective cost of owning a home as the capital gain offsets the cost of paying interest (or foregoing interest on home equity) and undertaking repairs and maintenance and paying taxes.

We assume that the percentage change in the demand for housing (measured in demand for physical property) depends upon the percentage change in average disposable real incomes, the change in the population and the percentage change in the user cost of housing.

We use central estimates for the sensitivity of demand and supply to the factors outlined above from the large literature on modeling the housing market. We then look at the history of the past ten years for several European counties to get an idea of the rise in real house prices over that period that might have been expected to match the rise in demand against the rise in supply.

The major unknown factor in this procedure is figuring out how people form expectations of where house prices will be going, which is an important determinant of the real cost of home ownership. It is exceptionally hard to get any sort of evidence on how people form these expectations. We make an assumption that people attach some weight to what has happened to house price inflation in recent years but also believe there is a tendency for price increases to move towards some long-run average rate of increase. In other

words, people believe there is an element of momentum in house price changes but also an element of reversion to some long-term rate of increase. There is some evidence for this — careful empirical work by John Muellbauer and Anthony Murphy (1997, 2006 and references therein) and David Hendry (1984) over many years has found a role for a backward-looking element and for a more forward-looking element in expectations.

The backward-looking role is potentially de-stabilising (and is sometimes called a "bubble builder"). The reason is straightforward: if people believe that a period of rapid high price growth means further sharp rises in prices, their demand is actually boosted by fast growth in prices, and this adds to price pressures. In our framework, that de-stabilising factor is offset by two other factors. First, there is a degree of mean reversion built into the way people are assumed to form expectations. Second, a higher *level* of real house prices does increase the cost of home ownership.

The box below sketches the model in more detail.

The Model:

House prices adjust to make demand for housing equal to the stock of houses (i.e. supply).

The demand (D) equation is:

$\text{Log } D = a_1 (\log (Y/pop)) + a_2 (\log (pop)) - b (\log (\text{user cost}))$

where D is demand, Y is aggregate household disposable income, pop is the total working age population and user cost is defined as:

User cost = Ph/P * (rr + mortgage spread + other costs - expected real house price growth)

where Ph is the average nominal house price and P is the level of consumer prices, hence Ph/P is the average real house price; rr is the real interest rate (we use the average of the yield on five- and ten-year government bonds net of a moving average of consumer price inflation); mortgage spread is the spread between rr and the average mortgage rate; other costs are taxes, home insurance, depreciation, maintenance and fees associated with moving and owning a home.

For expected future real house price growth, we average a backward-looking and forward-looking component. For the backward-looking component, we use average annual house price inflation over the previous five years. For the forward-looking component, we use the steady state solution to our model, which turns out to be around 3% real house price growth for most countries (consistent with house prices rising about 5% a year if consumer prices rise at around 2%). This long run solution is based on an assumed long run elasticity of supply of about 0.3. In figuring out the relative importance of backward and forward looking elements in generating expectations of house price growth we use the weights for each country that best explain the rate of house price growth over the past 10 years.

Aggregate household disposable income is given by:

$Y = (Y/pop)\ (pop)$

where Y/pop is household disposable income per working age person and pop is the working age population. We will assume that the impact of more people of working age upon demand is the same as the impact of higher incomes per person, so that: $a_2 = a_1 = a$

Our supply (S) equation is:

Log S = d + c (log(Ph/P))

So, we assume that the total supply of housing is greater the higher are house prices; house builders find it more profitable to build if prices are higher relative to the cost of constructing homes. (A significant element of that cost is the cost of land with planning permission to develop.)

From our supply (S) and demand (D) equations, we have that approximately:

% change in S = c (% change real Ph/P)

% change in D = a (% change Y/pop + % change pop) - b (% change Ph/P) - b (% change [rr + mortgage spread + other costs - expected real house price growth]) (1)

Equating the change in supply and demand and re-arranging gives:

% change (Ph/P) = a [% change Y/pop + % change pop] / (b+c) - b [% change [rr + mortgage spread + other costs - expected real house price growth]] /(b + c) (2)

We use this equation to estimate the long run (or steady state) rise in real house prices. This is simple because in steady state the final term in equation (2) is zero so that in steady state:

% change (Ph/P) = a [%change Y/pop + %change pop] / (b+c) (3)

To evaluate this we need values for a, b and c, where a is the elasticity of housing demand with respect to income; b is the elasticity of demand with respect to price/user cost and c is the elasticity of supply with respect to price. Cameron, Muellbauer and Murphy (2006) report that the international literature suggests that 'a' is between ½ and 1 in cross section data and as high as 1¼ in time series data. We use an elasticity of 1. They also suggests that the price elasticity ('b') is about ½.

Explaining the last 10 years:

Let X be the actual percentage change in supply over the past ten years. We then solve for the rise in price that would have made demand increase over the ten years to today by X. Using equation (1) this is:

% change (Ph/P) = a (% change Y/pop + % change pop) / b - X/b - % change [rr + mortgage spread + other costs - expected real house price growth] (4)

What has driven prices higher? We compare today with ten years ago, and ask what change in real house prices seen over this ten-year period would be expected given the rough orders of magnitude for changes in income, population and user cost over the same ten-year period, using the model described in the box (equation 4).

Figures 11-14, show the results of the decomposition of the change in prices into parts due to rises in average real incomes, changes in population, shifts in the real interest rate, movements in supply, and finally into a residual component that we think of as the change in optimism about future changes in house prices. We set the relative weight of the backwards and forward components in the expectations formation for future capital gains on housing to try to get this speculative factor, which we label the "change in capital gains effect", to match the change in house prices not explained by shifts in the other "fundamental" factors. (Appendix 1 describes how we applied equation (4) to each country).

