ASTIN, AFIR/ERM and IACA Colloquia
Innovation & Invention
23-27 August 2015 | Amora Hotel Jamison Sydney

Actuaries Institute

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Presented to the Actuaries Institute
ASTIN, AFIR/ERM and IACA Colloquia
23-27 August 2015
Sydney

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Home equity release: An alternative product and its pricing

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Purpose: Using data from England, we price a floating-rate home equity release product based on a house price index, and explore how to customize the product for use with long term care in the absence of LTC data.

Keywords: Home equity release; no-negative-equity-guarantee; Adjustable rate loan;

1.0 Introduction

Existing home equity release (HER) products that function as reverse mortgages with fixed or floating interest rates have struggled to fulfil the potential envisioned for them. Although HER plans have been available in the UK for many years, they have not received as much take-up as might be expected. In a 2011 press release, Andrea Rozario of SHIP states that it is estimated that there is £250 billion of equity that could be released immediately, yet the market is just under £1 billion a year (SHIP, 2012).

Both the product design and its pricing may contribute to the low popularity of the product. Andrews and Oberoi (2015) propose a revised structure for better risk sharing, whereby the lender receives a return based on a housing price index (HPI) and an annual fixed percentage charge throughout the term of the loan. In that paper we propose this product design for use for HER when one member of a couple requires long-term care (LTC) and the home is not to be sold. We also propose that to assist with use of HER in connection with LTC needs that the government would participate through a public-private-partnership (PPP). The PPP would bear the No Negative Equity Guarantee (NNEG). We find that the pricing of this product design is more favourable than current market pricing.

For this paper for the International Actuarial Association (IAA) meeting in Sydney, we propose to extend our analysis of the HER product so that it could be used in the wider market, not just in situations involving LTC needs.

In addition to product design, there has also been recent attention on the pricing approaches, as assumptions of future home appreciation and the expected tenure of the loan both have a significant impact on its pricing. One difficulty with calibrating existing models has been the unavailability of sufficiently detailed data on LTC. The second objective of this paper is to apply the method of Gourieroux and Lu (2014) to price the product without requiring mortality data regarding those in long-term care.

Moreover, we have been able to acquire data regarding house sales for three additional years. We show the impact on our earlier results of using three additional years of data.

This paper proceeds as follows. In section 2 we provide background on various designs of HER products. In section 3 we describe the product design and the pricing model used in this paper. In section 4 we present the results of our analysis. Section 5 describes areas for future research and the section 6 concludes.

2.0 Background on Product Design

Several alternative arrangements have been proposed to address design features that may result in low take-up. Shiller and Weiss (2000) review several of these, and recommend indexation of the mortgages to a house price index to mitigate moral hazard. One such structure is a housing partnership discussed in Caplin et al. (1997).

Andrews and Oberoi (2015) build on these ideas to propose a revised structure for better risk sharing, whereby the lender receives a return based on a HPI and an annual fixed percentage charge. It could be offered as either a large upfront loan or a loan with annual installments. We also propose that to assist with use of home equity release in connection with long-term care needs that the government would participate through a public-private-partnership (PPP). The PPP would bear the No Negative Equity Guarantee (NNEG), which translates in this setting to the basis risk between the house price index and individual house appreciation combined with the longevity risk arising because the actual time of house sale means that the loan amount was set too high. We find that the pricing of this product design is more favourable than current market pricing.

In addition to product design, there has also been recent attention on the pricing approaches, as assumptions of future home appreciation and the expected tenure of the loan both have a significant impact on its pricing. For instance, Ji, Hardy and Li (2012) summarize the criticisms of existing models of reverse mortgage terminations, proposing instead a model that includes borrower states such as entry to long-term care and bereavement. One difficulty with calibrating existing models has been the unavailability of sufficiently detailed data on long term care.

Fabozzi et al. (2012) developed new methods for pricing the main real estate derivatives — futures and forward contracts, total return swaps, and options. They outlined a suitable modelling framework that accounts for the incompleteness of this market, which can produce exact formulae, assuming that the market price of risk is known. Data issues can be significant when applying such a methodology.

