

# PRICING AND RISK CAPITAL IN THE EQUITY RELEASE MARKET

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## ABSTRACT

Although equity release market sales have been flat since 2003, the market has seen significant developments in terms of product flexibility, with greater levels of guarantees and drawdown schemes in particular leading to the reduction in average case sizes. All things being equal products should have become more expensive for consumers, but the competitive environment that has driven product innovation has also resulted in lower product margins. This is all good for the consumer, but it is increasingly difficult for providers to reach target returns on capital, and this is deterring some prospective new entrants. One of the purposes of this paper is to investigate the profitability of typical schemes in the market at present, and so to address the question of whether competition has forced the market to function at non-profitable levels. In doing this, the paper also provides a benchmark for existing providers and potential new entrants against which they can check the reasonableness of their own assumptions. We will aim to provide a rational pricing methodology which can be adopted by any organisation active in the market, and we hope that this can support the market as it expands over the coming years. In order to produce a set of cohesive results we have modelled a range of potential outcomes using a pricing basis which we consider to be broadly “average”. While we would encourage providers to compare our results with their own pricing assumptions and ensure that they are satisfied as to the reasons for any differences, there is a health warning as our results should only be used as a check in this regard. If our “averages” are suitable for use by some providers then this is just co-incidence. In practice providers should adapt the assumptions made to suit their own product features, target market, expense profile and appetite for risk.

## KEYWORDS

Lifetime Mortgage; Equity Release; NNEG; No Negative Equity Guarantee

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## 1. INTRODUCTION

The equity release market has been one of the fastest-developing markets in financial services in recent years. In early 2002 it was reasonably comfortable for providers with simple products offering gross margins for leading IFA providers of around 2.50%, in part reflecting the higher level of

guarantees, risks and expenses associated with equity release compared to standard mortgages, and in part perhaps reflecting the fact that there was very little experience in the market so most providers were able to load relatively high risk premia and profit margins. By mid 2006 competition had reduced gross margins to around 1.50%, and at the time of writing (September 2007) the leading IFA rate represents a margin of just 1.0% over 20 year swap rates, and equity release loans are now available on lower headline rates than standard mortgages (reference: SHIP press release) (see Figure 1).

Yet most of the reasons for equity release being more expensive in the first place (lack of experience, higher levels of guarantees, expenses and risk) prevail, and in fact recent improvements in product flexibility and guarantees, and consequent reductions in case size, mean that all other things being equal the products today should be more expensive for the customer than 5 years ago. There is now concern that providers may not be able to offer a product profitably at current margins. Some competitive pressure is clearly a good thing, as it will force providers to find more efficient ways of providing their product to consumers. In the equity release market, too much competitive pressure may be a bad thing. The guarantees that come with products offer important protection to elderly householders, and pressure to

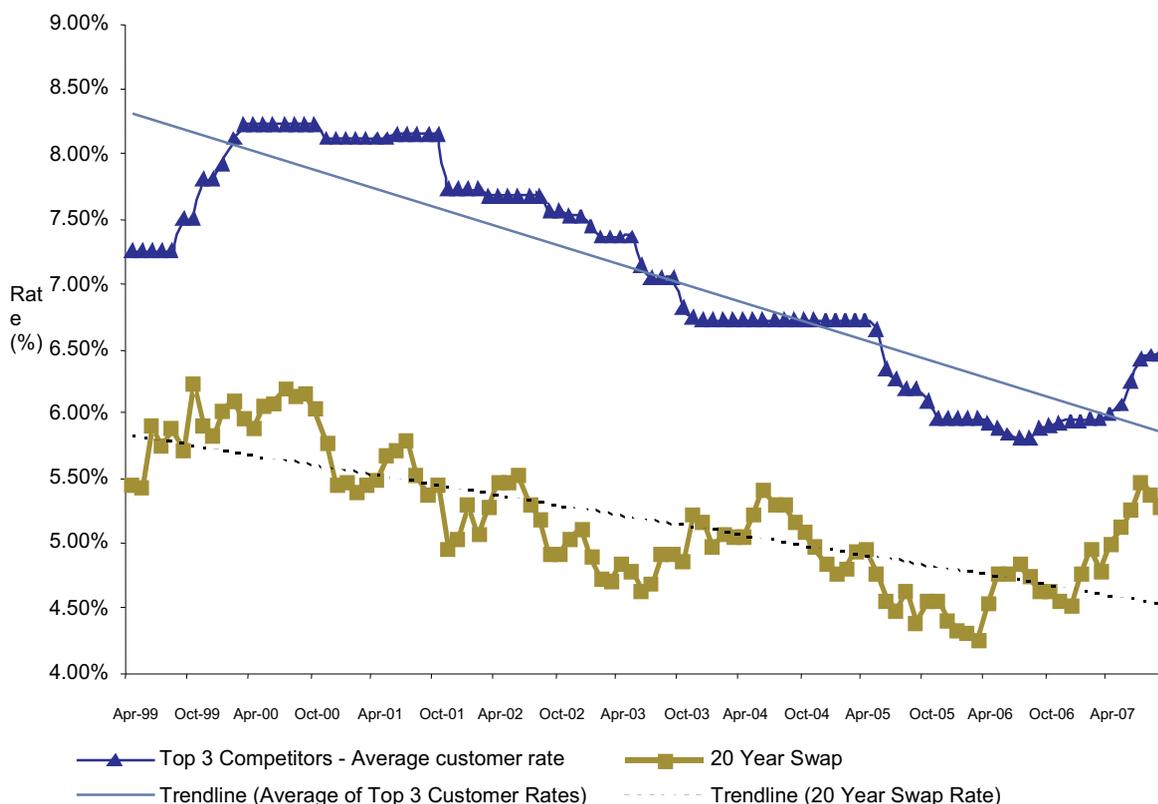


Figure 1. Average of top 3 customer rates against 20 year swap rates

reduce these could be to consumer detriment. Likewise pressure to reduce expensive selling time or improve low conversion ratios may result in short-cuts in the advice process or pressure on sales teams to sell business where it is not needed.

## 2. PRODUCT DESCRIPTIONS

There is a variety of products available in the market as described below, the two main categories of which are mortgage schemes and reversion schemes. Although we show descriptions for all main scheme types we have confined our analysis to the roll-up mortgage scheme as this is by far the biggest selling product in the market. In Appendix 1 we have set out a product specification for the specimen mortgage that we will use for our pricing and capital analysis.

### 2.1 *Lifetime Mortgages*

Under Lifetime Mortgages the provider lends the customer cash and takes a mortgage charge over their property. There are (usually) no repayments during the customer's lifetime, and capital and interest are usually repaid from the property sale proceeds when the customer dies or moves into care, although the customer can repay earlier for other reasons — see 2.1.4.

#### 2.1.1 *Accessing funds*

There is now a range of options for customers regarding how they access funds from Lifetime Mortgages.

Most common remain *lump sum* mortgages representing around 2/3rds of the mortgage market in 2006 both in terms of total advances and numbers of schemes (source: SHIP, Q4 2006 new business figures). Under these schemes customers borrow a sum of money up to a maximum loan to value (MLTV) ratio depending on their age (and their partner's age if appropriate). Some providers allow the customer to borrow higher amounts in return for a higher interest rate being payable on the loan. Even where the customer borrows less than the maximum permitted at outset, there is no guarantee that further funds will be available for the customer, and their ability to borrow more will depend on their property value at the time and the MLTV for their future age compared to the loan accrued with interest to date. Some providers apply restrictions which limit the time at which a customer can apply for a further advance.

Increasingly popular are *drawdown* schemes under which customers are given a lending limit by the provider, based on their age(s) and their property's value at the outset of the scheme. The customer can then draw down funds whenever they choose, subject to minima on the amount of the

initial drawdown and any subsequent advance. Interest accrues only on the outstanding balance at any time, and there is usually no commitment fee payable by the customer on undrawn funds.

Some providers now also offer *income* schemes under which customers draw down their money on a regular basis (e.g. annually) either for a set period e.g. 10 years, or for life in which case the provider guarantees to advance funds even if the property reaches a negative equity situation. Income schemes can usually be combined with lump sum schemes to provide a higher advance at outset followed by a regular income.

### 2.1.2 *Interest options*

#### *Fixed rate schemes*

For the majority of Lifetime Mortgages the interest rate is fixed for life at the outset of the loan. For drawdown schemes or further advances on existing loans, each advance is treated independently and is charged interest at the fixed rate prevailing at the time the advance is taken. For income schemes the same rate of interest is applied across the entire loan (except where further advances are made that are not agreed at the outset).

#### *Variable rate schemes*

Variable interest lifetime mortgages are generally linked either to the lender's standard variable rate or to RPI, and for SHIP-compliant schemes the rate must be capped. These loans generally offer a lower interest rate at outset but with the possibility that it may increase later. As interest is only notionally paid the attraction to the borrower of reduced initial interest is limited, although to the product provider they give a partial hedge against interest rate or house price movements and thus should be cheaper for the borrower in the longer term.

### 2.1.3 *Other product variants*

As competition has increased in the equity release market, so has innovation. There is now a greater range of choice for consumers, although it should be said that the market still has some way to go before reaching maturity.

- Protected capital products base the loan on a proportion of the property only. For example, if a customer uses only 60% of their available MLTV then the provider guarantees that a maximum of 60% of the final sale proceeds will be used to repay the loan. This is an important protection for customers looking to offer some form of inheritance, although it necessarily means that they have lower benefits at outset.
- Some providers now offer customers enhanced MLTVs in return for higher interest charges. This provides explicit pricing for a part of the “no negative equity” guarantee.

- The Fixed Repayment Lifetime Mortgage has been available for a number of years, although sales volumes have always been modest. Under this scheme a fixed repayment amount is set at the outset of the loan based on the customer's life expectancy at that time. This amount is then repaid regardless of how long the loan actually runs. Relative to the roll-up mortgage, the amount repaid will be more if the borrower lives less than average life expectancy and less if the borrower live longer. Options available include impaired life variants for customers with below-average life expectancy at outset, or stepped repayments for customers preferring not to see the full repayment due on early decrement (although the final repayment will then be higher).

#### 2.1.4 *Early repayment charges*

A key product feature is the early redemption charge and there is a wide range of charges being applied by different providers. Although most providers still offer products with fixed rate charges applied irrespective of market movements, mark to market penalties are becoming more common. In August 2007 the fixed charge scales ranged from 3% flat for the first 5 years and nil thereafter, to 7% initially stepping down to nil after 10 years and some providers applied charges for the first 20 years. These fixed rate charges will be seen as protecting the provider against lost costs of sales and manufacture, although they provide little protection against swap break-costs if interest rates fall between inception and early redemption. Most of the larger providers now charge mark to market penalties with the charge applied depending on interest rate movements between inception and repayment. These are always capped (currently at either 20% or 25%) and provide greater protection to the provider against early redemption in the event that interest rates have moved, but do not protect against lost distribution costs.

## 2.2 *Reversions*

Unlike mortgage schemes where the legal structure involves the provider placing a charge against the customer's property, with reversion schemes the provider buys a share of (or all) of the customer's property so that there is a transfer in ownership. As part of the transaction a lease for life is granted to the customer enabling them to live in their property for the rest of their life and this contract will contain important other rights such as the ability to move to a suitable new property. The provider nets off the cost of the lease for life from the amount paid to the customer, so that effectively the customer receives a discounted price for the property sold, the amount of which depends on their age e.g. £30,000 for a 65% share of a £100,000 house.

### 2.2.1 *Cash reversions*

In the market at present most reversions are sold as cash products, i.e. the customer gets the value of the reversion paid over as a single cash sum at the outset of the scheme. This results from a general trend for the market to provide unbundled products and the fact that only a life assurance company can be authorised to offer an income version. Most providers offer cash reversions with the optional purchase of an annuity if required.

### 2.2.2 *Income reversions*

At present income reversions are not common as it is generally assumed that an annuity could be bought with the proceeds of a cash reversion. For the client an income reversion provides a guaranteed level of income for life and for the reversion company there will be an improvement in the funding and cash flow position.

### 2.2.3 *Stepped reversions*

With a stepped reversion the customer can take their benefits from the scheme either as a lump sum or as a series of payments, and the amount that is repaid is expressed as a proportion of the property sale proceeds. The proportion starts as the proportion of the initial advance to the initial property value and “steps up” by a fixed percentage each year, adjusted for further payments as they are made. This product overcomes the main criticism of reversions, that the schemes are very expensive on early death, although there is less certainty for the customer on how much of the property has been committed to the scheme.

## 2.3 *Impaired Life Schemes*

An important market development over the last 12 months has been the development of impaired life schemes. Under these schemes customer benefits are enhanced where some form of health impairment suggests a reduced life expectancy; for roll-up mortgage schemes the enhancement is in the form of an increased MLTV so the value will depend on whether or not the customer is seeking a cash sum beyond the standard permitted MLTV; for the Reversion and Fixed Repayment Lifetime Mortgage schemes the benefits are more certain, being a lower repayment than would have been applied to a healthy life.

## 3. DECREMENT ASSUMPTIONS

The key assumptions required when setting appropriate decrement assumptions are base mortality, mortality improvements, long term care (“LTC”) incidence, future LTC entry trends and early redemptions. These assumptions are discussed in more detail in Appendix 5, but an outline

of the recommendations and supporting rationale is provided below. With these assumptions perhaps more than any others we carry our warning that we can only generalise: each individual provider should set their assumptions with regard to their own specific experience and circumstances. This should include consideration of the following factors:

- The sales channel through which the product is sold (especially relevant for early redemptions)
- Any marketing used to support the product
- The expected socio-economic and geographic distribution of the mortgages, including regard for case-size variation.
- Product features and their impact on early redemptions: for example, decrements from this source can be expected to be lower for products that have a flexible structure enabling customers to move house and transfer any outstanding mortgage, or to draw-down additional funds if required in the future. Likewise, providers with fixed early repayment charge scales should expect to see higher levels of prepayment if interest rates fall and cheaper alternatives are available than providers with “mark to market” scales.
- The interaction between different basis items should also be explored to establish what represents a “conservative” assumption. Examples are as follows:
  - Mortality at lower levels than the central assumption will mean that margins are earned for longer, increasing profitability, but will also increase negative equity costs. Which factor has greatest impact depends on future house price inflation.
  - Higher house price inflation may result in lower rates of LTC entry because customers can afford greater levels of “at home” care if they have more equity in their property although this will result in higher rates of “at home” mortality.

### 3.1 *Base Mortality*

The authors have selected PNXA00 (U=2007) as the base table, principally because of the good fit between the socio-economic profile of lives buying equity release contracts and those buying pension annuities. This table is derived from significantly more data than other annuity tables, and so provides a relatively credible starting point.