Table 3

The decomposition of house price changes

	Germany	France	Italy	Spain	NL	Ireland	Belgium
Change in real house prices due to:							
Rise in real income per capita	22.5	37.5	4.0	37.8	21.9	107.7	15.0
Increase in number of persons	-4.5	12.8	6.8	35.4	10.6	70.3	5.9
Change in real interest rate	8.2	35.6	37.9	66.2	58.9	72.3	36.5
Change in the capital gains effect	-24.8	8.6	0.8	45.0	-0.6	8.1	53.3
Change in housing supply	-22.8	-21.0	-3.8	-51.6	-16.8	-84.8	-18.5
Total	-21.3	73.4	45.7	132.7	74.1	173.6	92.1
Actual	-21.3	73.4	45.7	132.7	90.7	173.6	92.1

	Portugal	Greece	Sweden	Denmark	Norway	UK	US
Rise in real income per capita	40.5	81.3	41.9	37.3	56.7	44.4	39.7
Increase in number of persons	11.5	7.9	12.6	3.0	21.3	14.6	33.7
Change in real interest rate	22.8	-38.6	31.1	52.1	29.0	32.9	25.9
Change in the capital gains effect	-6.0	60.7	53.7	45.3	3.0	38.8	1.4
Change in housing supply	-37.5	-39.8	-8.1	-14.3	-22.9	-16.0	-28.6
Total	31.3	71.5	131.2	123.4	87.1	114.7	72.2
Actual	3.6	71.5	131.2	123.4	96.1	113.7	59.7

Parameter Settings

	Germany	France	Italy	Spain	NL	Ireland	Belgium
Steady state real house price growth	3.00	3.00	2.50	3.00	3.10	3.30	3.00
Backward-looking weight	0.44	0.04	0.01	0.23	0.01	0.11	0.60
Forward-looking weight	0.56	0.96	0.99	0.78	0.99	0.89	0.40
Other housing costs	4.50	4.20	4.60	5.00	3.30	4.00	4.50
Mortgage spread (%)	0.70	0.80	1.00	1.30	0.65	0.70	0.70

	Portugal	Greece	Sweden	Denmark	Norway	UK	US
Steady state real house price growth	3.00	3.20	3.14	3.10	3.05	3.16	3.10
Backward-looking weight	0.98	0.89	0.25	0.14	0.05	0.13	0.01
Forward-looking weight	0.02	0.11	0.75	0.86	0.95	0.88	0.99
Other housing costs	4.50	4.50	3.50	3.80	4.20	3.50	4.00
Mortgage spread (%)	1.10	0.90	0.70	0.80	0.84	0.70	0.80

Sources: Morgan Stanley Research, National Statistical offices, ECB, OECD, Economist House Price index, Bloomberg, Bank of Greece, EMF, Nomisma, Irish Department of the Environment, EU, IMF, Kennedy (2006), Dutch Land Registry Office, OFHEO

The results of the rough decomposition of house price rises for Western Europe (illustrated in figures 11-14) suggest the following:

- Over the past 10 year falling interest rates have been a major driver of higher house prices in many countries. In Spain, the Netherlands, Denmark and Ireland they may have generated, all else unchanged, between a 50% and 70% rise in real prices.

- Rising real incomes explain a significant amount of house price inflation. This has been particularly strong in Ireland, Norway and Greece.

- Population increases have played a substantial role in some countries – particularly in Spain and Ireland (and also in the US).

- New supply has offset some of the impact on prices of factors driving demand, but the strength of the supply response has varied greatly across countries. It has been weak in the UK, Denmark, Italy and Sweden. But extra supply has been a powerful factor in Spain, Ireland and Greece.

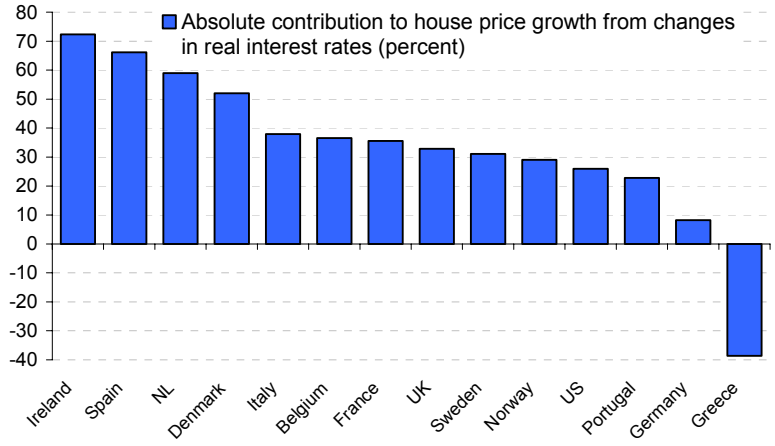
- In many cases our catch all residual factor — which we have identified as shifts in optimism driven by a degree of extrapolation from past price changes (to an extent required to account as best we can for the actual shift in prices) — is very significant (see Figure 13).

So after allowing, in a fairly rough way, for the powerful impact of other fundamental drivers of demand and supply, which on the whole would have generated substantially higher house prices, we are left with a good deal to explain. If we allow past changes in prices to have some impact on expectations of future price rises, we can account for much of that residual. The extent to which we rely upon this factor varies quite significantly across countries, as does the weight given to extrapolation in forming expectations. The countries where we identify a strong rise in anticipated returns to housing as having driven up demand and prices are Spain, UK, Greece, Sweden, Belgium and Denmark.

Any unwinding of a shift towards greater optimism in the returns on housing has the potential to drive prices down.