An explanation for low take-up of loans could be a perceived need for conservatism in pricing because of the uncertainty regarding improvements in mortality and morbidity, which may increase the potential time until the loan is repaid, hence, increasing the risk exposure period. With respect to UK data, Jagger (2012) states that over the previous decade life expectancy at birth increased at a relatively constant rate, rising by 2.4 years for men and 1.7 years for women, and that disability-free life expectancy has increased by 3.6 years for men and 2.3 years for women. However, these averages hide differences within the UK (across England, Northern Ireland, Scotland, and Wales). Moreover, there are differences in the extent of improvement in both these longevity measures among European countries (ibid).

In this paper we use a completely different approach to mortality and morbidity data than our previous paper (Andrews and Oberoi, 2015). The data in this paper uses estimates based on French mortality by Gourieroux and Lu (2014) to estimate the hazard rates, whereby a latent state of disability or LTC is modelled. If the approach of Gourieroux and Lu (ibid) is viable it addresses some of the concerns regarding availability of data, particularly disability incidence and disabled mortality rates. Moreover the French data is based on 1950 cohort which has experienced mortality improvements over the mortality data used in Andrews and Oberoi (2015). Hence comparing the results using the French data to results in Andrews and Oberoi (2015) may provide insight on the impact of pricing that mortality and morbidity improvements have.

3.0 Pricing Model

The product design proposed in this paper provides that the rate charged by the lender on the HER loan would be calculated by reference to a HPI. In addition, we provide for a fixed annual percentage charge of 3.2 percent in addition to the return on HPI, to make provision for administrative, risk and profit charges.

Since our main interests in this paper are to illustrate the pricing of the new product design, test the ease with which the method proposed by Gourieroux and Lu (2014) can be implemented, and understand the impact on pricing of the additional housing data, we only illustrate one fixed percentage charge rate. As the fixed percentage charge rate increases, the breakeven NNEG increases slightly and the maximum initial loan value decreases. We have illustrated this in Andrews and Oberoi (2015) where different levels of fixed percentage charges ranging from 0.2 to 4.2 percent are shown. For this paper we have selected 3.2 percent for illustration purposes. In our opinion, if the product is efficiently administered and underwritten, this would provide a more than adequate compensation for any lender.

For the purpose of illustrating the product's pricing we use purchased data from the Land Registry, regarding house sales during the period January 1, 1995 to December 31, 2014 for post codes in the county of Kent, England, CT1 and CT2, which correspond to the Canterbury area, and ME8, which corresponds to the Medway area. The data was matched and filtered, so that only houses that were sold at least twice during the period were included. The first sale was used to determine the market price and subsequent sales could be used to determine individual house returns. This return was compared to the change in the HPI for the same period pertaining to the county of Kent, as calculated and published by the Land Registry. There is considerable variation in the monthly return on HPI, as shown in Figure 1. This approach provided a set of data points comparing actual house price increases to a broader county-wide HPI.

We also price different loan arrangements, when the full loan is made in a lump-sum upfront and when the loan is made in installments.

This data set expands on the data used in Andrews and Oberoi (2015) that is shown in Tables 5.1A and 5.1B, by including the three calendar years 2012 to 2014. The additional data added 4,563 transactions and 3,304 repeat transactions.

Since our focus for the International Actuarial Association (IAA) Colloquium in Sydney is on product design and pricing, we have selected a couple, each member age 65, who takes out a HER loan. We assume both members are in reasonable health at loan inception. We provide for the possibility of health change for each member each year. Certain changes in health state are assumed to trigger the sale of the house and the termination of the HER loan, as shown in the following tables. We assume that once a member has LTC there is no recovery.

In the base case, the states that lead to house sale and loan termination are where one member is disabled (LTC) and the other member is either disabled (LTC) or dead, or where both members are dead. This is shown in Table 1. We price an alternative case, where the house is sold on the first death, when both members are disabled (LTC), or when both members are dead. This is shown in Table 2.