#### 3.1.1 *Adjustments for socio-economic class*

Each provider will then need to adjust the table to match the socio-economic profile of their target market. Experience provided to the authors by one office showed mortality experience for properties over £750k in value at 55% of the overall average experience, suggesting a very strong socio-economic effect. This is consistent with the findings in “Social Inequalities”

Table 3.1.1(a). Mortality of different socio-economic classes as a percentage of population mortality

Class	Ages 60-64
I	72%
II	77%
IIIN	104%
IIIM	130%
IV	120%
V	180%

Table 3.1.1(b). Mortality assumptions by property value

Property value	Mortality assumption	Comment
up to £130k	120% base table	consistent with Class IIIM/IV lives
£130k-£250k	100% base table	consistent with Class IIIN lives
£250k-£750k	85% base table	representing a mix of Class I/II/IIIN lives, depending on geographic location
£750k+	55%	consistent with a select group of Class I lives

[ONS: 1997] which showed mortality differentials by mortality class as shown in Table 3.1.1(a).

For this report the authors have adopted the bandings shown in Table 3.1.1(b).

### 3.1.2 *Adjustments for age*

The authors do not believe that adjustment is required at older ages. The strong version of the “Compensation Law of Mortality” (Gavrilov and Gavrilova, 1991) suggests that the log of the force of mortality for different sub-populations of a species converge (linearly) towards a common point at a particular, species-specific age. For humans Gavrilov and Gavrilova suggested this occurs at age 95. For the purposes of this paper we have accepted this hypothesis, and so assume that mortality trends towards 100% at age 95 for all socio-economic groups.

### 3.1.3 *Adjustments for selection*

Although the authors have not had access to any data to confirm or otherwise the existence of a select effect, their collective experience suggests that a 2 year select period is a reasonable expectation for these contracts. Consistent with this experience an assumption of 65% in the first year, 85% in the second year and 100% thereafter has been adopted.

### 3.2 *Mortality Improvements*

The likely rate of future mortality improvements has been the subject of considerable debate and study recently, and the authors' intention is only to pick out the best of these conclusions rather than revisit the underlying work and rationale. In the Profession's Report into Equity Release Mechanisms, 2005, medium cohort improvements were suggested as being most appropriate. However there is now at least some doubt as to whether these are strong enough, as expressed in WP20, "The patterns of higher observed mortality improvements for P-Spline projections compared to the interim cohort projections means that the interim projections based on data to 2000 are unlikely to be suitable as more recent data becomes available." Accordingly the authors believe it is now more appropriate to progress to the P-Spline projections for equity release product pricing, although other projection methods will also be suitable.

The reality for most providers is that they will have insufficient experience to develop their own mortality projections, or to use e.g. the P-Spline projection method based on individual office data.

Because of the close link between annuitant mortality and that expected for equity release customers, the authors have assumed mortality improvements as proposed for annuitants in WP20 using the P-Spline methodology, with the 50th percentile adopted for the central assumption.

### 3.3 *Long Term Care Entry*

There is a lack of data for the Long Term Care market as a whole, and for the equity release sector there is no meaningful data available publicly; indeed, given the strong select effects expected for decrements due to entry into Long Term Care, especially for joint lives, it is unlikely that any individual provider has meaningful data on which to base assumptions. This area was subject to detailed analysis in the Profession's Report into Equity Release Mechanisms, 2005 and in the absence of any new information it is not proposed to revisit it in this paper; the authors will assume the same decrement rates as were proposed in that previous paper.

However, it is worth highlighting the importance of multi-state modelling when considering the interaction between long term care entry and mortality; the significantly higher mortality experienced by long term care residents compared to "at home" mortality means that to maintain the same aggregate assumption for mortality by age lighter than average mortality should be assumed for "at home" lives. Again this is explored in detail in the 2005 Report.

The net impact of additional decrements due to Long Term Care entry, offset by reductions in at-home mortality, is therefore taken to be the following uplifts to base mortality, with intermediate value established by linear interpolation. These are shown in Table 3.3.

Table 3.3. Percentage loading to base mortality due to long term care entry

Age	Males	Females
≤70	2	3
80	4	12
90	5	13
≥100	4	8

### 3.4 *Early Redemptions and Pre-Payments*

Setting assumptions for pre-payments is one of the most difficult and unreliable aspects of pricing lifetime mortgages, and one which carries significant risk for providers. Some decrements under this heading will be Long Term Care decrements in disguise e.g. where the householder becomes infirm and moves in with family. Of most concern will be customers pre-paying in order to remortgage elsewhere. Consumers will generally be incentivised to remortgage and seek a lower cost of borrowing with another provider when interest rates have fallen, especially if the provider operates a flat early repayment charge scale. The more interest rates have fallen, the greater will be the loss to the provider who will have to break expensive interest rate hedges, and the greater will be the incentive on the consumer to remortgage. Providers operating flat-rate charge scales are offering consumers a one-way bet on interest rates: if interest rates fall then the consumer can remortgage to the lower rate at a very modest cost; if rates rise then the consumer can hold the rate that was fixed at outset. Mark to market penalties will go some way towards protecting providers from anti-selection on this cause, but they do nothing to protect providers for lost administration and distribution costs on early repayment, and caps on the early repayment charge mean that protection is provided only for relatively modest falls in interest rates (although even the capped charge will act as a disincentive to remortgaging). The dependency of remortgaging rates on product design, distribution method and prevailing interest rates means that they are difficult to predict reliably, and can be expected to vary significantly from one provider to another and in different economic circumstances. Factors the actuary should consider when setting pricing and reserving assumptions include the following:

- The Early Repayment Charge scale.
- The prevailing rate of interest; if interest rates are relatively low, then there is less potential incentive for remortgaging in the future.
- Distribution channel. Intermediaries are likely to be more proactive in stimulating remortgaging than direct or controlled distribution channels.
- Product Design. More flexible product design may allow consumers to meet future needs without the need to consider alternative products (for example flexible drawdown schemes should exhibit lower pre-payment rates than lump sum schemes with no increment facility).

- Competitive positioning: market-leading rate providers should expect some of their customers to be more rate-driven than others whose customers have selected their provider for reasons other than best rate.

For in force books the actuary should also consider the initial LTV and house price inflation since inception, as the greater the level of growth the more straightforward it will be for the consumer to remortgage. Consumers taking the maximum available LTV in periods of low house price inflation are unlikely to be able to remortgage.

The most recent publicly available data on remortgaging rates is provided by Norwich Union in the prospectus for Equity Release Funding (no.5) plc, August 2005. This shows voluntary prepayment rates for the previous issues as follows: ERF1, 4.4% p.a.; ERF2, 3.7%; ERF3, 2.5%; ERF4, 1.4% (prepayment rates given by number of loans). The prepayment rates can be rationalised by reference to the above considerations, with ERF1 representing inflexible products sold at high interest rates, with the products becoming progressively more flexible and sold on lower rates for the later securitisations; although selection will also be a factor.

The voluntary prepayment rates we have assumed for modelling purposes might be considered best estimates for a provider with robust early repayment charges distributing a flexible product at competitive but not market-leading rates through a broker distribution channel at a time when interest rates are relatively low but not bottom of the market (say headline rates of 6.5% p.a.) These are shown in Table 3.4.

Table 3.4. Assumed prepayment rates

Year	Prepayment rate
1-2	1.0%
3	2.0%
4-5	2.5%
6-8	2.0%
9-10	1.0%
11-20	0.5%
21+	0.25%

3.5 *Assumed Decrement Basis — Summary (Table 3.5)*

Table 3.5. Summary of assumed decrement basis

Assumption	Best estimate			Notes
Base table	PNXA00 (U = 2007)			See CMI WP20
Select effect	65% in year 1 85% in year 2 100% in year 3			Dependent on distribution, product and target market
Base table weighting	100% of base table			Highly dependent on distribution, product and target market up to ages 95 Compensation Law of Mortality after age 95
Socio economic factors	Property value to £0-£130k: 120% £130k-£250k: 100% £250k-£750k: 85% £750K+: 55%			Based on limited data but consistent with amounts based adjustments generally. Will tend to 100% at age 95
Mortality improvement	p-s50ac			Significantly stronger than the 2005 report recommendation
LTC incidence	Age	Males	Females	Loaded as an addition to mortality. Intermediate ages by linear interpolation.
	≤70	2	3	
	80	4	12	
	90	5	13	
	≥100	4	8	
Early surrender	Years	Rate p.a.		Significant variability between providers. See considerations in 3.4
	1-2	1.0%		
	3	2.0%		
	4-5	2.5%		
	6-8	2.0%		
	9-10	1.0%		
	11-20	0.5%		
	21+	0.25%		

## 4. MODELLING HOUSE PRICE INFLATION

Anyone who has tried to create a model to represent future house prices will be familiar with the inherent difficulties and will probably have concluded that it is not possible to predict reliably what future house price inflation will be either in nominal terms or in real terms. Models tend to take 2 distinct forms:

- Macroeconomic models will project forwards the future population and housing stock, combine this with assumptions regarding future economic growth, and derive future house prices using supply-demand curves and economic values.

- Trend models assume that short-term imbalances in supply and demand will be corrected by the market, and so analyse trends in historic house prices and project forwards on the derived growth assumptions.

In both cases application of these models to historic data in the U.K. shows them to be inaccurate when extrapolated beyond the period from which the base data was derived.

Nevertheless modelling can bring significant and worthwhile benefits to providers. In particular stochastic models can demonstrate to providers what the range of potential outcomes is, and attach a probability distribution to help understand the risks that are being carried. The authors' objectives are to achieve this, rather than to establish a central view on future house price inflation.

#### 4.1 *Analysis of Historical House Price Inflation in the OECD*

Although the OECD keeps data for annual house price statistics from member countries, only some of the details are publicly available. There are also issues with the reliability of the data that is available because of historic differences in calculation methods between countries. These issues are compounded by changes in mortgage/ownership patterns and housing stock in many countries, which means that historical observations cannot simply be taken at face value.

Any analysis of historic data can only sensibly be done in real terms, by making comparisons between house price growth and consumer price inflation (CPI), salary inflation, economic growth or some other real index. Salary data suffers from different treatment in different countries and over different periods within the same country, and so whilst recognising that there are also issues with CPI and GDP comparisons, we have based our analysis on CPI inflation and nominal per capita GDP.

##### 4.1.1 *CPI deflated house price growth*

Indexing house price inflation (HPI) against CPI shows that there has been a wide range of experience since 1970 between the 17 countries we have analysed. Switzerland and Denmark have HPI at or below CPI for nearly the entire period from 1970 to 2005; the U.K. and Spain show HPI averaging CPI + 4.3% p.a. over the period. For the majority of countries real house prices have grown by between 50% and 100% over the 35 year period, representing real annual growth of between 1% and 2%. In Figure 4.1.1(a) we have showed data for all countries studied. The volume of data makes this graph difficult to read, but the main point being made is that growth for the U.K. is exceptional. Figure 4.1.1(b) shows graphs for the extreme countries only.