Figure 11

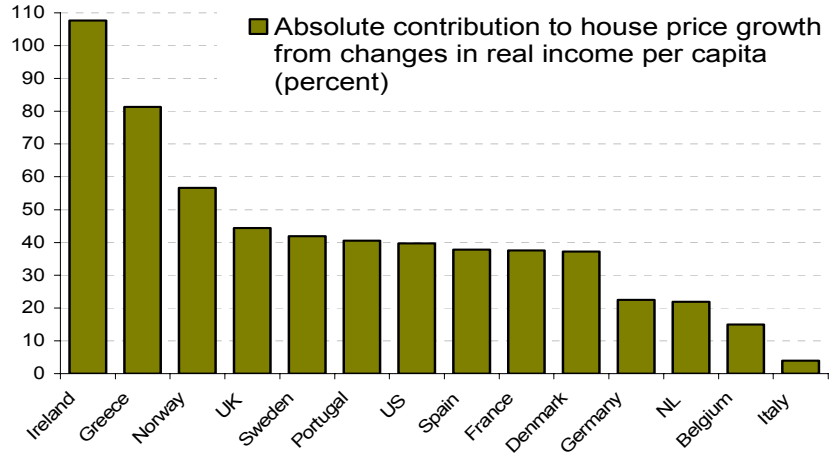
Contribution from changes in real interest rates to 10 year house price growth



Source: Morgan Stanley Research

Figure 12

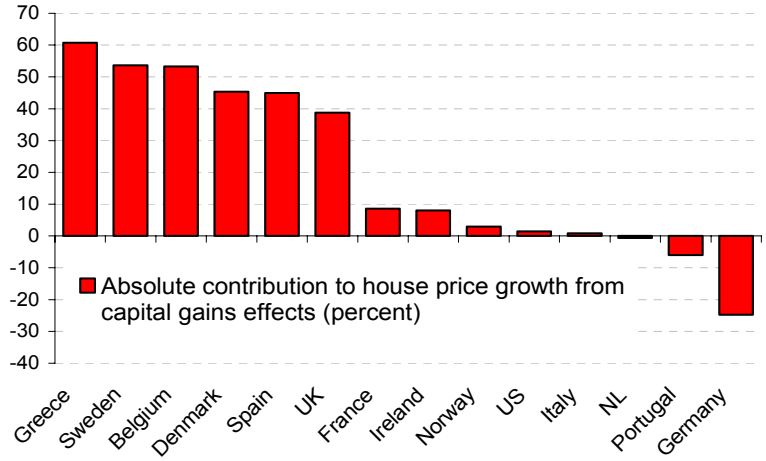
Contribution from changes in real income to 10 year house price growth



Source: Morgan Stanley Research

Figure 13

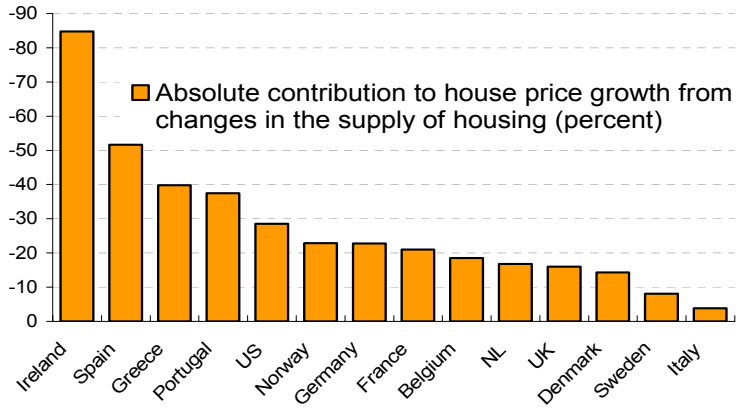
Contribution of estimated change in expected capital gains to 10 year house price growth



Source: Morgan Stanley Research

Figure 14

Estimated offsetting supply effects on change in house prices over past 10 years



Source: Morgan Stanley Research

House Prices and Affordability: Conclusions

House prices across most of Europe are much higher than 10 years ago; to a significant extent this is likely to have been driven by higher incomes and to a lesser extent by rising population. Lower interest rates have been an important factor. But in many countries more favourable expectations have also probably played a big role. That factor is likely to be volatile and possibly transitory, so declines in prices are clearly possible, and in some countries quite likely.

The question we address in the second half of this paper is what types of mortgage are likely to prove more suitable in a world where prices are higher relative to incomes and where house prices may be volatile and cannot be assumed to carry on rising.

Section III: The Design of Mortgage Contracts

Overwhelmingly across Europe a mortgage remains a nominal contract with repayments unrelated to movements in consumer or house prices. Typically capital is repaid over a period of 20 to 30 years, or at least it would be if people did not re-mortgage. In practice people often re-mortgage when they move house and only a minority would gradually repay their original mortgage in line with the amortising schedule used to calculate the regular payments.

Sometimes the nominal rate is fixed, sometimes it is variable. Different mixes of fixed and variable rate mortgages are seen in different countries, though there have been some significant changes in recent years with variable rates becoming more popular in some countries where in the past fixed rate contracts were common (e.g. Denmark and the US), while in other countries fixed rate contracts have become more common (the UK).

The differences in the risk characteristics between fixed nominal and variable nominal rate debt contracts are well understood and much analysed (Miles (1994, 2003, 2004), Leece (2005), Campbell and Cocco (2003)).

Neither the overall real value of the stream of payments or its time profile are known with nominal debt contracts, either fixed or variable rate. Fixed and variable contracts nonetheless generate very different risks. Front end loading (or the tilt effect) — whereby the real value of payments is higher earlier in the term of the mortgage and lower later — is less serious with the fixed nominal rate contract if inflation and nominal rates suddenly rise, but with fixed nominal rate mortgages the real cost of borrowing can nonetheless be highly variable if inflation deviates from what seemed likely when the nominal rate was set. With variable rate nominal contracts the real overall cost of borrowing could be less variable, and is likely to be should the dominant driver of nominal rates be inflation; but shifts in inflation will create big shifts in the timing of payments which for credit constrained households can cause big problems.

So in terms of risk, the problem with standard, nominal mortgages is threefold:

1. They generate uncertainty about the real repayment profile.

2. Because payments are unrelated to shifts in the value of the home, they create a highly levered investment position with substantial exposure of the home owner's net worth to changes in the value of their specific property.

3. With either fixed or variable nominal rates, typically the burden of repayments is highest when the debt is taken out and gradually declines, which is not ideal given the typical profile of income for buyers, particularly first-time buyers.

In short, nearly all mortgages offered in Europe today do not afford certainty over real payments nor do they in any way link what is owed to the value of the underlying asset, the house.