This differs from the approach used in Andrews and Oberoi (2015) in which we assumed that one member of the couple was disabled, i.e., required LTC, at the time of loan origination. Thereafter we used the exit logic set out for the base case. We price this special case in this paper in order to provide comparative results to our earlier paper (Op. Cit.).

Gourieroux and Lu (2014) present an approach to derive LTC hazard and mortality rates from the underlying mortality data without reference to LTC data. For this paper we use hazard rates they derived for French male mortality. Since our purpose is to illustrate how our new product structure could be priced without access to other than mortality data, we use the rates derived by Gourieroux and Lu (2014). Effectively we are pricing a product for a couple of French males both age 65 who are taking the loan priced off the HPI for which we have data. As noted above we provide a comparison to the results in our earlier paper to show the impact of the different data. In a subsequent paper we plan to apply the methodology of Gourieroux and Lu (2014) to mortality data from the United Kingdom. Our purpose here for the IAA Colloquium in Sydney is to demonstrate that the product can be priced without access to LTC data.

We applied the approach used by Gourieroux and Lu (2014) to derive the hazard rates for the Markov model with deterministic exponential factor described in section 5.3, Appendix A.4.1, and illustrated in Figure 14 of their paper (Op. Cit.). Minor discrepancies were corrected to produce Table 3 that shows hazard rates at selected ages for the Cohort 1950.

4.0 Results

We present the results in several ways. In Tables 4.1A and 4.1B we present the results for the base case. In Tables 4.2A and 4.2B we present the results for the alternative case. Table series A and B show how the breakeven value varies by the discount rate and the level of NNEG charge, for lump sum loan and 10 year installment loan respectively.

In Tables 4.3.1A and 4.3.1B we present results for a couple both age 65 but with one member requiring LTC, using the house price index data through December 31, 2011. These results may be compared to the results from our earlier paper (Andrews and Oberoi, 2015), which are presented in Tables 4.3.2A and 4.3.2B. The differences between tables 4.3.1 and 4.3.2 show the impact of using different mortality rates and LTC incidence rates.

In Tables 4.3.3A, and 4.3.3B we present the results for a couple both age 65 but with one member requiring LTC, using the expanded house price index data through December 31, 2014. The differences between tables 4.3.1 and 4.3.3 show the impact of the expanded housing data set.

The value of the breakeven NNEG for a fixed charge in respect of administration, risk, and profit of 3.2 per cent, that is addition to the NNEG charge, and different discount rates, is shown for a lump-sum loan in the "A tables" and for a loan advanced in 10 equal installments in the "B tables". These results are discussed in the following subsections.

4.1 Base Case

In the base case we find for a lump sum loan that the breakeven NNEG charge is more than 65 basis points but less than 80 basis points annually, regardless of the discount rate. If the loan is advanced in 10 equal installments, the breakeven NNEG ranges between 22 basis points at an interest rate of 1.5 percent to 16 basis points at a discount rate of 7.5 per cent.

These levels of NNEG charge suggest that this product could be priced in a way that might increase the take-up and illustrate the pricing advantage in advancing the loan in installments rather than as a lump sum. Our concern is especially with respect to retirees for whom most of their wealth may be in their home's equity. For such a group it is likely that an installment loan would meet their retirement income requirements, and might be preferred if there were a pricing advantage.

4.2 Alternative Case

In the alternative case, where borrowers exit on the first death or when both become disabled, the expected date of exit is 16 years after loan origination, compared to 25 years in the base case. This increases the breakeven NNEG for the lump sum loan to be in the range of 140 basis points to 95 basis points, when the discount rate is between 1.2 percent and 7.5 percent respectively. For the loan in 10 equal installments, the breakeven NNEG ranges between 37 basis points at a discount rate of 1.5 percent to 19 basis points at a discount rate of 7.5 percent.

As illustrated in the next subsection, this suggests that assumptions regarding exit have a more significant impact on pricing than do the differences in mortality and morbidity rates.