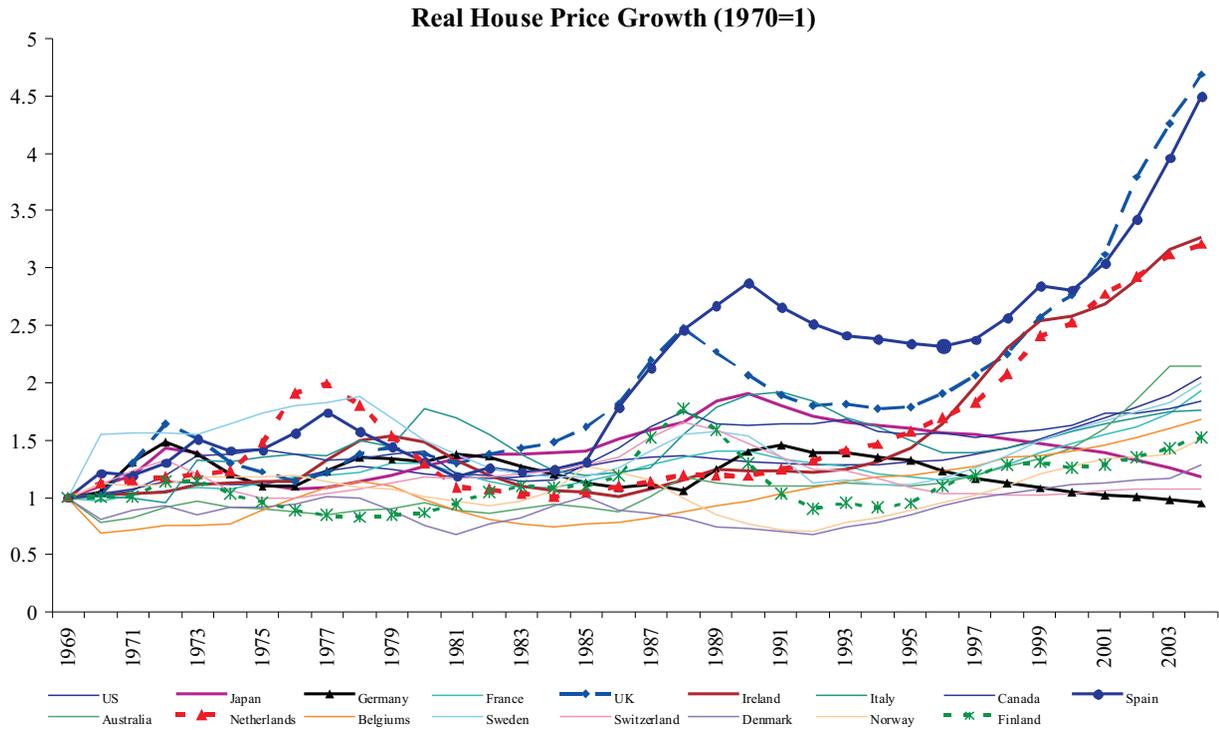


Figure 4.1.1(a). CPI deflated HPI, all countries

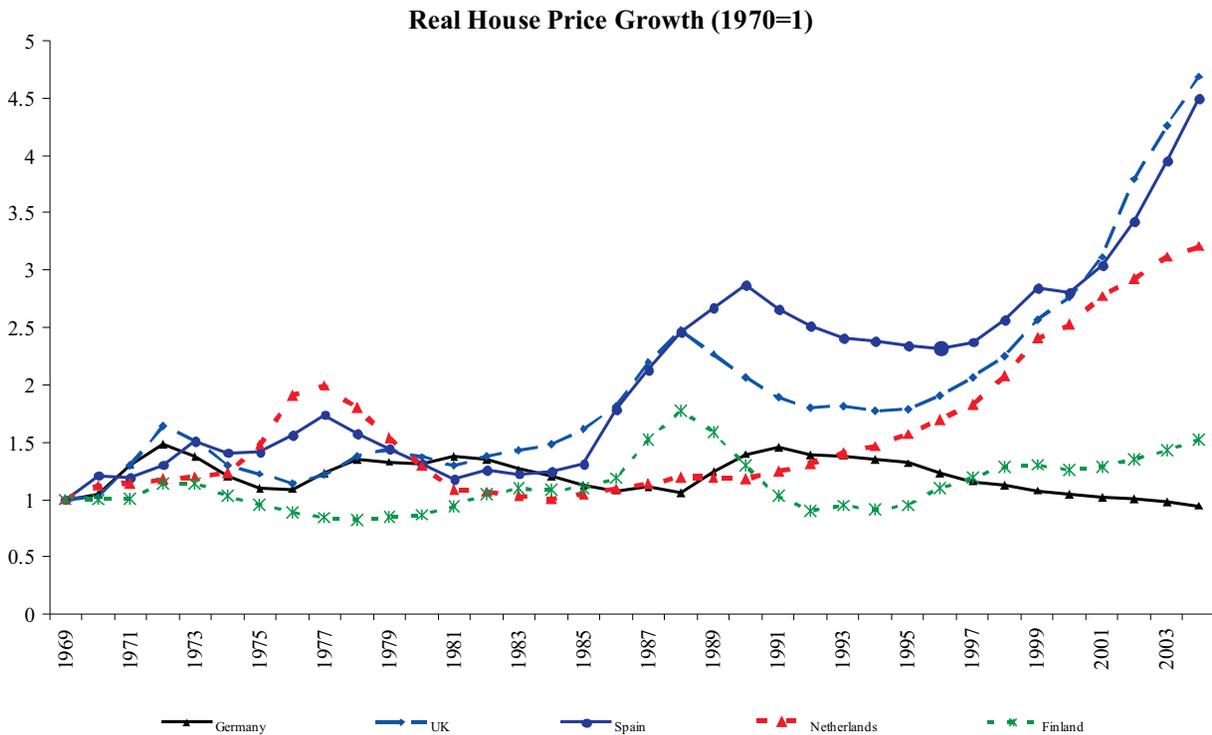


Figure 4.1.1(b). CPI deflated HPI, five extreme countries

4.1.2 GDP deflated house price growth

Analysis of HPI over GDP shows a similarly broad range of results between different countries. It is only in the U.K. and Netherlands where house price growth has exceeded GDP growth over the entire period, and in both cases there have been long periods where this has not been the case, and in both cases house prices have shown greater volatility than in other countries, meaning that the outcome is more dependent on the start and end points than it is for countries with more stable housing markets. For all of the other countries analysed, house prices have fallen to between 100% and 50% of the GDP-adjusted start level, representing an average annual fall of 0% to 2%. For Ireland and Spain the very high rates of house price inflation relative to CPI are shown to be supported by strong economic growth.

The message for equity release providers must be that recent house price growth in the U.K. has been exceptional, and central assumptions for long term future growth rates are more likely to be in the range of CPI + 1% to GDP-growth. Indeed, it is very difficult to rationalise a realistic scenario where house prices continue to grow at above GDP rates for the long term (Figures 4.1.2(a) and 4.1.2(b)).

As important as central projection rates are volatility assumptions, and we consider these in the next section.

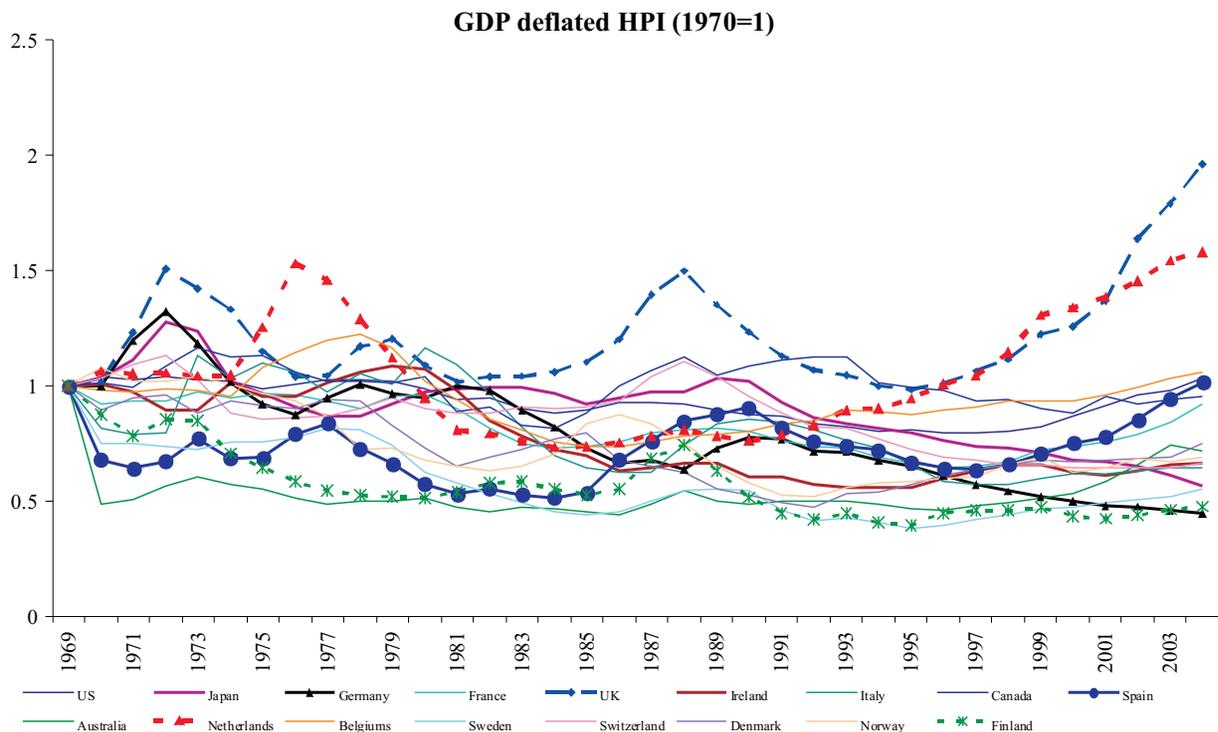


Figure 4.1.2(a). GDP deflated HPI, all countries

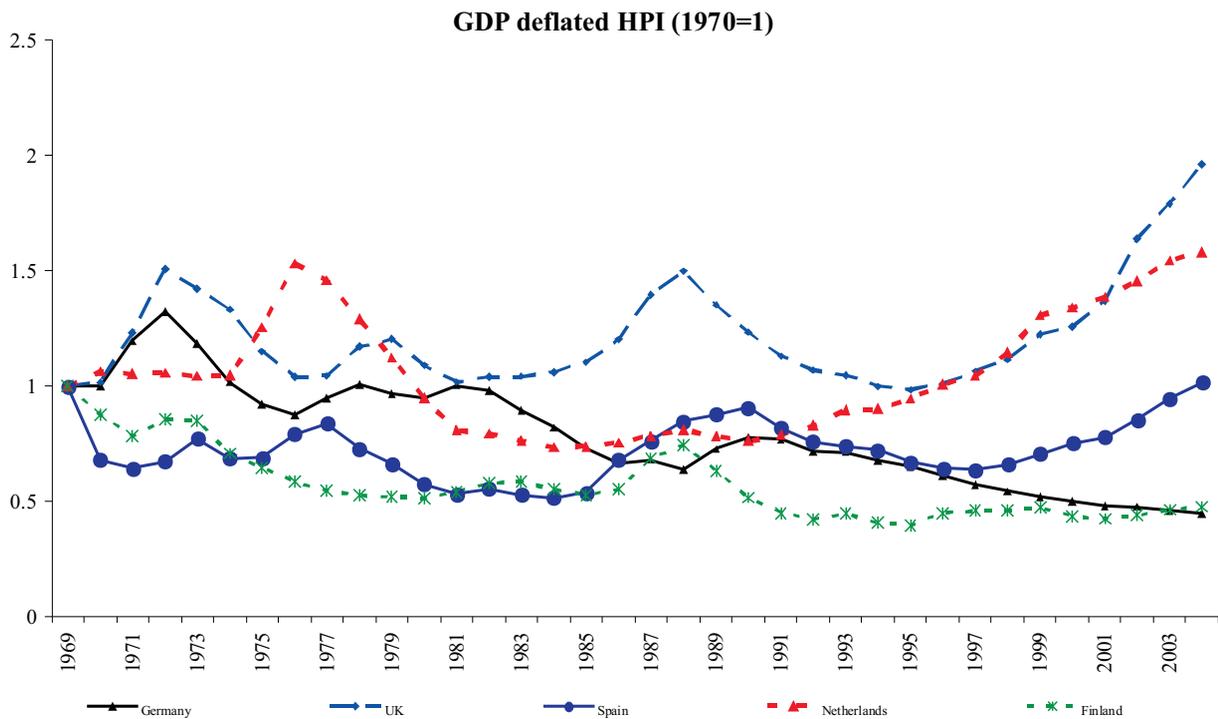


Figure 4.1.2(b). GDP deflated HPI, five extreme countries only

#### 4.2 Analysis of U.K. Regional House Price Inflation

We have analysed HPI trends since 1974 by reference to the Nationwide House Price Index. This shows that across the country average nominal growth for the period has been 8.8% p.a. The volatility of the index is 5% p.a., and autocorrelation with the previous quarter is 0.66. Using the de-smoothing process set out in Booth and Marcato (2003) increases the volatility to 11% p.a. and the de-smoothed index shows an excess kurtosis of 0.74. This shows that the index remains reasonably close to the normal distribution over the period.

The nominal annual growth in the different regions over the period is relatively similar, with an overall average of 8.8% p.a., the lowest region being Scotland with 8.3% and the highest is London with 9.3% (see Table 4.2).

Regional indices show quite a variation in volatility and autocorrelation as shown in Figures 4.2(a) and 4.2(b).

The index annual volatility varies from 5.4% in the Northwest to 7.3% in East Anglia. Desmoothed volatility varies from 7% in Scotland and Northern Ireland to 14% in the South East. It is no coincidence that more data is available in the South East.

It is notable that the areas with the strongest autocorrelation are those with the greatest volume of data: thus the South East has strongest autocorrelation while Scotland and Northern Ireland have very little autocorrelation (see Figure 4.2(c)).

Table 4.2. Nominal average annual HPI for U.K. regions, 1974 to 2006

Region	Average
North	8.7%
Yorks & Hside	8.5%
North West	9.1%
East Mids	8.8%
West Mids	8.7%
East Anglia	8.8%
Outer S East	9.0%
Outer Met	9.0%
London	9.3%
South West	9.2%
Wales	8.7%
Scotland	8.3%
N Ireland	9.1%
U.K.	8.8%

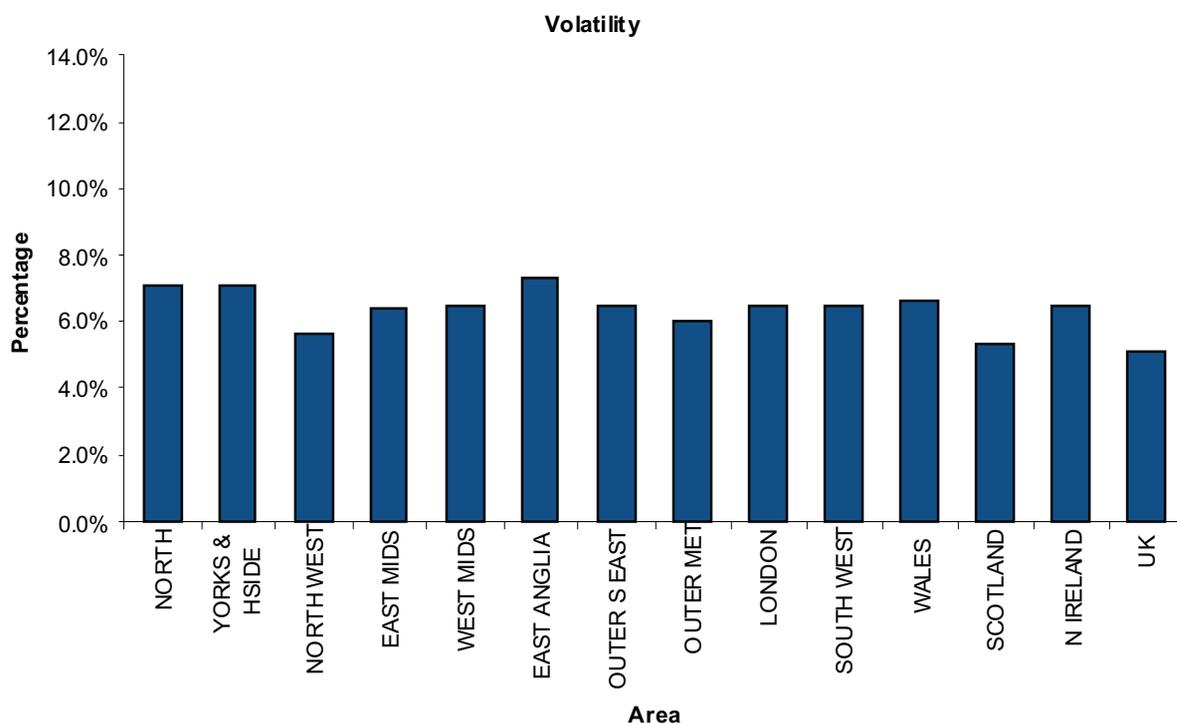


Figure 4.2(a). Observed volatility in HPI for U.K. regions

The strong autocorrelation suggests that house prices are strongly influenced by prices for the immediately preceding period, which is no surprise in a market where a key part of the valuation process is to refer to “comparables”. This means that underlying volatility is likely to be higher than demonstrated by the analysis, and this will be further distorted by inducements for buyers when the market is slow e.g. cash-back deals.