That becomes potentially a more serious problem as the amount people need to borrow is larger relative to their incomes. Campbell and Cocco (2003) find that real (consumer price indexed) mortgages — where the real value of the repayments is set by the contract and not the nominal values — are generally optimal. Yet this is a contract rarely seen.

All these problems: front end loading; the impact of uncertainty over the profile of real burden of servicing the debt; the great exposure of net worth to unexpected movements in the price of the specific house purchased; get worse if house prices are higher relative to incomes. As we have seen real house prices have risen sharply, and far faster than real incomes, across much of Europe. This creates problems whether the rise in prices is permanent or transitory, but the problems are different.

If the big rise in prices is largely permanent, people will consistently need to borrow more, so the risk of unexpected rate movements or of locking in at "wrong" nominal rate will now be more serious. The burden of servicing debt will also be permanently higher.

If a very substantial part of the rise in house prices is transitory then those who have bought very recently, and whose debt liability is independent of house prices, will experience very large shocks to net wealth.

The evolution of mortgage contracts in a world of higher house prices:

A major part of the problem generated by higher house prices and standard nominal debt contracts is that the initial cost of mortgages is sharply higher. The ratio of initial repayments to income can be reduced by:

- Extending the period over which the loan is to be repaid. This has the advantage of reducing the initial cost of servicing the debt but it also exposes people for longer to the risk of shocks to interest rates.

- Allowing interest only mortgages. This is really a special case of extending the period over which the loan is to be repaid (to infinity).

- Shared appreciation mortgages, which link some element of the repayment of the mortgage to rises in house prices. These have been available in some countries, though they do not represent an ideal way of sharing house price risk since the contracts have not generally created true risk sharing of house price changes (since price falls generally do not reduce the amount owed).

Problems of affordability and the manageability of the debt repayment profile have triggered some changes in the type of mortgages offered in Europe. Table 4, from Girouard et al (2006), summarises some of the recent changes in mortgage contracts across developed countries.

Table 4
Recent mortgage product innovations in selected countries

United States	**Interest only loans, flexible mortgages with variable repayments.**
Germany	**New Pfandbriefe Law abolishing penalties for early mortgage pay-offs.**
France	**Variable payment mortgages; lengthening mortgage terms.**
United Kingdom	**Flexible mortgages; offset mortgages (savings and mortgage held in same/linked accounts, with savings offset against mortgage balance); base rate trackers.**
Canada	**Shorter-term mortgages, initial fixed-rate period shortened from five years to one year; Skip-a-payment, early mortgage renewal and flexible payment schedules.**
Australia	**Flexible mortgages with variable repayments; split-purpose loans (splits loan into two sub-accounts, giving tax advantages); deposit bonds (insurance company guarantees payment of deposit at settlement); non-conforming loans; redraw facilities and offset accounts; new providers including mortgage originators and brokers.**
Denmark	**"Interest-adjusted" loans: interest rate set at regular intervals by sale of bonds; capped-rate loans; BoligXloans: interest adjusted every six months with reference to ten-day average of CIBOR; Interest-only loans.**
Finland	**Lengthening mortgage terms; introduction of state guarantee for mortgages.**
Ireland	**Lengthening mortgage terms.**
Netherlands	**Savings or equity mortgages: part of payment covers interest, part goes into fixed interest savings account or equity account (confers tax advantages); interest-only mortgages.**

Source: Girouard, Kennedy, van den Noord and Andre (2006), based on Scanlon and Whitehead (2004) and Canada Mortgage and Housing Corporation (2005).

Optimal mortgage contracts

What might an ideal contract look like? The careful analysis of Campbell and Cocco (2003) strongly suggests it should give more certainty about the real cost of repayments: it should have a strong (consumer) price indexed element. To allow households to be less exposed to shifts in the price of the specific property they own it might also have an element of true risk sharing of movements in the price of the property. With greater life expectancy it might also have a somewhat longer repayment period than has been typical in the past.

In the next section we will consider the characteristics of such mortgages using simulation analysis to see how they compare with standard mortgages. Before that we briefly describe how mortgages with some of these features are emerging in the UK, where house price rises have been so much in excess of incomes that innovation in mortgages has been particularly needed.

Recent developments in the UK market

Average house prices in the UK have more than doubled since 2000. Incomes have not increased by anything like as much. As a result buyers, and particularly first-time buyers, are having to borrow far more relative to their incomes than was the case in the past. For recent first-time buyers in the UK the average ratio between purchase price and incomes is above 4.5; ten years ago it was 2.9. Mortgage advances relative to incomes are up sharply, on average now about 40% higher than was typical ten years ago. At the same time most first-time buyers are now having to find a somewhat higher proportion of the purchase price as a deposit, and with prices having risen so much, many buyers are struggling to afford even the most modest homes. All this is happening against a backdrop of very sharply rising personal insolvencies and increased bank write-offs of bad debts. Thus far most of the defaults have been on un-secured lending: credit card debt and overdraft lending. But there has also been an increase in the rate of possession orders taken out by lenders as a first step towards possible repossession of homes from owners unable to make mortgage debt repayments.

In this environment the type of mortgage that has been typical in the UK for many years becomes increasingly unsuitable for many aspiring home owners. The typical UK mortgage has been a variable rate debt contract (or one where the rate is fixed for a small part of its life, typically two years or so). The loan usually represents a high proportion of the purchase price — often 90% or more of the value of a house — but the liability is not linked to shifts in the value of the property.

This loan contract means that first time buyers are taking a highly leveraged investment in a highly-non-diversified portfolio of residential property. The concentration of investment in one property is, in itself, pretty extreme when viewed in the light of standard portfolio theory. And the protection against interest rate fluctuations created by fixing the rate for just two years or so is limited in a world where no one knows where short term, nominal interest rates will be a few years down the road.

What kind of financial contract would offer a better way to deal with affordability and risk issues for many first time buyers? And could it be offered on a commercial basis? Some desirable features of a loan contract are:

1. That the burden of repayments on the loan are not fully exposed to shifts in nominal interest rates, which can cause severe problems to those who might only just be able to manage payments at current levels of interest rates.