4.3 Comparison to Earlier Results

We find the comparison of the breakeven NNEG charge level in Tables 4.3.1 and 4.3.2 to be very interesting. The breakeven NNEG charge is approximately 125 basis points in both cases for the lump sum loan. For the loan advanced in 10 equal installments where the NNEG charge is much smaller, the breakeven charge based on the French mortality data ranges between 40 and 25 basis points as the discount rate increases from 1.5 percent to 7.5 percent. Whereas in the published paper that combined Canadian mortality data with incidence rates from a Society of Actuaries experience report, the breakeven NNEG charge ranged from 28 basis points to 16 basis points for comparable discount rates.

This shows that the mortality and morbidity data have some impact. However, the impact appears to be relatively minor, being greater for NNEG for installment loans than for lump sum loans. Hence, it is a legitimate concern that mortality and morbidity experience may be improving and this could have an impact on product pricing. But it is not a significant impact and should not require large margins to provide for the uncertainty.

5.0 Future Research and Conclusions

Our first purpose in this paper was to illustrate the pricing of a HER product where the return on the loan is based on HPI plus a fixed percentage charge. This approach suggests that the current pricing of HER products is somewhat unfavourable to borrowers, which may explain the limited take-up of HER products. Our findings are consistent with those of Li et al. (2010) and Hosty et al. (2008) who analyse the pricing of the NNEG in a traditional product design and conclude that the pricing basis used is conservative, resulting in unattractive prices. We also illustrate how the aggregate amount borrowed can be made more favourable to the borrower through installment loans.

In future research we would like to be able to use data from a broader selection of house prices than what we have used that is based on a few post codes in Kent over a 20 year time period, January 1, 1995 to December 31, 2014, in order to be able to examine the extent to which the pricing is affected by the data in particular geographic areas. It would also be desirable to extend the data on house sales beyond 20 years, even though the data shows a clustering about the mean as the time elapsed since last sale increases, as shown in Figure 2. The manipulation and analysis of such a large data set is beyond the purposes of this paper but will be considered in future research. However, as shown in this paper, increasing the data set for an additional three years of house sales experience in the same post codes in Kent had little impact on the results.

This paper builds on our earlier paper (Andrews and Oberoi, 2015) by generalising the product to be applied to healthy borrowers, not just borrowers who require HER because of LTC needs. Moreover, we have applied the approach of Gourieroux and Lu (2014) that relies only on the availability of mortality data and has the advantage of deriving all the hazard rates from this data. Admittedly, it takes some sophisticated analysis and modelling of the basic mortality data in order to derive the hazard rates. In future research we plan to use the general methodology of Gourieroux and Lu (2014) but to conduct our own analysis and model for mortality data for the

United Kingdom to derive the hazard rates and then to re-price the product. However, the results presented here suggest that the underlying mortality and morbidity rates have only a small impact on the pricing.

The pricing of the alternative case shows that the assumption regarding exit have a much larger impact on the NNEG. The general adage is that people typically like to "age in place". If the product is designed principally as a means for retirees to unlock some of their equity while remaining in their homes for as long as possible then the base case may be more representative. It would be of interest to have data regarding the "aging-in-place" hypothesis.

Our earlier paper (Andrews and Oberoi, 2015) proposed that the NNEG risk would rest with a PPP, which would then pass this risk to the markets through a securitisation. We think that this structure holds considerable promise; however, we have not explored it in this paper and this is also an area for further research.

Like many others, such as Gourieroux and Lu (2014) we have assumed that individuals acquiring a disability do not recover. We think this is a reasonably good assumption, given that we are considering a disability to be one that results in LTC. Nonetheless, it would be interesting to explore the product pricing if this assumption were relaxed.

6.0 References

Andrews, D., and J. Oberoi, 2015. Home equity release for long-term care financing: an improved market structure and pricing approach. *Annals of Actuarial Science*, 9, 85-107.

Caplin, A., S. Chan, C. Freeman, and J. Tracy, 1997. Housing Partnerships. MIT Press. Cambridge, USA.