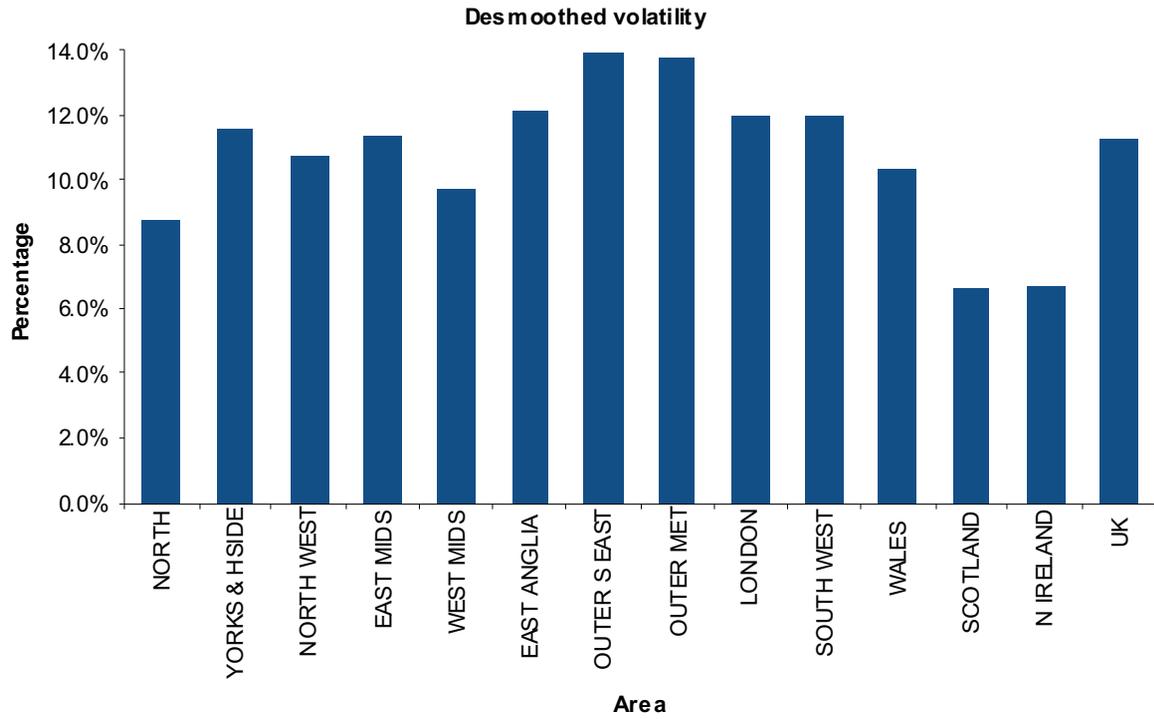


Figure 4.2(b). Desmoothed volatility in HPI for U.K. regions

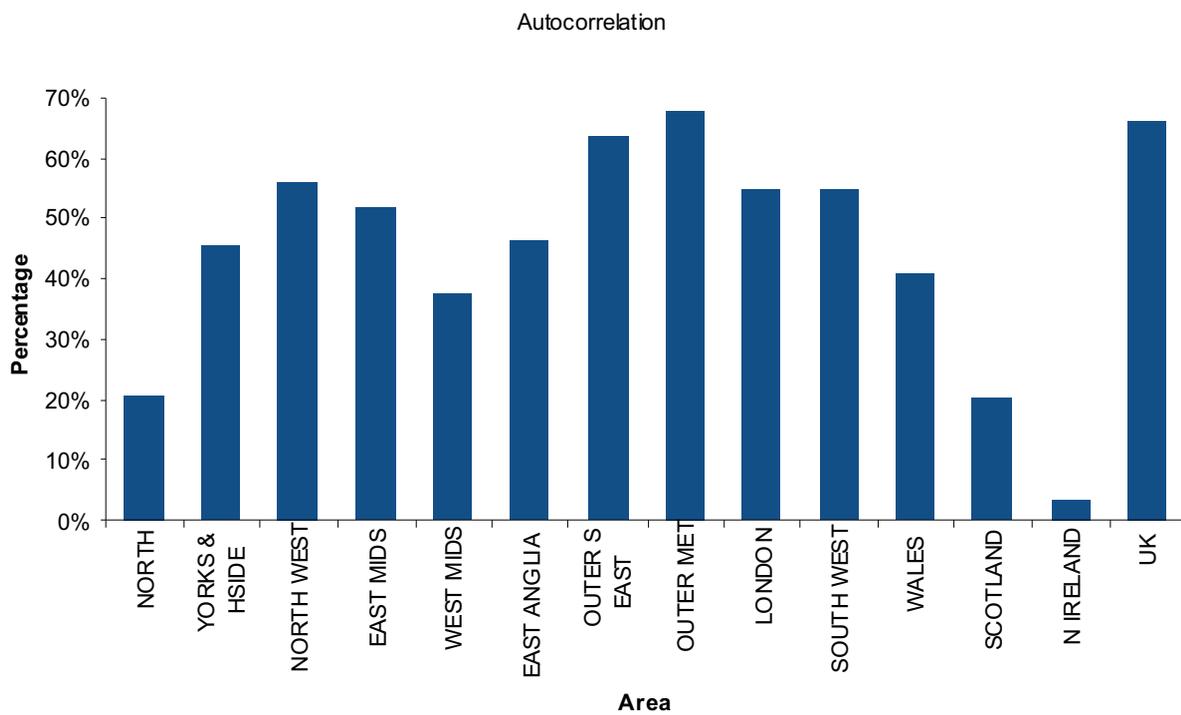


Figure 4.2(c). Autocorrelation in HPI for U.K. regions

It is important to consider to what extent the results we have seen are due to sparse data, and to what extent they are due to underlying differences in autocorrelation and volatility because this will dictate the extent to which it is appropriate to factor in higher levels of volatility for portfolios which have concentration in a particular region (or indeed in some other specific property category). The authors' analysis suggests that compared to diversification across the U.K., concentration in a particular region could add 2% to 3% to the annual volatility.

#### 4.3 *European Property Market Experience*

Appendix 4 discusses in more detail the property markets in different European countries. The main conclusions to be drawn are that long term real house price inflation is influenced by:

- Economic growth.
- Government policy.
- Proportion of owner occupiers.
- Demographics, including immigration and emigration.
- Household occupancy rates.
- Housing supply.
- Mortgage Markets.
- Cultural attitude towards property ownership.

The strong impact of Government policy, in particular, creates uncertainty around long term future growth rates, and this should be recognised when setting assumptions by reference to past experience.

#### 4.4 *Assumptions for Pricing Analysis*

The question of what assumptions to adopt for central projections for HPI and volatility has been the subject of considerable debate amongst the authors, scrutineers and other professionals consulted. There is no one right answer, but everyone seems to have a strongly-held view. There is clearly some interaction between the two assumptions: a higher central HPI is consistent with higher volatility; a lower central HPI represents a more stable, low inflation environment where volatility will also be lower.

Our analysis suggests that RPI is an absolute minimum assumption for HPI, and that economic growth plus a bit the maximum. If we take CPI as 2% and RPI as 2.5%, and economic growth as  $RPI + 2.5\%$  that gives us a range of 2.5% to 5.5%, with either extreme being difficult to justify.

For the volatility assumption the fundamental question is whether the observed results should be desmoothed. The Booth and Marcato technique was developed for use with commercial property indices where the index is comprised mostly of valuation data; the Nationwide Index is a transactional index and so is less “smoothed” than commercial indices — it is the underlying property values that are being smoothed by buying behaviours.

Without de-smoothing we have a historic volatility of 5% and with de-smoothing a volatility of 11%. The authors believe that an appropriate assumption for index volatility will be between these two values.

On balance the authors think a reasonable combination of assumptions for a pricing basis is 4.5% HPI with 8% Index volatility. As explained in Section 7 we have then loaded the volatility assumption by 3% to cover the shift from Index to individual properties, giving a final assumption of 11% volatility.

## 5. THE COST OF FUNDS

This section covers the cost of providing the underlying funds, the cost of meeting any risks resulting from a mis-match between the product characteristics and the funding solution and the cost of capital that will be required to be held against the product. It excludes the cost of the negative equity guarantee, which is covered in Section 7.

### 5.1 *Scope*

Whilst there are many funding options in the U.K. for equity release we will focus primarily on use of the wholesale banking markets as the source of funds. Other funding options are outlined in Section 5.6.

### 5.2 *Wholesale Funding Cost*

An equity release mortgage portfolio is primarily a fixed interest asset, although the negative equity guarantee means that it may carry property investment characteristics in the portfolio tail. As wholesale banking markets provide funds at a margin over LIBOR the provider will usually arrange a series of interest rate swaps to convert the asset to a LIBOR-yielding investment.

A typical margin for the funder to charge assuming that they are taking only residual funding risks is 40 to 50 bps over LIBOR (by residual funding risks we mean e.g. the risk that the decrement profile doesn't fall within hedged tramlines, and perhaps with NNEG cover in place on an index solution, the risk of underperformance of the portfolio against the index). Alternatively funders may take on more of the funding risks in return for a higher lending margin.

The cost of the swaps for a portfolio of policies will be based on the average of swap rates over different terms weighted by the expected portfolio profile. The provider will require extra margins above the swap rate to allow for inherent risks and profit.

The base cost of funds is therefore given by:

- Average swap rate weighted by expected cash flows over the redemption profile.

- Funder's margin over LIBOR.
- Additional margin to cover cost of any risks borne by funder.
- Provider's cost of hedging or risk premium to cover retained risks.
- No negative equity guarantee (see Section 7).

### 5.3 *Modelling the Portfolio Redemption Profile*

The cost of funding depends on the expected redemption profile of the policies that are expected to be sold. This in turn depends on a number of factors:

- age distribution of those taking an equity release product;
- expected mortality rate of policyholders;
- mortality improvement factors;
- expected rate of sufficient morbidity such that policyholders move into long-term care;
- the propensity for early redemptions; and
- expected negative equity claims.

We have selected a range of model points to represent the behaviour of a typical portfolio in Appendix 2. The characteristics of this portfolio is consistent with the characteristics of the portfolio securitised by Norwich Union in Equity Release Funding (no. 5).

Applying the decrement assumptions in Section 3 to the model portfolio and the standard product in Appendix 1, we get a run-off table for the portfolio of business as shown in Appendix 3. Working back from this we get a blended term swap rate of 5.1% p.a. – this is the average base cost of funds.

### 5.4 *Cost of Solvency Capital*

In addition to the cost of sourcing funds with which to support the equity release product there will also be costs related to holding solvency capital to back the product. For companies adopting the Standardised approach the new solvency capital requirement proposed by the FSA is 8% of the outstanding loan amount plus any additional drawdown commitment, multiplied by a factor. The factor is determined by the value of the loan at the expected redemption date (allowing for mortality only) discounted to the present at the gross redemption yield on 10 year government bonds. If on this basis the projected loan to value is less than 80%, the factor is 0.35. If it is greater than 80% the factor is 0.75. If the LTV is greater than 100%, a loss is deemed to have arisen. The mortality used in the projection is PM/FA92 (C = 2010).

We calculated the solvency requirement by calculating the projected loan to value at the end of each month in the portfolio projection. Based on the portfolio used, the loan to value factor did not exceed 80% until late in the projection so for the majority of the time a factor of 0.35 was used.

Assuming a cost of capital of 2% per annum, the present value of the solvency capital cost amounted to 1.4% of the loan. In terms of annual basis cost, it amounts to 7 bps per annum.

### 5.5 *Cost of Redemption Profile Insurance*

Because of the uncertainty around the repayment profile that the portfolio will exhibit in practice, most funders obtain Redemption Profile Insurance to cover the cost of breaking swaps (if the portfolio level falls below the central estimate) or putting additional swaps in place at the initial rate (if the portfolio level is higher than the central estimate). This means that the funder will continue to earn LIBOR on the full outstanding balance irrespective of the redemption profile. Because a full balance guarantee is very expensive (perhaps 70 bps p.a.) most funders obtain insurance which covers them provided the portfolio balance remains within specified “tramlines” around the central estimate.

Thus in Figure 5.5 the funder would be swapped out to receive LIBOR provided the outstanding balance remains within the shaded area; if the balance went above the top line then the funder would receive the fixed product rate on the excess balance; if the balance fell below the bottom line then the funder would either have to break some of the outstanding swaps, or they have to reinvest the additional repayments received and meet the swap payments as scheduled. The cost of this insurance might be 15 bps to 30 bps

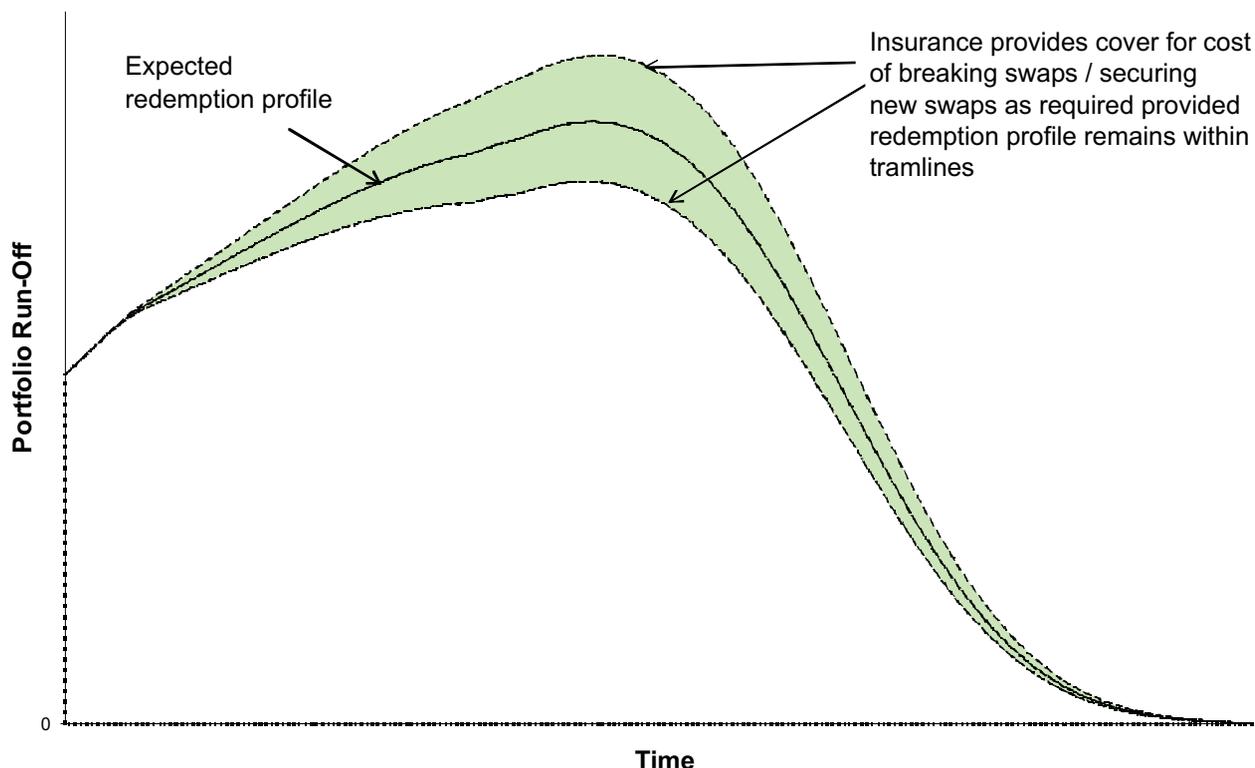


Figure 5.5. Redemption profile insurance

depending on the width of the tramlines, but the funder should also allow an additional risk premium to recognise the fact that the actual balance might fall outside the tramlines.

For product pricing purposes we have assumed that the cost of redemption profile insurance, together with any associated risk premium is 25 bps p.a.

### 5.6 *Other Sources of Funds*

Alternative sources of funds include:

- Securitisation.
- Annuity Funds.
- Negative reserves on term and other protection business.
- Savings and deposits.
- Fixed interest investment funds.
- With profits funds.