2. That it makes buyers less exposed to sharp swings in the value of the specific property that they buy *and* that it makes the value of the loan reflect, to some extent, shifts in the value of the home that is its collateral.

In the light of the first point, setting repayments by reference to a <u>real</u> interest rate, rather than to a <u>nominal</u> one, has advantages. Real interest rates are less volatile that nominal rates.

In the light of the second point, equity share (or equity loan) contracts, where a lender effectively takes an equity stake in a home and gains exposure to movements in the value of the property, are promising. The UK government had various initiatives in this area. But those schemes have an element of public subsidy and, as a result, are likely to be targeted at specific groups rather than be available more widely to all potential borrowers. This is why it is interesting to ask whether financial contacts that have these features can be offered on commercial terms.

Since the economic advantages — particularly in terms of risk sharing between lenders and home owners — of having a contract that has these features are potentially substantial there is every reason to believe that they can be mutually beneficial and therefore commercially viable.

The idea behind the schemes is simple: some significant part of a loan will have a repayment value that is a proportion of the value of the home. The interest rate on that part of the loan whose outstanding balance

moves in line with the house value will be low: a deal of this sort recently offered sets that rate at a fixed 2.99% for the life of the loan. This contract means that house price risk is shared, *and* that on a substantial element of the overall loan the cost of funds is both low and fixed for the life of the loan. Because of this both the current cost of, and the risks generated by, loans that are a high proportion of current income can be less than with conventional loans. In exchange for getting a lower interest *and* some insurance against house prices falling home owners will give up some of any house price appreciation. This will not be right for everyone, but might be attractive to the risk averse struggling to get onto the housing ladder.

In the final section we consider in more detail what the potential advantages of indexed mortgages and those that create shared equity might be.

IV The Future Design of Mortgage Contracts - Indexed and Shared Equity Mortgages

In this section we look in detail at the risk and cost characteristics of different mortgage contracts.

We compare the profile of debt servicing costs on a standard repayment mortgage to that on an indexed mortgage with a flexible equity share component. The indexed component is straightforward: it is an element of debt where the real value of repayments (at a given real interest rate) is constant over the life of the mortgage. The real rate could be fixed over the course of the mortgage or could vary from period to period.

The equity share component is effectively a loan with a fixed rate and where the capital outstanding is linked to the value of the home. The home owner has the option of repaying this debt by repaying the principle amount borrowed but scaled up by the change in house prices between the point at which the loan was taken out and the point at which capital is repaid.

We consider the path of mortgage repayments, both relative to income and in present value terms, for the following types of mortgage:

1. a 30 year repayment mortgage with a variable nominal rate;

2. a 30 year repayment mortgage with a fixed nominal rate;

3. a 30 year fixed index linked mortgage[2] with an element of shared ownership and where the occupier steps up their share over time so that by year 30 they own all the house;

4. a 30 year index linked mortgage with the real interest rate re-set each year in line with market rates, and with an element of shared ownership where the occupier steps up their share over time so that by year 30 they own all the house.

We assess the characteristics of these mortgages by seeing how the profile of repayments that they generate evolves as the economy is hit by shocks to inflation, interest rates, incomes and house prices. We briefly first describe the technical details of the modeling and then focus on the results. Readers less interested in technical details should go straight to the Results.

The economic environment:

[2] With a fixed real interest rate so that real repayments are fixed and nominal payments only vary as the consumer price index changes.

We assume that inflation at time t (p_t) follows a process that makes it somewhat persistent (an AR1 process).

$$p_t = a_p + b_p\, p_{t-1} + e_{pt} \quad (5)$$

The real interest rate (rr_t) also follows a persistent process, so that periods of above average real interest last for some time.

$$rr_t = a_{rr} + b_{rr}\, rr_{t-1} + e_{rr} \quad (6)$$

We assume a flat real yield curve so that at any time all real yields are the same.

Real house price inflation (hp) is an identically and independently distributed (iid) process:

$$hp_t = a_{hp} + e_{hpt} \quad (7)$$

A household's real income growth, y, is also an iid process (so that real income is a random walk with drift)

$$y_t = a_y + e_{yt} \quad (8)$$

a_p, a_{rr}, a_{hp}, a_y are constants that reflect average outcomes.

e_p, e_{rr}, e_{hp} and e_y are normally distributed random shocks to inflation, real interest rates, house prices and incomes.

The growth in nominal income is $(1+y)(1+p) - 1$

The growth in nominal house prices is $(1+hp)(1+p) - 1$

We assume the nominal interest rate in any period is simply the real rate adjusted for inflation. Denoting the nominal rate at time t by r_t we have:

$$r_t = (1+rr_t)(1+p_t) - 1 \quad (9)$$

The mortgage contracts

The standard repayment mortgage with 30 year amortisation and a variable nominal rate is one where the payment in any period t (denoted m_t) is given by:

$$m_t = M_t\ [r_t /(1+r_t)]\ /\ (1 - 1 /(1+r_t)^{30-t}) \quad (10)$$

When the mortgage is taken out t=0.

The stock of mortgage debt outstanding evolves from one period to the next according to the formula:

$$M_t = M_{t-1}(1 + r_{t-1}) - m_{t-1} \quad (11)$$

For the fixed nominal rate mortgage we use the constant rate r_0 in the above formula.

For the shared ownership, indexed mortgage we also consider a case where after 30 years the household owns their home and has paid off all debt. To do that they need to make capital and interest payments on the indexed mortgage and also gradually buy back the stake in the home from the lender, while paying a fixed rate (set at 3%) on that part of the original loan still outstanding whose value is linked to the value of the house. This regular payment is essentially a rental yield to the lender on their equity stake in the house.

In essence the overall contract is an indexed loan with part of the loan (the standard amortising part) indexed to the consumer price level and the other part (which has a flexible repayment schedule chosen by the owner) indexed to the price of the specific property. We assume that the household chooses to start increasing its own ownership stake after 10 years and gradually repays the flexible part of the loan, whose value is indexed to the price of the house, over the last 20 years of the 30 year contract. In effect this means that the household starts out renting some fraction of the house it occupies from the lender. After several years the occupier starts to buy that equity stake from the lender at whatever the prevailing value of the property then is. That happens over the remaining 20 years of the original 30 year contract.