Fabozzi, F.J., Shiller, R.J. and Tunaru, R.S. 2012. A Pricing Framework for Real Estate Derivatives. *Journal of European Financial Management*. Vol. 18, No. 5, 762-789.

Gourieroux, C., and Y. Lu, 2014. Long-term care and longevity. Working Paper. Available at SSRN: http://ssrn.com/abstract=2347735

Hosty, G.M., Groves, S.J., Murray, C.A. and Shah, M. 2008. Pricing and Risk Capital on the Equity Release Market. *British Actuarial Journal*, Vol. 14, Issue 01, 41 – 91.

Jagger, C. 2012. *Longevity Bulletin 04*.Institute and Faculty of Actuaries. London, U.K.

Ji, M., M. Hardy, and J. S-H Li, 2012. A semi-markov multiple state model for reverse mortgage terminations. *Annals of Actuarial Science*, 6, 235-257.

Li, J.S-H., Hardy, M.R. and Tan, K.S. 2010. On Pricing and Hedging the No-Negative-Equity-Guarantee in Equity Release Mechanisms. *Journal of Risk and Insurance*. Vol. 77, Issue 2, 499-522.

Shiller, R. J., and A. N. Weiss, 2000. Moral hazard in home equity conversion. *Real Estate Economics*, 28, 1-31.

SHIP website www.ship-ltd.org/.

7.0 Tables

Table 1 Base case transitions for members X and Y

Status Beginning of Year	Status End of Year	Action
X1Y1	X1Y1	Loan continues
X1Y1	X1Y2	Loan continues
X1Y1	X1Y3	Loan continues
X2Y1	X2Y1	Loan continues
X2Y1	X2Y2	House sold; loan ends
X2Y1	X2Y3	House sold; loan ends
X3Y1	Y1	Loan continues
X3Y1	Y2	House sold; loan ends
X3Y1	Y3	House sold; loan ends
X1Y3	X1	Loan continues
X1Y3	X2	House sold; loan ends
X1Y3	X3	House sold; loan ends
X1Y2	X1Y2	Loan continues
X1Y2	X1Y3	Loan continues
X1Y2	X2Y2	House sold; loan ends
X1Y2	X3Y2	House sold; loan ends
X1Y2	X2Y3	House sold; loan ends
X1Y2	X3Y3	House sold; loan ends
X1Y1	X2Y1	Loan continues
X1Y1	X3Y1	Loan continues
X1Y1	X3Y3	House sold; loan ends
X1Y1	X2Y2	House sold; loan ends
X1Y1	X3Y2	House sold; loan ends
X1Y1	X2Y3	House sold; loan ends
X2Y1	X3Y1	Loan continues
X2Y1	X3Y2	House sold; loan ends
X2Y1	X3Y3	House sold; loan ends

Note: the states are 1 healthy, 2 disabled (LTC), 3 dead

Table 2 Alternative case transitions for members X and Y - sale when single

Status Beginning of Year	Status End of Year	Action
X1Y1	X1Y1	Loan continues
X1Y1	X1Y2	Loan continues
X1Y1	X1Y3	House sold; loan ends
X2Y1	X2Y1	Loan continues
X2Y1	X2Y2	House sold; loan ends
X2Y1	X2Y3	House sold; loan ends
X1Y2	X1Y2	Loan continues
X1Y2	X1Y3	House sold; loan ends
X1Y2	X2Y2	House sold; loan ends
X1Y2	X3Y2	House sold; loan ends
X1Y2	X2Y3	House sold; loan ends
X1Y2	X3Y3	House sold; loan ends
X1Y1	X2Y1	Loan continues
X1Y1	X3Y1	Loan continues
X1Y1	X3Y3	House sold; loan ends
X1Y1	X2Y2	House sold; loan ends
X1Y1	X3Y2	House sold; loan ends
X1Y1	X2Y3	House sold; loan ends
X2Y1	X3Y1	House sold; loan ends
X2Y1	X3Y2	House sold; loan ends
X2Y1	X3Y3	House sold; loan ends