These may result in significantly different funding costs and obviate the need for some of the hedging and insurance costs considered above. For example investment by annuity funds would not require swaps or Redemption Profile Insurance as the liability being backed is fixed interest in nature.

### 5.7 *Assumed Funding Costs*

Our assumed annualised funding costs for a provider raising funds in the wholesale banking markets is therefore:

— Average swap rate	5.10%
— Funder's margin over LIBOR	0.40%
— Redemption Profile Insurance and Risk Premium	0.25%
— Cost of Solvency Capital	0.07%
— No negative equity guarantee	see Section 7.

## 6. EXPENSES

In some respects expenses are the most individual of any provider's pricing considerations, and each provider should look at their own cost base and business plan in order to assess what loadings are appropriate. Table 6 has been constructed to demonstrate what the authors consider to be reasonable ranges for the main cost headings, and shows what has been assumed in our example product pricing.

Table 6. Policy expenses summary

Item	Range	Assumption
Distribution and sales	1%-6% of the customer advance for a broker distribution model, similar for direct telesales, 5% or more for a direct sales model offering home visits	2.5% of the customer advance
Marketing	From 0.5% for limited support to a broker distribution model to 5% for cold advertising to generate leads for a direct sales force	1.0% of the customer advance
Administration		
Initial	£250-£750	£500
In force	£40 p.a.-£120 p.a.	£60
Termination	£200-£500	£350
Property Management		
Initial valuation	Charged to customer	£nil
Re-inspections and maintenance issues	Included in "in force" admin fee	
Property sale	Charged to customer except for NNEG situation	
Funding	Assumed to be covered in "cost of funds"	
Expense Inflation	Upwards of assumed CPI at 2%-3% p.a.	3% p.a.

## Notes:

1. It is assumed the valuation costs, provider's legal fees and disbursements are all charged to the customer. In addition a customer accessing the product through a broker channel may also have to pay an additional advice fee.
2. The cost of reinspections will depend very much on the providers' practices. We have assumed costs for a provider who reinspects properties only as needed to cover very specific situations e.g. complaints handling. For providers who operate a programme of sampling or systematic periodic revaluations then costs may be significantly higher.

## 7. THE "NO NEGATIVE EQUITY GUARANTEE" (NNEG)

The NNEG is a feature of most modern equity release schemes, and is compulsory for schemes following the SHIP code. Through the NNEG the provider guarantees the borrower that the redemption amount of the mortgage will be capped at the lesser of the face amount of the mortgage and the sale proceeds of the home, usually net of sale expenses.

The NNEG cannot be priced accurately using a deterministic approach because of its option-like features. Furthermore, the NNEG cost on a portfolio of mortgages is the sum of a number of binary outcomes on the different mortgages in the portfolio, and the circumstances of each will be different (i.e. the average portfolio experience does not matter, the portfolio

loss is the sum of losses on individual cases with no offset for cases where there was surplus equity cover). In Section 4.2 we analysed house price inflation for different U.K. regions over the last 30 years and observed that average annual U.K. growth was 8.8% for the period with the lowest-growth area being 0.5% lower (Scotland at 8.3% p.a.) and the highest-growth area 0.5% higher (London at 9.3%).

Thus a provider considering experience over the next 30 years with a central expected growth rate of 4.5% p.a. could reasonably expect to see growth in some regions averaging 5.0% p.a. or more and in others where growth is 4.0% p.a. or less. Within these regions there will be further diversification, so that some individual properties may experience growth at under 3.5% p.a. while others may have enjoyed growth at 5.5% or more. All other things being equal, the properties that have enjoyed higher growth rates may not result in NNEG claims even if the householders live towards the tail of the mortality curve. However, the properties with the lowest growth may have NNEG claims even if the householder does not live significantly beyond their average life expectancy. It is important that providers should recognise that they can realise their central pricing assumptions for house price growth and decrements and yet suffer losses due to NNEG claims being greater than expected.

The authors have represented this feature in modelling by assuming portfolio volatility at the higher level of 11% (compared to assumed index volatility of 8% — see 4.4).

### *7.1 Providing for the Cost of the NNEG*

Negative equity claims will arise principally on the longest surviving cases; by the time claims emerge the profits from contracts that ran off at earlier durations may well have been booked and spent if no provision is made. It is therefore important that providers should either outsource the risk through insurance or hedging, or that they should allow for the cost of this benefit in their customer pricing, and then regularly reappraise the appropriate level of reserves to hold as the portfolio evolves.

Clearly, the higher the permitted MLTV, the greater the risk of adverse experience from this feature, and providers will want to consider their product terms as an integral part of their product pricing and profitability.

### *7.2 Hedging the NNEG*

Because NNEG claims arise principally on the longest-surviving cases, and so will be greater across a portfolio if decrements are lower than expected, there is an inherent hedge for the provider as they will receive their margin for longer in this situation. For writers of options or insurance there is no such hedge and so these instruments tend to look expensive compared to self-insuring. This is perhaps one reason why the hedging market for the NNEG risk is relatively undeveloped. However, some instruments have been

available from time to time, and providers can usually obtain some form of cover at a price.

Depending very much on portfolio distribution, product features, interest rate and the level and structure of MLTVs, and insurer might charge 15-50 bps p.a. for a hedging instrument based on index performance. In this situation the provider should set aside reserves for expected additional losses on their specific portfolio. For full cover the binary nature of claims, higher expenses and high specific portfolio/management exposure might push this to 50-100 bps p.a.

### 7.3 *Quantifying the Cost of the NNEG*

When quantifying the NNEG cost we have assumed that all customers drawdown to the maximum permitted LTV at some future point. This avoids the situation where we might understate the NNEG cost which will ultimately apply to the loan.

We have then quantified the no negative equity guarantee risk on two bases as follows:

- An approximate market consistent basis similar to the pricing of options on stocks.
- An insurance pricing basis using “real world” assumptions.

#### 7.3.1 *The (proxy) market consistent basis*

The main challenge with a market consistent basis is the fact that there is no underlying market to speak of. Accordingly we have tried to create a proxy market consistent basis using techniques that are standard in similar markets, specifically Black Scholes style modelling. We have also estimated what the key parameters would be in this market, again borrowing techniques from other securitised markets. In practice it is entirely possible that as a market developed modelling techniques more appropriate to the stable real nature of property would also come into use, and these might well produce different NNEG costs to the process we outline below:

- A log normal model has been calibrated using the Nationwide House Price Index.
- The calibration has led to an assumption of house price volatility of 11% p.a.
- Using a risk neutral basis, house price inflation should be linked to the return on long term risk free instruments (i.e. government stocks) less an assumption for rental income (net of expenses).
- Residential rental income has been taken as the net rental yield from the IPD Residential Property Index for 2006, and so is set at 3.3% p.a. Although this is only the current yield we have no better assumption to make for the long term, and so have adopted it as our long term assumption.

- Current yields on long term government stocks are around 4.75% per annum.
- This gives us a forward rate for house price inflation of 1.5%.
- From the log normal we took 10,000 samples of HPI movements over the next 40 years.

On this basis, the option value for the sample policies used is set out in Table 7.3.1(a).

Note that option prices are similar for single females as for single males due to the higher assumed incidence of Long Term Care entry.

Sensitivities to the forward rate are in Table 7.3.1(b).

Sensitivities to the volatility assumption are in Table 7.3.1(c).

In reality the absence of an underlying market means that this proxy market consistent approach is only of limited academic value; for a provider seeking to obtain cover the market is whatever can be negotiated in their specific case.

Table 7.3.1(a). Option value for NNEG cost with 1.5% forward rate and 11% volatility

Sample case	Option price as a percentage of initial mortgage	Option price as an annual percentage of the outstanding mortgage
Male 65	18%	0.73%
Female 65	19%	0.74%
Joint life 65	29%	0.90%
Male 70	12%	0.64%
Female 70	13%	0.67%
Joint life 70	20%	0.82%
Sample portfolio	15%	0.67%

Table 7.3.1(b). Option value for NNEG cost with 0% forward rate and 11% volatility

Sample case	Option price as a percentage of initial mortgage	Option price as an annual percentage of the outstanding mortgage
Male 65	29%	1.22%
Female 65	31%	1.24%
Joint life 65	45%	1.45%
Male 70	20%	1.09%
Female 70	22%	1.13%
Joint life 70	32%	1.34%
Sample portfolio	25%	1.11%

Table 7.3.1(c). Option value for NNEG cost with 1.5% forward rate and 14%/17% volatility

Sample case	Volatility of 14%	Volatility of 17%
Male 65	21.4% (0.9% p.a.)	24.1% (1.0% p.a.)
Female 65	22.6% (0.9% p.a.)	25.9% (1.0% p.a.)
Joint life 65	32.7% (1.0% p.a.)	36.2% (1.1% p.a.)
Male 70	14.6% (0.8% p.a.)	17.1% (1.0% p.a.)
Female 70	16.0% (0.8% p.a.)	19.2% (1.0% p.a.)
Joint life 70	23.7% (1.0% p.a.)	27.3% (1.1% p.a.)
Sample portfolio	18.1% (0.8% p.a.)	22.3% (1.0% p.a.)

### 7.3.2 “Real world” assumptions

The alternative method we have used is to calculate the option cost using “real world” basis. The methodology we have used is as follows:

- Use the log normal model as before (with same volatility).
- A best estimate of 4.5% p.a. for HPI in the future (see Section 4.4). This is then the mean return under the model.
- We have assumed that a real world discount rate of 4.75% per annum.
- We have not assumed a “mean reversion” so that the random walk in each future period is applied independently of the position in preceding periods. The authors acknowledge that use of a “mean reversion” approach is equally valid.

Results for sample model points and our overall portfolio are in Table 7.3.2.

As can be seen, the resulting costs are significantly below those assessed using our proxy market consistent basis.

### 7.3.3 Market consistent or real world?

On our proxy market consistent approach we have derived a cost for the NNEG which would render the product non-profitable, whilst real world modelling has produced a significantly lower cost. One key factor is that the

Table 7.3.2. NNEG cost assessed using “real world” assumptions

Sample case	Option price as a percentage of initial mortgage	Option price as an annual percentage of the outstanding mortgage
Male 65	2.5%	0.10% p.a.
Female 65	2.6%	0.10% p.a.
Joint life 65	4.1%	0.13% p.a.
Male 70	1.8%	0.10% p.a.
Female 70	2.0%	0.10% p.a.
Joint life 70	3.2%	0.13% p.a.
Sample portfolio	2.7%	0.12% p.a.

market consistent approach assumes that the risk-adjusted return from all asset classes is the same as the risk free rate. In the case of property investment we have net rental yields assumed to be 3.3% implying that future property growth is only 1.5% p.a. more than the risk premium.

Under the real world projection we have assumed HPI at an average of 4.5% p.a. and this higher rate of house price growth inevitably leads to lower expected NNEG costs.

Which approach is most appropriate will depend on the purpose for which the analysis is being carried out. For a realistic assessment of the cost of future negative equity claims, the real world approach is clearly the best approach; organisations adopting market consistent embedded values may well develop their own market consistent approach for this purpose; for product pricing each organisation should have regard to its own capital position and risk appetite, and to the accounting and reserving implications of the above, and make allowance accordingly.

#### 7.3.4 Allowance for NNEG costs in product pricing

We have considered 2 approaches to the NNEG which have resulted in 2 different costs:

- Buying a hedge or insurance product to cover NNEG claims. Assuming that this is done on an index basis with the provider retaining an additional 10 bps p.a. to cover portfolio-specific risk, the total expected cost of this approach might reasonably be expected to be around 40 bps p.a. for our model portfolio (note that it will be less on initial advances but will average 40 bps across the loan once fully drawn down). However, if the hedge counterparty is pricing on some proxy market consistent basis then the cost could be significantly more.
- Option pricing methodology on a realistic pricing basis would be 10-15 bps.

For the purposes of product pricing we have assumed that the provider retains the risk in house and prices at a cost of 12 bps p.a.

## 8. RESULTS

The analysis we have shown in the preceding chapters suggests that a reasonable ready reckoner for pricing our specimen product is as follows:

— Average swap rate	5.10%
— Funder's margin over LIBOR	0.40%
— Redemption Profile Insurance and Risk Premium	0.25%
— Cost of Solvency Capital	0.07%
— Cost of NNEG	0.12%
— Expenses	0.30%
<b>TOTAL COST OF PROVIDING THE PRODUCT</b>	<b>6.24%.</b>

With a headline rate of 6.5% compounding monthly to give an equivalent annual rate of 6.7% this gives the provider 0.45% for a risk margin and profit, equivalent to 9.0% PVP. For providers attempting to price the NNEG on a market consistent basis there is insufficient product margin in order to provide a competitive product unless they have strong competitive advantages in one or more of the other cost areas.

The authors have validated the above costs by running the model portfolio through a stochastic model which produced similar results.

### 8.1 *Sensitivity Analysis*

Sensitivity analysis for the NNEG cost is shown in Section 7. The other principal unknown is the decrement basis, and analysis on this showed that the profitability reduces to 6.1% PVP (30 bps p.a.) if prepayments are set to zero, or 1.7% PVP (8 bps p.a.) for mortality at 50% of the assumed level.