The repayments on the amortising, consumer price indexed mortgage (denoted m_{rt}) are given by the following formula

$$m_{rt} = M_{it} \; [rr_t /(1+rr_t)] \; / \; (1 - 1 /(1+rr_t)^{30-t}) \qquad (12)$$

M_{it} is the outstanding current value of the indexed mortgage. The stock of this part of the mortgage evolves from one period to the next according to the formula:

$$M_{it} = M_{it-1}(1 + rr_{t-1})(1+p_{t-1}) - m_{rt-1} \qquad (13)$$

When we use a fixed real rate $rr_t = rr_{t-1} = rr_0$

With a fixed real rate the repayment schedule implies that the real value of the flow of repayments will be constant and nominal payments rise at a rate equal to the rate of consumer price inflation.

The equity share part of the mortgage: In essence this is an interest only mortgage with a fixed rate. That rate could be considered the rental charge for using a part of the home. The value of the capital outstanding on the equity share of the mortgage is indexed to the house price. Households are able to reduce the amount of the initial equity mortgage by making capital repayments. Denoting the initial value of the equity loan as M_e the payment schedule, denoted m_e , is then:

$$m_e = r_e M_e \qquad (14)$$

where r_e is a fixed yield.

If the household makes capital repayments to reduce M_e the repayments due are linked to the current house price.

We assume that when households become homeowners they have a deposit of 10% (in all cases). If they chose a shared ownership mortgage, the lender's initial share of the home value is 40% and the standard (consumer price indexed) mortgage is 50% of the house value. With a standard repayment mortgage the initial loan to house price ratio is 90%. The initial value of the house is HP_0.

Thus:

for standard mortgages $M_0 = 0.9\ HP_0$;

for indexed mortgages $M_{i0} = 0.5\ HP_0$; $M_{e0} = 0.4\ HP_0$

To reduce the share of the equity linked mortgage (whose initial size is M_{eo}) from 0.4 of the house value to a lower level at time t (s_t) a repayment would be due of:

$(0.4 – s_t)\ HP_t$

We assume that at t=10, s_t first falls below 0.4. To reduce the share further capital repayments would need to be made according to the rule: $(s_{t-1} – s_t)\, HP_t$

We set $s_t = 0.4$ for t=0 to 10 while $s_t = s_{t-1} - 0.02$ for t=11 to 30. So at end of 30 years all debt has been repaid.

Parameterisation

We set the (unconditional) mean real mortgage rate (rr) at 3%. Index linked bond yields across Europe have been around 2% recently so our 3% figure for the average real mortgage rate implies a mark up over the cost of (default free) debt of around 100bp. The AR coefficient (b_{rr}) is set to 0.8, implying a significant degree of persistence in variability about the unconditional mean. The real interest rate shock is assumed normally distributed with a standard deviation of 0.6%; this implies an unconditional standard deviation of 1%. We assume the yield curve is flat.

We set the (unconditional) mean rate of inflation to 3%. The AR coefficient is set to 0.67, implying that inflation is quite persistent, though less so than real interest rates. The inflation shock has a standard deviation of 2%, which means that the unconditional standard deviation of inflation is 2.7%. In one specification of the model we allow the central bank to respond to inflation by moving the short-term nominal rate by more than needed to keep real rates constant. In that case we then let the real rates follow the process:

$$rr_t = a_{rr} + b_{rr}\, rr_{t-1} + \alpha(p_{t-1} – 0.03) + e_{rrt} \qquad (6')$$

When we allow for this feedback from inflation to monetary policy we let $\alpha = 0.5$.

The mean rate of growth of real income is set to 2%. The standard deviation of the normally distributed shock to real income is set at 5%, a level that is high if interpreted as the volatility in the growth of average real incomes but probably rather low when viewed as a largely household-specific (idiosyncratic) shock.

The average growth of real house prices is set at 1%. The standard deviation of the shock is set to 6% and is assumed to be normal.

The rate charged on the mortgage whose outstanding value is linked to the house value is set at 3% (which is the rate charged by the UK lender Advantage on its loan whose repayment value is linked to the house value). This means an income of 3% + house price inflation is generated for the lender.

Clearly this is all very stylized, and we have made the simplifying assumption of no feedback from shocks to incomes to real interest rates or to house prices, which is only plausible if we view the income shock as household specific.

In the simulations we start with inflation at its unconditional mean and the real rate at its unconditional mean. With the assumption of a flat real yield curve, and the assumption of no term premia in the nominal yield curve, this means that the natural assumption for the fixed nominal rate is that it be $(1+rr_0)(1+p_0)$, which means that with inflation and the real rate both at their unconditional means of 3% (rr_0=0.03, p_0= 0.03) the nominal yields curve is initially flat at around 6%. We assume fixed rate real and nominal mortgages are therefore available at real and nominal rates of 3% and slightly above 6% respectively.

We look at profiles of payments and incomes and house values over 30 year periods. In all cases the household ends up in the same place: they own 100% on an un-mortgaged property. But each of the contracts represents a very different way of getting there. We evaluate those differences by taking draws of income, inflation, interest rates and house price shocks for a large number of 30 year possible histories. We look at 3750 different (independent) such 30 year histories.

We assume that the house purchased is worth 3.5 times the annual income of the household. With a 10% deposit, households need to borrow 3.15 times income, a ratio that roughly matches the recent experience of first time buyers in the UK.

Results

Tables 5 and 6 summarise the results. Table 5 shows several things. First, if we focus simply on the present discounted value of all payments needed to get complete ownership of the house with no debt outstanding, a standard (non-indexed) repayment mortgage does best. It has lowest cost, on average, and least variability in cost.

The loans where the repayments are linked to the house value have, on average, higher total repayments, largely because the value of real house prices is trending upwards, so repaying debt indexed to house prices is on average more costly than repaying nominal debt, at least if we assume the nominal interest rate reflects consumer price, and not house price, inflation.