Note: the states are 1 healthy, 2 disabled (LTC), 3 dead

Table 3 Hazard Rates Cohort 1950

Age	Probability of Death in the year	Probability of Becoming Disabled (LTC) in the year	Probability of Death in the year if disabled at beginning of year
65	0.013	0.002	0.263
70	0.015	0.004	0.297
75	0.016	0.014	0.331
80	0.018	0.023	0.365
85	0.046	0.032	0.399
90	0.073	0.041	0.433
95	0.109	0.050	0.467
100	0.146	0.059	0.501
105	0.182	0.068	0.535
110	0.218	0.077	0.569

Source: derived from Gourieroux and Lu (2014) Figure 17

Table 4.1A: Base Case Derivation of Breakeven NNEG c Based on Present Values Discounted at Rate r When Loan Paid in a Lump Sum Data Through 2014

r↓/c→	0.65%	0.80%	0.95%	1.10%	1.25%	1.40%
1.5%	-0.13	0.00	0.12	0.24	0.35	0.46
4.5%	-0.03	0.02	0.07	0.12	0.17	0.21
7.5%	-0.00	0.02	0.04	0.06	0.08	0.10

Table 4.1B: Base Case Derivation of Breakeven NNEG c Based on Present Values Discounted at Rate r When Loan Paid in 10 Equal Installments Data Through 2014

r↓/c→	0.16%	0.19%	0.22%	0.25%	0.28%	0.31%	0.34%	0.37%	0.40%
1.5%	-0.04	-0.02	0.00	0.01	0.03	0.05	0.07	0.09	0.11
4.5%	-0.01	0.00	0.00	0.01	0.02	0.03	0.03	0.04	0.05
7.5%	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.02

Table 4.2A: Alternative Case Derivation of Breakeven NNEG c Based on Present Values Discounted at Rate r When Loan Paid in a Lump Sum Data Through 2014

r↓/c→	0.65%	0.80%	0.95%	1.10%	1.25%	1.40%
1.5%	-0.24	-0.18	-0.13	-0.08	-0.03	0.02
4.5%	-0.10	-0.07	-0.04	-0.01	0.01	0.04
7.5%	-0.04	-0.02	-0.01	0.01	0.02	0.04

Table 4.2B: Alternative Case Derivation of Breakeven NNEG c Based on Present Values Discounted at Rate r When Loan Paid in 10 Equal Installments Data Through 2014

r↓/c→	0.16%	0.19%	0.22%	0.25%	0.28%	0.31%	0.34%	0.37%	0.40%
1.5%	-0.05	-0.04	-0.03	-0.03	-0.02	-0.01	-0.01	0.00	0.01
4.5%	-0.02	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.01	0.01
7.5%	-0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01

Table 4.3.1A: LTC Case Derivation of Breakeven NNEG c Based on Present Values Discounted at Rate r When Loan Paid in a Lump Sum Data Through 2011

r↓/c→	0.65%	0.80%	0.95%	1.10%	1.25%	1.40%
1.5%	-0.40	-0.30	-0.19	-0.09	0.01	0.11
4.5%	-0.14	-0.09	-0.05	-0.00	0.04	0.09
7.5%	-0.05	-0.02	-0.00	0.02	0.04	0.06

Table 4.3.1B: LTC Case Derivation of Breakeven NNEG c Based on Present Values Discounted at Rate r When Loan Paid in 10 Equal Installments Data Through 2011

r↓/c→	0.16%	0.19%	0.22%	0.25%	0.28%	0.31%	0.34%	0.37%	0.40%
1.5%	-0.12	-0.10	-0.08	-0.07	-0.05	-0.04	-0.02	-0.01	0.01
4.5%	-0.04	-0.03	-0.03	-0.02	-0.01	-0.01	0.00	0.01	0.01
7.5%	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.01	0.01	0.01

Table 4.3.2A: Previously Published Results Derivation of Breakeven NNEG c Based on Present Values Discounted at Rate r When Loan Paid in a Lump Sum Data Through 2011