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## APPENDIX 1

## SPECIMEN PRODUCT SPECIFICATION

Maximum initial loan to value ratio (MLTV)	15% at age 55 increasing by 1% for each year of age to 50% at age 90 (younger age for joint life cases)
Initial fees payable by customer (assumed to be added to the loan)	Application fee           £495 Provider's legal fees   £300 Property valuation fee   £1 per mille
Other fees	Mortgage discharge fee £350
Minimum property value	£75,000 (or as implied by combination of minimum advance and MLTV)
Minimum Cash Advance	£20,000
Interest	6.5% p.a. compounded monthly (i.e. annual equivalent 6.697%)
Further drawdowns	A cash fund is guaranteed available for future drawdown equal to the difference between the initial advance and the maximum permitted initial advance. The rate of interest applied to further drawdowns will be the rate prevailing at the time of drawdown
Negative equity guarantee	The maximum amount repayable is capped at the final property sales proceeds net of sales expenses
Property sales expenses	2.0% of final property value
Additional costs in event of negative equity claim	£500 to cover costs of additional valuation and administration
Early repayment charges	Mark to market with 25% cap
Portability	Customer may move home and transfer the outstanding mortgage, subject to the new property providing sufficient value that the LTV ratio is not increased on moving. If the replacement property value is lower a partial repayment may be required. The customer meets all expenses of moving

## APPENDIX 2

## MODEL PORTFOLIO

	Age bands						
	<60	60-64	65-69	70-74	75-79	80-84	84+
Weight of age band in portfolio:	1%	13%	28%	29%	17%	9%	4%
Weight in portfolio	0%	1%	3%	9%	4%	2%	1%
Weight in age band	<b>7%</b>	<b>10%</b>	<b>12%</b>	<b>30%</b>	<b>22%</b>	<b>25%</b>	<b>20%</b>
Male	59	64	67	73	76	80	91
Female							
Property value	180.0k	320.0k	145.0k	170.0k	350.0k	100.0k	175.0k
LTV%	19.0%	18.0%	20.0%	30.0%	20.0%	40.0%	28.0%
Initial loan amount	34.2k	57.6k	29.0k	51.0k	70.0k	40.0k	49.0k
Weight in portfolio	0%	2%	6%	4%	6%	5%	2%
Weight in age band	<b>10%</b>	<b>15%</b>	<b>20%</b>	<b>15%</b>	<b>37%</b>	<b>55%</b>	<b>66%</b>
Male							
Female	57	62	69	71	78	84	86
Property value	200.0k	170.0k	225.0k	250.0k	125.0k	205.0k	200.0k
LTV%	15%	22%	21%	22%	38%	35%	42%
Initial loan amount	30.0k	37.4k	47.3k	55.0k	47.5k	71.8k	84.0k
Weight in portfolio	0%	4%	10%	6%	2%	1%	0%
Weight in age band	<b>20%</b>	<b>30%</b>	<b>36%</b>	<b>20%</b>	<b>14%</b>	<b>9%</b>	<b>3%</b>
Male	55	60	65	70	75	80	85
Female	55	60	65	70	75	80	85
Property value	275.0k	180.0k	200.0k	170.0k	240.0k	230.0k	180.0k
LTV%	15%	18%	21%	30%	32%	40%	45%
Initial loan amount	41.3k	32.4k	42.0k	51.0k	76.8k	92.0k	81.0k
Weight in portfolio	0%	3%	3%	4%	3%	1%	0%
Weight in age band	<b>30%</b>	<b>25%</b>	<b>12%</b>	<b>15%</b>	<b>18%</b>	<b>6%</b>	<b>4%</b>
Male	57	62	67	72	77	82	87
Female	57	62	67	72	77	82	87
Property value	150.0k	120.0k	180.0k	250.0k	200.0k	180.0k	220.0k
LTV%	17%	22%	27%	22%	16%	30%	20%
Initial loan amount	25.5k	26.4k	48.6k	55.0k	32.0k	54.0k	44.0k
Weight in portfolio	0%	3%	6%	6%	2%	0%	0%
Weight in age band	<b>33%</b>	<b>20%</b>	<b>20%</b>	<b>20%</b>	<b>10%</b>	<b>5%</b>	<b>7%</b>
Male	59	64	69	74	79	84	89
Female	59	64	69	74	79	84	89
Property value	190.0k	275.0k	160.0k	125.0k	170.0k	160.0k	200.0k
LTV%	18%	18%	21%	28%	39%	25%	45%
Initial loan amount	34.2k	49.5k	33.6k	35.0k	66.3k	40.0k	90.0k

## APPENDIX 3

## PORTFOLIO RUN-OFF TABLE

Year	Mid-year		
	Proportion in force	Average loan	Spot rate*
1	0.995017	51,209	6.57%
2	0.971069	53,429	6.33%
3	0.941013	55,353	6.21%
4	0.904227	56,864	6.13%
5	0.865793	58,209	6.07%
6	0.830092	59,665	6.01%
7	0.796118	61,177	5.94%
8	0.762125	62,612	5.87%
9	0.732350	64,323	5.81%
10	0.707176	66,403	5.75%
11	0.682646	68,529	5.69%
12	0.657291	70,543	5.63%
13	0.631173	72,419	5.57%
14	0.604352	74,133	5.52%
15	0.576888	75,655	5.46%
16	0.548901	76,959	5.41%
17	0.520493	78,017	5.36%
18	0.491783	78,807	5.32%
19	0.462892	79,304	5.27%
20	0.433962	79,483	5.22%
21	0.405071	79,319	5.18%
22	0.376421	78,802	5.13%
23	0.348194	77,928	5.09%
24	0.320428	76,672	5.05%
25	0.293326	75,037	5.01%
26	0.266947	73,007	4.97%
27	0.241512	70,616	4.93%
28	0.217121	67,870	4.89%
29	0.193856	64,784	4.86%
30	0.171857	61,400	4.83%
31	0.151183	57,748	4.80%
32	0.131977	53,890	4.78%
33	0.114236	49,868	4.75%
34	0.097963	45,726	4.73%
35	0.083216	41,523	4.70%
36	0.069956	37,321	4.68%
37	0.058203	33,191	4.66%
38	0.047876	29,193	4.65%
39	0.038936	25,379	4.63%
40	0.031281	21,801	4.61%

\* The spot rate is taken from the Bank of England Commercial Bank Liability Curve for 23 August 2007.

## APPENDIX 4

## EUROPEAN HOUSING MARKETS

The extent to which house price inflation exceeds local CPI in the long term depends on:

- Economic growth.
- Government policy.
- Proportion of owner occupiers.
- Demographics, including immigration and emigration.
- Household occupancy rates.
- Housing supply.
- Mortgage Markets.
- Cultural attitude towards property ownership.

In the paragraphs below we have set out some characteristics of various European markets that have been chosen due to fact they are markedly different from the U.K. structure. We have concentrated on owner occupier, rental and tax characteristics of various European property markets. Most of this information has been drawn from the excellent RICS survey of 2005.

#### A4.1 *Switzerland*

- Switzerland is a prosperous country but economic growth in recent years has been very low in common with its neighbours.
- Swiss population growth has been quite slow with a low fertility rate. Immigration has been strong but there are severe restrictions on citizenship and there have been restrictions on owning property (see below).
- Switzerland has demonstrated very low real rates of return in its property market.
- Approximately 65% of households rent with homeownership increasing only slowly from 31% in 1990 to 35% in 2000.
- There is general consumer satisfaction with renting and few tax benefits of owner occupation. Urban owner occupation is a feature of the upper end of the market. There is no tradition of starter homes and ownership of flats is a recent development (except in Valais).
- Due to the low level of ownership, the housing market is relatively illiquid and in the 1990s showed significant price risk. This discouraged developments in home ownership.
- Approximately 20% of the Swiss population are non nationals. Until recently they were unable to own property and had to rent.
- For home owners, mortgage interest is tax deductible but they have to pay tax on “imputed rent”. Capital gains tax is also payable.

- Rent controls exist whereby at the initiation of the rental contract rents are freely negotiated but after that they are subject to controls relating to average landlord costs.
- The Swiss mortgage market is dominated by variable rate mortgages. Where fixed rates exist they are short term.

#### A4.2 *Germany*

- Germany's strong economic growth over decades but recent sluggish growth has been well documented. An interesting feature of its recent performance has been the failure of house prices to keep up with the economic growth.
- Population growth in the combined Germany has been 5% since 1980 with a low fertility rate of 1.4 in 2002.
- Germany has exceptionally low levels of home ownership (40%) with a higher percentage in the former Federal Republic. The cities have the lowest level of home ownership with the highest percentage in Saarland (at 58%).
- Post war past housing policies favoured rental as it was a way to generate affordable housing quickly. This continued in the 1970s. However there have been some initiatives by the government to increase ownership with limited success so far.
- The major housing shortage at the time of reunification encouraged the government to redouble its efforts to expand the rental sector. This had an adverse effect on home ownership percentages.
- Home owners tend to buy a plot of land and build a house on it and live there for a very long time. Therefore there is little "trading up" movement such as that that takes place in Ireland, the U.K. and U.S.
- There are also supply side constraints with local landowners unwilling to release land as they have to bear the infrastructure costs themselves. In addition, security of tenure to existing tenants gives landlords little opportunity to sell even when prices are attractive.
- The rental market tends to follow market principles with a long lag period. Like Switzerland, rents are freely negotiated at the time when a householder rents a dwelling. After this, rents are linked to inflation or to rent levels in comparable dwellings. Any increase in rent is limited to 20% over 3 years. This leads landlords to frontload increases when new tenants arrive.
- This can also lead to rents falling behind markets which encourages tenants to stay and impairs the value of the building.
- The mortgage market tends to be a long term fixed rate. Real mortgage rates have been quite high since 1990 which has contributed to slow property growth.

#### A4.3 *France*

- France has experienced strong economic growth until the mid 1990s when it began tail off. The last decade has been characterised by sluggish growth.
- France's population has increased by 10% since 1980. This has been largely due to immigration but a good fertility rate of 1.9 has also helped.
- The property market in France has been quite vibrant over the past number of years despite the slower economic growth. At times, the focus has been on houses but at other times on flats as city living becomes popular and supply struggles to keep up.
- The vibrant market has been encouraged by:
  - Low interest rate.
  - A greater propensity to borrow.
  - Renewed consumer confidence.
  - Government subsidies.
- This is also encouraged a substantial shift to owner occupation.
- There has been a long history of state involvement in property in France, both in renting and in owner occupation. Direct state expenditure on housing, through investment subsidies or housing allowances is one of the highest in the E.U. This has encouraged upward house price movements in the last decade. In addition, there has been state encouragement of renovation through subsidies and reliefs.
- Owner occupiers made up 54% in 1992 but this has increased to 56% in 2001. However over that period the housing stock increased very fast which has disguised a significant increase in house ownership.
- Recent price increases have lead to affordability problems for young people with a greater proportion staying at home with parents.
- 38% of dwellings are rented with more in the private and social sector. Tenants are very mobile with two thirds occupying their dwelling for less than four years. Since 1997, initial rent levels are freely negotiable but subsequent rent increases are linked to the construction price index. Real rent increases have been quite limited and in the social sector in particular (where rent levels remain at the level when the house or complex was built), average social rents are 40% less than equivalent market rents.

#### A4.4 *Netherlands*

- The Netherlands experienced very strong economic growth in the 1990s with average real growth rates of 4% per annum. Since 2000, economic growth has been slow.
- It has experienced significant population growth since 1980 with the population in 2001 13% higher than its level in 1980. The fertility rate in 2002 was 1.7.

- The mortgage market is characterised by rolling five year fixed rates.
- The Dutch market remained fairly subdued until the mid 1990s when property prices accelerated significantly until 2001. This coincided with strong growth in the Dutch economy which slackened in 2001. After this period property prices have been reasonably flat although transaction levels have remained fairly high. Low interest rates and a housing shortage have sustained prices at 2001 levels.
- Traditionally the housing market has had high state intervention. Until the 1990s the state undertook virtually all of the land development function and even today a significant amount of land is developed by local authorities and sold on to private developers or housing associations.
- In the past the Dutch market consisted of a relatively low level of owner occupation and a very large social housing sector. Recent years have seen a marked increase in homeownership from 42% in 1980 to 54% in 2004. This occurred due to the following events:
  - Home ownership has tax benefits with full deductibility of mortgage interest for tax purposes and no capital gains on sale. There is an imputed rent tax on assessed rental values.
  - Transaction taxes are quite high.
  - Overall property taxes are quite small (2% of GDP).
  - Politicians have made repeated pledges to sustain the tax advantage.
  - Subsidies for social housing have been withdrawn.
  - Greater mortgage competition.
  - Fading memories of the real fall in housing prices that took place from 1970 to mid 1990s.
  - The government restricted land supply in suburban areas in the mid 1990s that assisted in rapid price growth.
- For the social and private housing sector rent controls exist. Rents bear no relation to market costs but are based on a points system related to amenities and service charges. If landlords do not keep up repairs, tenants can apply for a rent reduction. All rents can only be raised annually by a maximum amount decreed each year by the government. Real rents have been declining since the mid 1990s.

#### A4.5 *Sweden*

- Sweden's economic growth rate has been very strong since the 1970s. It was characterised by booms in the late 1980s and 1990s. The population has grown by 7% from 1980 to 2001.
- The mortgage market has been characterised by rolling five year fixed rates. Recently more variable rates have been introduced as the interest rates have become more influenced by Eurozone rates.
- House price growth has been strong in Sweden from 1997 to 2001 due to strong economic growth and low interest rates. Since 2001 the boom

has tapered off until an upswing in 2004. Problems of affordability are now arising due to high land costs. Rental supply has been constrained leading to more price problems in the rental sector.

- The country has had a history of interventionist housing policies combined with high housing standards. Between the 1950s and 1990s, substantial subsidies were given to all tenures to raise the number of new dwellings built and to enable all households to exercise tenure choice. Then during the 1990s these subsidies were almost entirely withdrawn and housing policy was given far less government attention. Nevertheless housing is one of the most overtly state managed systems in the world.
- Homeownership was transformed in the 1980s in the context of newly liberalised mortgage finance but led to a series of strong booms and busts.
- The housing system is quite complex. There are four tenures namely single family owner occupied, owner cooperatives and private and public rental. 38% of all dwellings are single family owner occupied, 16% are cooperatives and 46% are rented (of which half are private rented). Owner occupation does appear to be increasing. 55% of housing stock is in flats in multi-storey buildings. This is one of the highest percentages in Europe.
- Owner cooperatives have grown rapidly in importance. Cooperatives are similar to condominiums but differ in some important respects. From a legal perspective cooperative associations own the apartment structures but households can sell their right to occupy them on the open market once it has been bought from the cooperative at its set up. The association takes out a mortgage and charges members a monthly fee to pay off the mortgage. Individuals may take out a mortgage for part of the purchase price and pay reduced fees to the cooperative.
- In Sweden, there is tax relief on mortgages but also a tax on imputed rent. Capital gains are taxable but can be deferred by buying a similarly priced property.
- For rental housing, in the social sector rents reflect the age composition of the housing stock and are historic cost based. The rents are usually set in aggregate through local negotiations between local authorities, tenants and private landlords. The rents set pay little attention to the location or quality of the stock. This means that rents for attractive urban locations are often well below market rates. This has led to blackmarket transactions through unofficial sublets.
- The private rental sector rents are limited by reference to the social housing rents. Removal of subsidies has led rents to rise but lack of profitable opportunities is constraining rental supply.
- Rental inefficiencies have led to a glut of rental accommodation in some areas and a shortage in others. Some local authorities have demolished empty buildings to reduce maintenance costs.

- The government has set up various commissions to look at ways of managing the housing situation much better in the future.

#### A4.6 *Italy*

- Economic growth in Italy has been struggling for a significant period of time since 1990s.
- Population growth has been sluggish with a growth in population of 2.3% from 1980 to 2001. Fertility rates are low also at 1.3%.
- The mortgage market has grown in recent years as Italians borrow more. Growth has been inhibited by difficulties banks have in recovering bad debts.
- The housing market has been on a sustained upswing for 5 years after a long period of recession in the 1990s when real prices fell by over a fifth over a seven year period due to poor economic growth. Economic growth has remained slow over the last 5 years but house price inflation has remained brisk.
- Homeownership is high and increasing. In 2003, 83% of homes were owner-occupied and 16% were privately rented. Homeownership rates are highest in the South and in rural areas.
- Owner-occupation has growth substantially since its level of 53% in 1980. The main factors underlying this increase are as follows:
  - Financial and economic conditions have shifted towards purchase. Mortgage borrowing is now possible and affordable with Eurozone interest rates.
  - Tax breaks are biased towards ownership with mortgage interest relief and no capital gains tax for homeowners.
  - New housing supply is for home ownership with existing properties in poor rates of repair. Many of these were in rental tenure and suffered from price controls.
  - Rent laws changed in the late 1970s and the policy assisted (accidentally) landlords to sell out. It limited leases to 4 years with continued rent controls. At the end of the 4 years, landlords could evict tenants.
  - An additional rental law introduced in 1998 enabled tenants to automatically renew the lease for an additional 4 years under the same terms. Rent increase are limited to 75% of the CPI index per annum. This has reduced the attractiveness to landlords but has also led to frontloading of rents.