But few households can be sure that the timing of repayments is irrelevant and simply focus on the present value of all payments over 30 years without regard to the variability of payments from year to year. The great advantage of the indexed loans is that they generate a much flatter and less variable pattern of repayments relative to incomes. The variability across the life cycle for the home owner in the repayment burden, relative to income, is less than half that with standard mortgages. Furthermore the initial burden of the mortgage, relative to income, is only around half that with standard (nominal) mortgages. The front end loading problem with the nominal debt contracts is severe, even though inflation is only at 3% when loans are taken out. Figure 15 shows the smoother pattern of the repayment burden with indexed mortgages.

The indexed mortgage also creates a degree of sharing of house price risks. It is not likely that households want to lose all this risk – a substantial part of movements in the home value will not be idiosyncratic and is highly correlated with movements in the general level of house prices. So a household that knows it will need to live somewhere for many years to come will view some substantial element of the exposure of its net worth to fluctuations in its house value as a form of hedging. But some significant part of house prices shifts is not correlated with the price of potential *other* homes so it is also not likely that 100% ownership of the equity (financed by a very high level of gearing) is optimal. The advantage of partial risk sharing is not reflected in Table 5 of course since it only focuses on the cost of repayments, and not variability in household net worth.

The differences between nominal and indexed contracts become exacerbated when we allow for monetary policy to respond to deviations of inflation from its unconditional mean (Table 6). In this case the real interest rate, and therefore also nominal rates, are more variable.

Table 5

Key characteristics of mortgage contracts: average outcomes across 3750 contracts of 30 year duration – real rates unrelated to inflation

	Standard repayment mortgage – variable nominal rate	Indexed and House price linked mortgage – variable real rate.	Standard repayment mortgage – fixed nominal rate	Indexed and House price linked mortgage – fixed real rate.
Initial repayment burden – relative to income	22.0%	12.9%	21.8%	12.9%
Average repayment burden – relative to income – across 30 years	11.9%	12.6%	12.2%	12.6%
Average standard deviation of repayment burden across 30 years	5.6%	2.4%	4.9%	2.3%
Present discounted value of all repayments – using actual path of nominal rate	3.15	3.21	3.21	3.21
Standard deviation of present value of repayments –using actual path of nominal rate	0	0.25	0.41	0.27
Present discounted value of all repayments – using constant real rate	3.15	3.21	3.19	3.20
Standard deviation of present value of repayments – using constant real rate	0.15	0.29	0.38	0.25
Present discounted value of all repayments – using constant nominal rate	3.15	3.23	3.15	3.24
Standard deviation of present value of repayments – using constant nominal rate	0.35	0.49	0	0.54

Source: Morgan Stanley Research

Notes: the present value of repayments is calculated by discounting the nominal value of all repayments – including the cost of repaying that part of a loan whose outstanding balance is linked to house prices – by the nominal discount factor. We consider 3 ways to calculate this discount factor. That discount factor can be calculated using the profile of actual nominal short term rates. Thus by construction the present discounted value of the repayments on a variable rate mortgage whose payments are calculated by reference to the short term nominal rates is simply the value of the initial mortgage (3.15) and is not affected by fluctuations in inflation or in real rates – hence the zero standard deviation.

We also calculate a nominal discount rate by adjusting a fixed real rate for actual inflation – even though ex-post the real rate will vary from period to period. We also use a fixed nominal rate – which is the nominal rate that would exist if neither inflation nor the real rate deviated from their initial starting values at their unconditional means.

Table 6

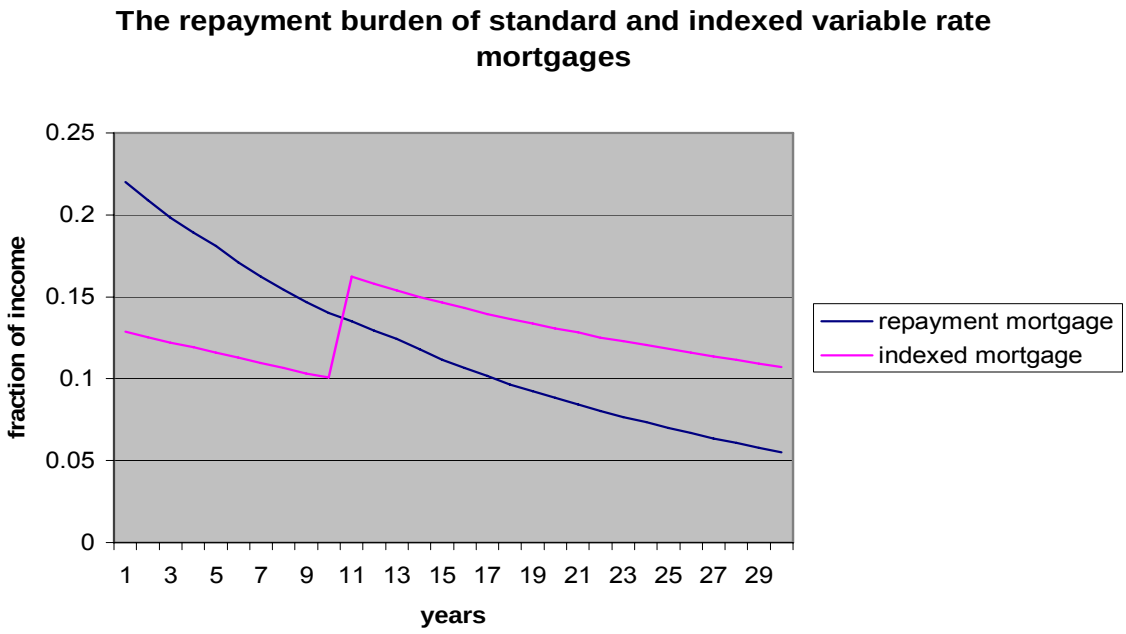
Key characteristics of mortgage contracts: average outcomes across 3750 contracts of 30 year duration – real rates react to lagged inflation (with coefficient of 0.5)