#### A4.7 *Spain*

- Economic growth in Spain has been very strong since 1990s. Population growth has been a relatively strong 9% from 1980 to 2001. The fertility rate remains low at 1.3% in 2002.

- The housing boom in Spain has continued apace since 1993. It has seen the most significant nominal price rises in the E.U. over the period 1993 to 2004. The boom has been attributed to the following factors:
  - Strong economic growth.
  - A substantial increase in living standards.
  - A fall in real mortgage rates (due to Euro membership).
  - Tight supply particularly in urban areas.
- The Spanish housing market has a few interesting characteristics:
  - Many dwellings contain several generations of family.
  - 44% of men and 30% of women remain at in the parental home at the age of 30.
  - 5% of 65 year olds live alone (lowest in E.U.).
  - Much of the housing in multidwelling structures. Only 37% is in single structures (lowest in E.U.).
  - Owner occupation levels are equivalent to Italy at 83%. Tax breaks for homeownership are generous. Some newly built owner occupied housing are given substantial subsidies through cheap loan rates. However all owner occupiers enjoy mortgage interest relief and no capital gains tax.
- In 2001, 14% of the stock was in second homes. 15% of the total housing stock in 1998 was derelict due to being rundown or in remote areas which are losing population.
- Renting makes up a small proportion of housing and nearly all is private sector renting. Renting is not attractive due to rent controls and pro-ownership subsidies. Recent policy has tried to revive the tenure in order to meet the housing demands of mobile and single person households.

#### A4.8 *Summary*

There are many different approaches to property throughout Europe which may be cultural as well as political. These have led to varying property price movements over the last 30 years. It is difficult to know what effect each differing element has on house price inflation and indeed this is beyond the scope of this report. However it is likely that issues such as owner occupation proportions, government incentives, access to finance all play a part. It is very clear that the extent of real house price inflation in the U.K., Ireland and Spain is exceptional compared with other European and overseas countries. The question is “Have they just been lucky?”

There is a temptation of believing that the Anglo Saxon property market is different. However it may be the case that the housing markets are simply at different stages of evolution, and as cultural and legal factors gradually harmonise across E.U. countries, so will housing market trends. Indeed the growth in property prices in the U.K. may lead to government action to

make property accessible to the population being left out, potentially leaving it a victim of its own success.

It is worth noting the experience of other countries which demonstrate that there is the potential for house prices to underperform salary growth and perhaps even CPI for a considerable period of time.

## APPENDIX 5

## DECREMENT ASSUMPTIONS (FURTHER DETAIL)

*A5.1 Introduction*

A5.1.1 This section of the Report is intended to assist actuaries in setting decrement assumptions for equity release products by highlighting the key issues that need to be considered.

A5.1.2 The key assumptions required when setting appropriate decrement assumptions are base mortality, mortality improvements, long term care (“LTC”) incidence, future LTC entry trends and early redemptions.

A5.1.3 In setting appropriate assumptions it is clear that the actuary must have regard to a number of factors which will be unique to his employer, these include but are not necessarily limited to:

- The sales channel through which the product is sold.
- Any marketing used to support the product.
- The socio-economic profile of applicants.
- The features of the product relative to the rest of the market.

A5.1.4 The remainder of this section analyses the approach taken to setting appropriate decrement assumptions for Equity Release with particular regard to the interplay between these assumptions. The authors do not believe that it is possible to construct a suitable basis by setting decrement assumptions in isolation. Actuaries pricing equity release contracts need to understand and model the correlations between these assumptions.

A5.1.5 In addition it is not possible to set decrement assumptions in isolation from economic assumptions, the average value of equity released, interest rate, surrender penalty structure etc. all have a material impact on likely future decrement rates. As another example the house price inflation assumption may be linked to the LTC entry decrement assumption, if property prices inflate significantly people are more likely to release further equity to support basic care in the home.

*A5.2 Base Mortality*

A5.2.1 As readers will be aware the last decade has seen significant increases in the longevity of lives aged over 60. The history of life expectancies implied by various standard industry bases various ages is shown in Table A5.2.1.

A5.2.2 Clearly the above tables are all based on pension annuitant experience but this table is believed to provide a relatively good indication of equity release experience overall, although there may be some shape issues in particular in relation to select periods.

Table A5.2.1. Life expectancies based on standard tables

Base table	(a)55	Peg 1967 to 70	PXA80	PXA92	PXA92	PNXA 00
Projection basis	n/a	PA(90)	PXA80c2010	PXA92u2000	Mid cohort	P-spline
Year of issue	1953	1978	1990	1999	2002	2006
Male $e_{65}$	14.3	14.6	16.9	19.1	21.5	Approx. 23-24*
Female $e_{65}$	17.6	18.4	20.7	22.1	24.4	Approx. 25-26*

\* Note: In the case of the p-spline model the projected life expectancy depends on the exact dataset and parameters used to derive the projection.

A5.2.3 It appears unlikely to the authors that the Base Mortality table adopted should be heavier than approximately 100% PXA00u06 unless there are compelling reasons (e.g. per A5.1.3 of this section of the report) to support a heavier assumption.

A5.2.4 This will then give a base table consistent with most the most recent major investigation into life office pension annuity experience. The pension annuity table was chosen as it includes significantly more data than other annuity tables and thus forms a credible starting point.

A5.2.5 There is a strong and pronounced link between the socio-economic rating factors and mortality. The actuary needs to consider this when selecting the percentage of the table to adopt.

A5.2.6 The key reason for the selection of this table is that the socio-economic profile of lives buying typical equity release contracts is similar to those purchasing pension annuities.

A5.2.7 An equity release contract sold to wealthy lives with a low prevalence of smoking may require a reduction to the base table of as much as 40 or 50%. A recent study of data supplied to the authors by one office suggested that the mortality experience for properties valued over £750k was 43% lighter than for properties valued under £130k with a clear progression between intermediate bandings. The experience for the properties over £750k was 55% of the overall average suggesting a very strong socio-economic effect.

A5.2.8 This is not inconsistent with the results found in “Social Inequalities” [ONS: 1997] on health inequalities based on the period 1991 to 1993. This showed relative mortality by socio-economic class (see Table A5.2.8(a)).

For this report the authors have adopted the bandings in Table A5.2.8(b).

A5.2.9 The actuary also needs to consider reasons why the mortality table shape may need adjustment. Possible areas to consider are older ages,

Table A5.2.8(a). Mortality of different socio-economic classes as a percentage of population mortality

Class	Ages 60-64
I	72%
II	77%
IIIN	104%
IIIM	130%
IV	120%
V	180%

Table A5.2.8(b). Mortality assumptions by property value

Property value	Mortality assumption	Comment
up to £130k	120% base table	consistent with Class IIIM/IV lives
£130k-£250k	100% base table	consistent with Class IIIN lives
£250k-£750k	85% base table	representing a mix of Class I/II/IIIN lives, depending on geographic location
£750k+	55%	consistent with a select group of Class I lives

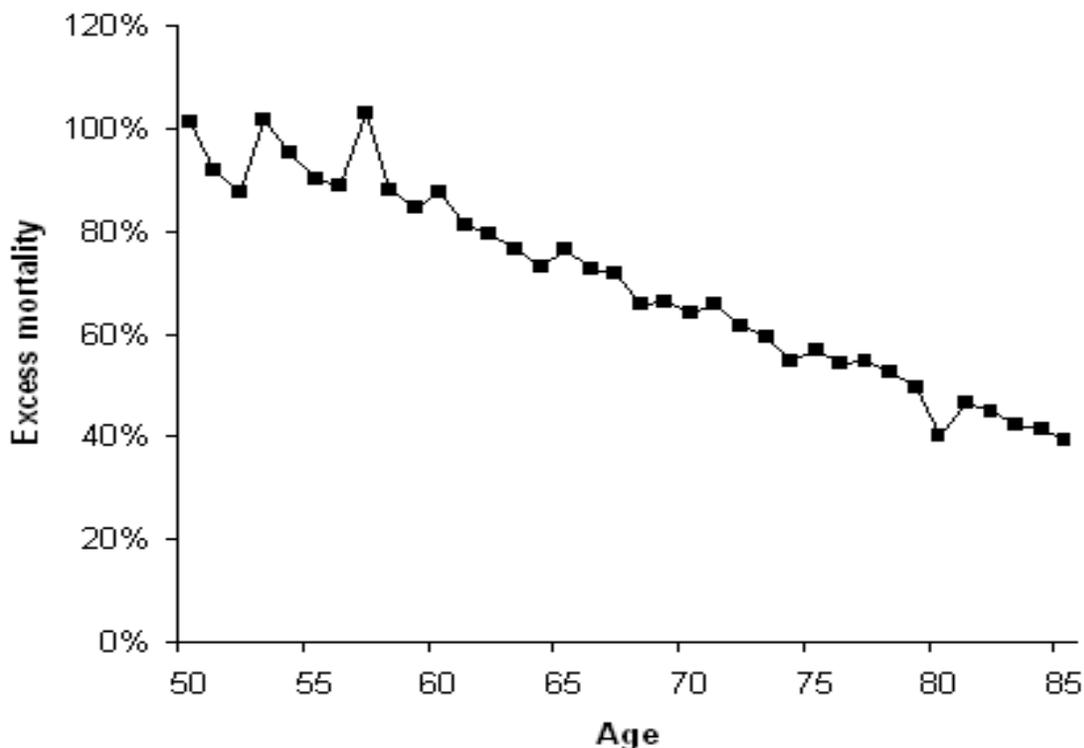
the select effect and differences in composition between the Equity Release population and the pension annuitant population.

A5.2.10 It is not believed that significant adjustment is required at older ages. The strong version of the “Compensation Law of Mortality” (Gavrilov and Gavrilova, 1991) suggests that the log of the force of mortality for different sub-populations of a species converge (linearly) towards a common point at a particular, species-specific age. For humans Gavrilov and Gavrilova suggested this occurs at age 95.

A5.2.11 Verification of this effect in principle can easily be achieved by comparing population mortality to CMI Assured Life data, Figure A5.2.11 shows excess mortality within the population relative to assured life data.

A5.2.12 There are many other investigations that can be conducted into this effect, but all appear to suggest similar results. It is not felt appropriate to further analyse this effect further in this paper, particularly given the significant volume of publications on the subject. The authors propose for ages over 95 the PMA 00 table selected is believed to be appropriate as a base table.

A5.2.13 The next obvious area for which the mortality table is likely to require adjustments is the select period. The level of adjustment required will depend on the contract being issued. Although the authors have not had access to any data to confirm or otherwise the existence of a select effect, their collective experience suggests that a 2 year select period is a reasonable expectation for these contracts. Consistent with this experience an



(Source: Willets Consulting)

Figure A5.2.11. Excess mortality in the England & Wales population relative to CMI assured lives, males, 1999

assumption of 65% in the first year, 85% in the second year and 100% thereafter has been adopted.

A5.2.14 This reflects the experience of a number of other products. A general reasoning approach suggests people are less able to forecast their likely state of health beyond approximately 36 months and are better at doing it in the first twelve months than the subsequent 12 month periods.

A5.2.15 The final area to adjust for relates to the composition of the equity release population and the pension annuitant population. Again this adjustment needs to be done on a company by company basis. Items to consider include the fact that many companies refuse to sell equity release to impaired lives, this will reduce the level of deaths in the early years so an adjustment factor may be needed for as long as ten years.

A5.2.16 This concludes the process of selecting an appropriate base table. Clearly it is not possible for the authors to construct a one size fits all basis however it is hoped that the section has highlighted significant issues to consider. A summary of how a best estimate basis might be constructed is provided at the end of this section of the report. For the purpose of this report we have adopted 100% of the base table reflecting a product sold to a diverse range of people primarily through an IFA sales channel.

### A5.3 Mortality Improvements

A5.3.1 The publication of all tables in Section 2 can be seen to show a trend of longevity improving more rapidly than had previously been projected. The Mid Cohort interim projections were unique in that they identified a specific group of individuals with unusually light mortality (see Willets *et al.*, 2000 & 2004).

A5.3.2 Broadly speaking the centre of this cohort was lives aged between 55 and 60 in 1990 but the cohort appeared to extend down as far as lives aged 45 in 1990 (CMI Working Paper 1, 2002). This implies the “Cohort Lives” are now aged between 61 and 76. The effect is shown in Figure A5.3.

A5.3.3 This can be taken to include the key range of ages in the Equity Release market. The impact of understating future mortality improvements on an equity release contract are potentially severe, particularly in the case of contracts which include a no-negative equity guarantee.

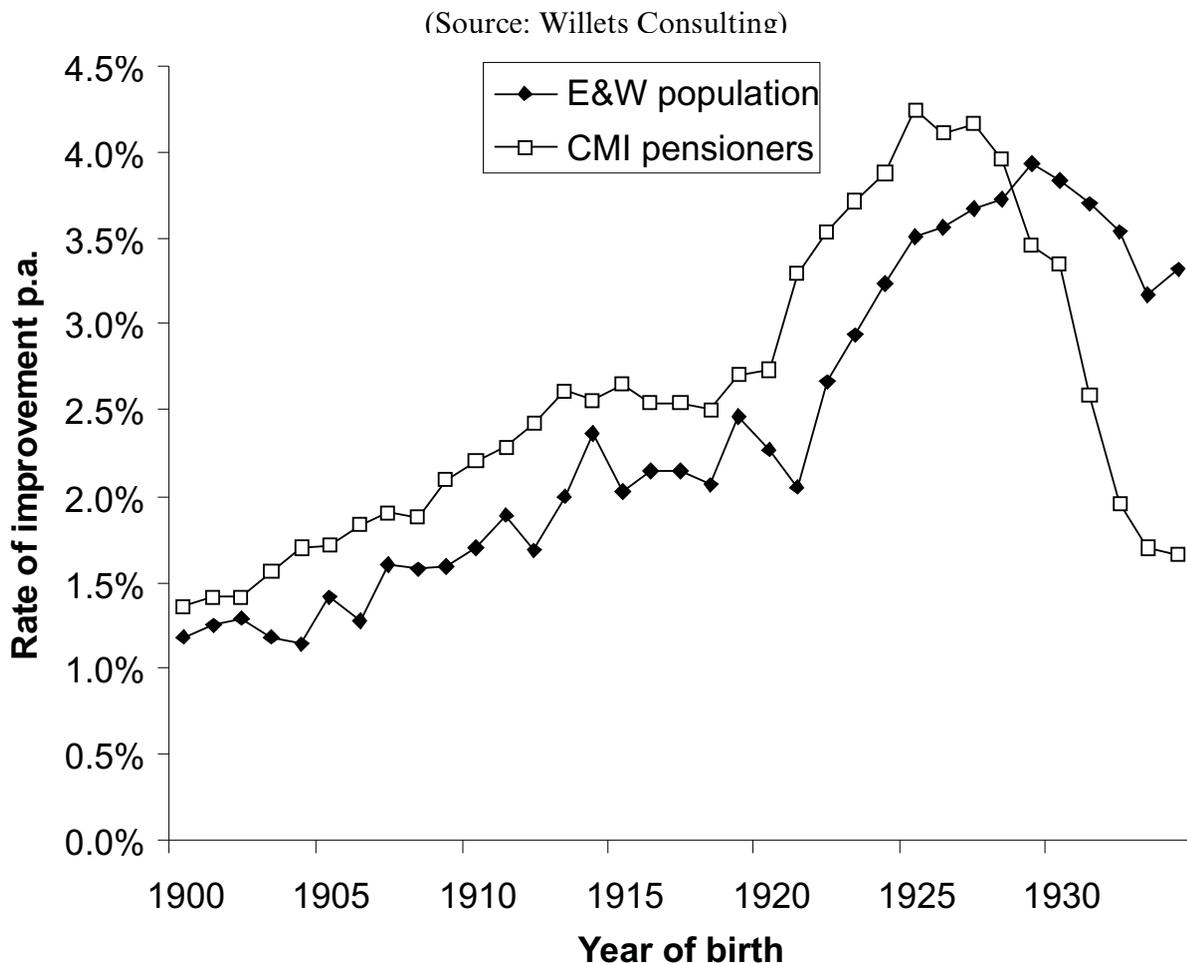


Figure A5.3.. Average rate of mortality improvement by year of birth for the period 1983 to 2002 for the male lives-weighted CMI pensioners and males in the population of England & Wales

A5.3.4 In some ways this situation has been made more complex by the decision of the CMI to cease to produce a standard set of projections and instead produce two stochastic models to project future mortality. This paper is not an appropriate place to re-examine this decision and readers who wish to understand the decision further should read CMI Working Paper 20, April 2006 (“WP20”).

A5.3.5 The CMI has released two models, P-Spline and Lee-Carter.

A5.3.6 The basis of the P-Spline model is clearly explained in WP20 and the model is available from the CMI website. The P-Spline model produces a series of projections. It is for actuaries together with their Boards to determine what level of confidence they believe to be appropriate for each purpose (e.g. reserving, ICA, pricing etc.) and this section summarises the thoughts of the authors.

A5.3.7 The P-Spline model requires relatively modest amounts of data for a stochastic model however this is still likely to be well beyond the available data for most equity release providers given the relative newness of the market (approximately 1,000 lives and 30 deaths in each age and year cell).

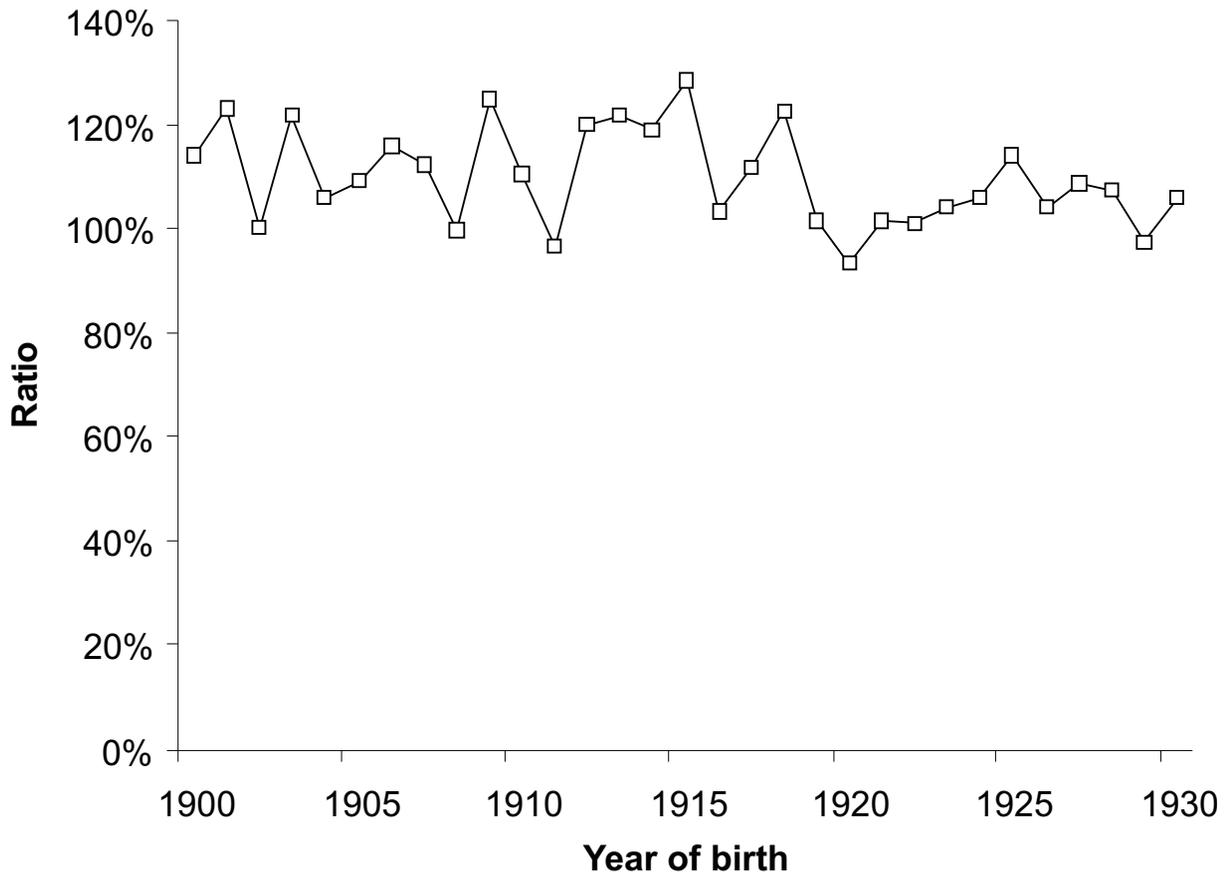
A5.3.8 A direct conclusion of this is there is limited opportunity to use the model on Equity Release providers own data. The approach recommended by the authors is thus to start from the pension annuitant investigation and consider the need for adjustments.

A5.3.9 To understand the required level of adjustment it is important to understand the key drivers of mortality improvements in the affected age groups. Given this is not the focus of this paper the authors have touched on what they believe to be the key considerations but have not investigated more fully as this would require a separate paper in its own right.

A5.3.10 The authors believe that the sub-groups of the population which make up Equity Release policyholders and Pension Annuitants are sufficiently close to adopt the same mortality improvement factors as a start point. The projections detailed in WP 20 were based on CMI assured life data (1947 to 2003) for males and ONS data (1961 to 2003) for males and females).

A5.3.11 The rates of mortality previously experienced by CMI pensioners appears to be reasonably closely correlated to the rates experienced by the population, in particular the extent of any variations appears to have been decreasing for later years of birth.

A5.3.12 This factor is useful as the result of a P-Spline projection depend significantly on the dataset used. WP 20 suggests that the CMI assured life dataset may result in lower future improvement than the population dataset. There are numerous possible explanations for this including potentially a significant decline in the CMI assured life exposed to risk or potentially the impact of preventative care being more significant for lower socio-economic groups (see Figure 5.3.12).



(Source: Willets Consulting)

Figure A5.3.12. Ratio of average rate of mortality improvement for male CMI pensioners versus males in the population of England & Wales, by year of birth for the period 1983 to 2002

A5.3.13 For a typical provider the authors therefore believe that the P-Spline methodology supplied in WP 20 is likely to be appropriate.

A5.3.14 Quoting directly from WP20: “The patterns of higher observed mortality improvements for P-Spline projections compared to the interim cohort projections means that the interim projections based on data to 2000 are unlikely to be suitable as more recent data becomes available.”

A5.3.15 Analysis of WP20 clearly shows a situation where the Long Cohort projection model may be inappropriately light for younger lives and the mid-cohort basis inappropriate for older lives.

A5.3.16 Given the importance of this assumption for contracts with a no negative equity guarantee and the need for prudence where the risk is retained (as highlighted in A5.3.3 and A5.3.4) the authors recommend that all actuaries involved in pricing equity release contracts consider their assumptions in the light of WP20.

A5.3.17 A best estimate basis is thus likely to be the P-Spline projection

basis with a 50% percentile and using either the age cohort penalty basis, or using the new notation p-s50ac.

A5.3.18 It is for each actuary to recommend to their Boards how they wish to interpret the results of the P-Spline models in the context of their product and its buyers.

A5.3.19 The authors believe that the models when taken with the data in WP20 suggest that an absolute minimum assumption for a typical provider should not be lighter than PXA92YoU2006 MC and that this is unlikely to be appropriate for pricing new business, particularly at younger ages, unless there is a compelling socio-economic reason.

A5.3.20 One clear advantage of the publication of the P-Spline model is that it produces stochastic projections of mortality improvements. Given the significant uncertainty around future mortality improvements the authors believe that companies offering no negative equity guarantees consider providing capital for these guarantees using stochastic projections of future mortality improvements and house prices.

A5.3.21 The authors believe this is typical practice where the product provider is part of an insurance group through the Individual Capital Assessment but not necessarily where the provider is part of a bank where capital rules are more formulaic although the capital rules as set out for Banks are currently under review as part of Basel II.

#### *A5.4 Long Term Care Incidence/Trends*

A5.4.1 The above sections identify a methodology for constructing a best estimate mortality basis. Many Equity Release contracts also have triggers relating to planholders moving out of their houses and requiring long term care.

A5.4.2 Only one provider in the U.K. offers long Term Care insurance as a new product at present, as a consequence few offices have material experience of modelling LTC incidence rates. Where the Equity Release contract terminates on entry to LTC this assumption makes a material difference to the level of equity that may be provided to consumers.

A5.4.3 Analysis of this decrement is significantly hampered by the absence of available statistics for Equity Release planholders. Where available the data is often combined to show voluntary surrenders and LTC exits as one event type.

A5.4.4 Actuaries pricing these contracts who wish to accurately model this risk may want to develop multiple state models as there is a clear relationship between long term care incidence and residual at home mortality. The removal of lives moving into care leaves a select group of lives in the Equity Release planholder population.

A5.4.5 As reported in the 2005 paper the Equity Release working party would caution against this approach, with limited data calibration is very tricky and the result is a model which appears scientific but is highly sensitive

to a number of uncertain parameters. If LTC incidence rates become more clearly available this stance would be reconsidered.

A5.4.6 An approach to modelling LTC rates was covered in detail in the 2005 report of this working party and the authors do not intend to revisit it further except to say they believe the analysis in that report remains materially valid.

A5.4.7 Life expectancies have continued to increase however healthy life expectancy is increasing far less quickly.

A5.4.8 The government appears to have a political agenda to care for people in their own homes, it appears that although life expectancy is increasing the average amount of time spent in a care home has been reasonably stable during the period, partly driven by later entries into care.

### *A5.5 Early Redemptions/PrePayments*

Setting assumptions for pre-payments is one of the most difficult and unreliable aspects of pricing lifetime mortgages, and the one which carries significant risk for providers. Some decrements under this heading will be Long Term Care decrements in disguise e.g. where the householder becomes infirm and moves in with family. Most concern will be customers pre-paying in order to remortgage elsewhere. Consumers will generally be incentivised to remortgage and seek a lower cost of borrowing with another provider when interest rates have fallen, especially if the provider operates a flat early repayment charge scale. The more interest rates have fallen, the greater will be the loss to the provider who will have to break expensive interest rate hedges, and the greater will be the incentive on the consumer to remortgage. Providers operating flat-rate charge scales are offering consumers a one-way bet on interest rates: if interest rates fall then the consumer can remortgage to the lower rate at a very modest cost; if rates rise then the consumer can hold the rate that was fixed at outset. Mark to market penalties will go some way towards protecting providers from anti-selection on this cause, but they do nothing to protect providers for lost administration and distribution costs on early repayment, and caps on the early repayment charge mean that protection is provided only for relatively modest falls in interest rates (although even the capped charge will act as a disincentive to remortgaging). The dependency of remortgaging rates on product design, distribution method and prevailing interest rates means that they are difficult to predict reliably, and can be expected to vary significantly from one provider to another and in different economic circumstances. Factors the actuary should consider when setting pricing and reserving assumptions include the following:

- The Early Repayment Charge scale.
- The prevailing rate of interest; if interest rates are relatively low, then there is less potential incentive for remortgaging in the future.

- Distribution channel. Intermediaries are likely to be more proactive in stimulating remortgaging than direct or controlled distribution channels.
- Product Design. More flexible product design may allow consumers to meet future needs without the need to consider alternative products (for example flexible drawdown schemes should exhibit lower pre-payment rates than lump sum schemes with no increment facility).
- Competitive positioning: market-leading rate providers should expect some of their customers to be more rate-driven than others whose customers have selected their provider for reasons other than best rate.

For in force books the actuary should also consider the initial LTV and house price inflation since inception, as the greater the level of growth the more straightforward it will be for the consumer to remortgage. Consumers taking the maximum available LTV in periods of low house price inflation are unlikely to be able to remortgage.

The most recent publicly available data on remortgaging rates is provided by Norwich Union in the prospectus for Equity Release Funding (no.5) plc, August 2005. This shows voluntary prepayment rates for the previous issues as follows: ERF1, 4.4% p.a.; ERF2, 3.7%; ERF3, 2.5%; ERF4, 1.4% (prepayment rates given by number of loans). The prepayment rates can be rationalised by reference to the above considerations, with ERF1 representing inflexible products sold at high interest rates, with the products becoming progressively more flexible and sold on lower rates for the later securitisations; although selection will also be a factor.

The voluntary prepayment rates we have assumed for modelling purposes might be considered best estimates for a provider with robust early repayment charges distributing a flexible product at competitive but not market-leading rates through a broker distribution channel at a time when interest rates are relatively low but not bottom of the market (say headline rates of 6.5% p.a.) (see Table A5.5).

Table A5.5. Assumed prepayment rates

Year	Prepayment rate
1-2	1.0%
3	2.0%
4-5	2.5%
6-8	2.0%
9-10	1.0%
11-20	0.5%
21+	0.25%