	Standard repayment mortgage – variable nominal rate	Indexed and House price linked mortgage – variable real rate.	Standard repayment mortgage – fixed nominal rate	Indexed and House price linked mortgage – fixed real rate.
Initial repayment burden – relative to income	21.9%	12.9%	21.8%	12.9%
Average repayment burden – relative to income – across 30 years	11.8	12.5	12.2%	12.4%
Average standard deviation of repayment burden across 30 years	5.9	3.7%	4.9%	2.8%
Present discounted value of all repayments – using actual path of nominal rate	3.15	3.22	3.43	3.27
Standard deviation of present value of repayments –using actual path of nominal rate	0	0.33	1.09	0.64
Present discounted value of all repayments – using constant real rate	3.07	3.16	3.23	3.13
Standard deviation of present value of repayments – using constant real rate	0.70	0.90	0.40	0.40
Present discounted value of all repayments – using constant nominal rate	3.19	3.34	3.15	3.22
Standard deviation of present value of repayments – using constant nominal rate	1.02	1.33	0	0.84

Source:, Morgan Stanley Research

Figure 15

Average repayment as % income over time



Source: Morgan Stanley Research

Conclusions

Indexed linked mortgages have the twin benefit of generating a less downward sloping real burden of repayments and also a less volatile one. The burden of servicing the debt is much lower in the early years of the mortgage – which is a desirable feature since that is when affordability issues are most acute. But will lenders want to offer them? There are strong reasons to believe that innovation will come because the products that are right for borrowers create financial assets that should suit investors. As a result of this sort of indexed lending securities can be created that allow investors to receive streams of income that are linked to consumer price inflation and to overall house price inflation. These could come to represent a useful addition to the supply of existing index linked bonds that create a return that is some fixed amount in excess of consumer price inflation and that are overwhelmingly issued by governments, with some limited private sector issues (often from utilities companies). A security that generates a fixed return over house price inflation is likely to be one that many long term investors would see as a useful addition to the existing pool of securities.

Appendix 1: Assumptions for Modelling House Price Decompositions

We used a range of house price indices from a series of sources including the European Central Bank (ECB), National Central Banks, The Economist and the European Mortgage Federation (EMF). To convert nominal house prices into real we deflated by the harmonized consumer price index. The consumer price indices used were EuroStat's HICP index for the euro area, and similar OECD consumer price indices for other countries.

Real disposable income and population data are from the OECD and the UN.

We define the mortgage spread as the difference between a representative mortgage interest rate and the yield on a 7.5 year government bond. The spread has been assumed to be around 80 basis points for much of Western Europe. Changing this assumption does not have a significant effect on the results of the model.

Specific assumptions made for each country

France

Housing stock data ends at the end of 2003. For 2004-2006 we assumed the housing stock continues to rise at a similar rate to that of the previous three years (1.2%Y in 2004-2006 vs. 1.0%Y in 2000-2003), reflecting the recent pick up in housing starts.

Germany

For 2006 we assumed the housing grew slightly (to 0.7%Y from 0.5-0.6%Y in the previous three years), reflecting the overall improvement in construction activity.

Italy

Housing stock data ends at the end of 2003. For 2004-2006 we assumed the housing stock continues to rise at a similar pace (0.2%Y) experienced in the previous three years. Changes to this assumption do not have a first order impact on the model's decomposition.

Netherlands and Belgium

Housing stock data ends at the end of 2005. We assumed the housing stock to have grown by the average rate of growth over the previous three years.

US & Spain and Ireland

Housing stock data is up to 2006.

Portugal

Housing stock data is up to 2005. For 2006, we assumed the same increase as in the previous year, as the average of the previous three years may be distorted by a sharp rise in 2004.

Greece

The moving average representation to proxy expected inflation, and the backward-looking element of 'expected' house price inflation, was truncated to three years (rather than five) due to no house price data being available prior to 1995. The level of house prices for 2006 is an estimate. Housing stock data ends in 2001, thereafter house price stock grows by the average of the previous three years.

Sweden, Denmark, Norway and Finland

Housing stock data is up to 2005. For 2006, we assumed the same increase as in the previous three years.

Appendix 2 : Measuring House Price Levels in 2006

Sources

European Mortgage Federation – House price levels for 2004 and growth rates for 2005-06 (EMF).

Housing Statistics in the European Union 2005/06 - Italian Ministry of Infrastructure (HSEU) – www.federcasa.it

Economist House Price Index (EHPI)

ECB: Residential Property Prices (ECB)

Belgium: EMF

Czech Republic: Czech Statistical Office - price refers to new buildings only.

Denmark: EMF

Estonia: average house size from HSEU; average price from Statistics Estonia (refers to Talinn only).

Finland: average price in 2004 from HSEU; EMF growth rates for 2005-06.

France: EMF

Germany: due to the widely differing estimates, we have used an average of i) EMF (refers only to transactions of private banks (members of the Verband Deutscher Pfandbriefbanken, Commerzbank, Deutsche Bank and Dresdner Bank); ii) Institut fur Stadtebau (IFS)

Greece: EMF till 2005; assumed 5.5% growth in 2006.

Ireland: average price in 2004 from HSEU; EMF growth rates for 2005-06.

Italy: average price in 2004 from HSEU; EHPI growth rates for 2005-06.

Latvia: average house size from HSEU; average price from State Enterprise Centre of Registers Lithuania.

Luxembourg: average price from HSEU – data for 2004 only.

Malta: average price from HSEU – data for 2004 only

Netherlands: average price in 2004 from HSEU; EHPI growth rates for 2005-06.

Norway: Statistics Norway (refers to Oslo only); assumes an average house size of 100 sq. m.

Poland: EMF

Slovakia: average house size from HSEU; average price from National Bank of Slovakia.

Slovenia: average house size from HSEU; average price from SLONEP.

Spain: EMF

Sweden: average price in 2004 from HSEU; EMF growth rates for 2005-06.

UK: Department for Communities and Local Government (DCLG)

Note: prices not in euros were converted using average 2006 spot prices from Reuters.

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