							Loan
r↓/c→	0.65%	0.80%	0.95%	1.10%	1.25%	1.40%	Allowed
1.5%	-0.23	-0.17	-0.12	-0.06	-0.01	0.04	50%
4.5%	-0.10	-0.07	-0.04	-0.01	0.02	0.05	51%
7.5%	-0.04	-0.02	-0.01	0.01	0.03	0.04	53%

Table 4.3.2B: Previously Published Results Derivation of Breakeven NNEG c Based on Present Values Discounted at Rate r When Loan Paid in 10 Equal Installments Data Through 2011

										Loan
r↓/c→	0.16%	0.19%	0.22%	0.25%	0.28%	0.31%	0.34%	0.37%	0.40%	Allowed
1.5%	-0.04	-0.03	-0.02	-0.01	0.00	0.00	0.01	0.02	0.03	59%
4.5%	-0.01	-0.01	-0.01	0.00	0.00	0.01	0.01	0.02	0.02	59%
7.5%	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	59%

Table 4.3.3A: LTC Case Derivation of Breakeven NNEG c Based on Present Values Discounted at Rate r When Loan Paid in a Lump Sum Data Through 2014

r↓/c→	0.65%	0.80%	0.95%	1.10%	1.25%	1.40%
0.015	-0.33	-0.24	-0.15	-0.07	0.01	0.09
0.045	-0.11	-0.07	-0.03	0.00	0.04	0.07
0.075	-0.04	-0.02	0.00	0.02	0.04	0.05

Table 4.3.1B: LTC Case Derivation of Breakeven NNEG c Based on Present Values Discounted at Rate r When Loan Paid in 10 Equal Installments Data Through 2014

r↓/c→	0.16%	0.19%	0.22%	0.25%	0.28%	0.31%	0.34%	0.37%	0.40%
1.5%	-0.10	-0.08	-0.07	-0.06	-0.04	-0.03	-0.02	0.00	0.01
4.5%	-0.03	-0.03	-0.02	-0.02	-0.01	0.00	0.00	0.01	0.01
7.5%	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.00	0.01	0.01

Table 5.1A: Data for Repeat Transactions Through December 31, 2011: Number of Transactions by Area Code, Type and Period

Area Codes -->	CT1	CT2	ME8	Total
Total Number	5,055	4,391	9,301	***18,747***
Freehold	3,787	3,582	8,496	***15,865***
Leasehold	1,268	809	805	***2,882***
Detached	452	764	1,487	***2,703***
Semi-detached	1,464	1,561	2,993	***6,018***
Terraced	1,928	1,278	4,094	***7,300***
Flat	1,211	788	727	***2,726***
New	258	301	341	***900***
Old	4,797	4,090	8,960	***17,847***
1995-1999	1,393	1,272	3,009	***5,674***
2000-2004	1,763	1,628	3,296	***6,687***
2005-2009	1,459	1,144	2,407	***5,010***
2010-	440	347	589	***1,376***

Table 2B: Data for Repeat Transactions Through December 31, 2011: Average Price of Transactions by Area Code, Type and Period

Area Codes -->	CT1	CT2	ME8	Combined
Overall Average	140,954	151,600	124,510	***135,289***
Freehold	150,527	161,283	129,141	***141,503***
Leasehold	112,366	108,728	75,632	***101,084***
Detached	237,601	233,383	195,402	***213,194***
Semi-detached	142,313	143,236	130,289	***136,573***
Terraced	134,738	138,788	103,170	***117,743***
Flat	113,135	109,657	75,891	***102,197***
New	164,957	111,179	112,519	***127,103***
Old	139,663	154,575	124,966	***135,702***
1995-1999	70,295	78,928	68,643	***71,354***
2000-2004	136,379	145,499	123,683	***132,342***
2005-2009	192,965	217,564	181,446	***193,048***
2010-	210,522	229,150	181,872	***202,956***

Figure 1: House Price Index Returns: Monthly HPI Returns

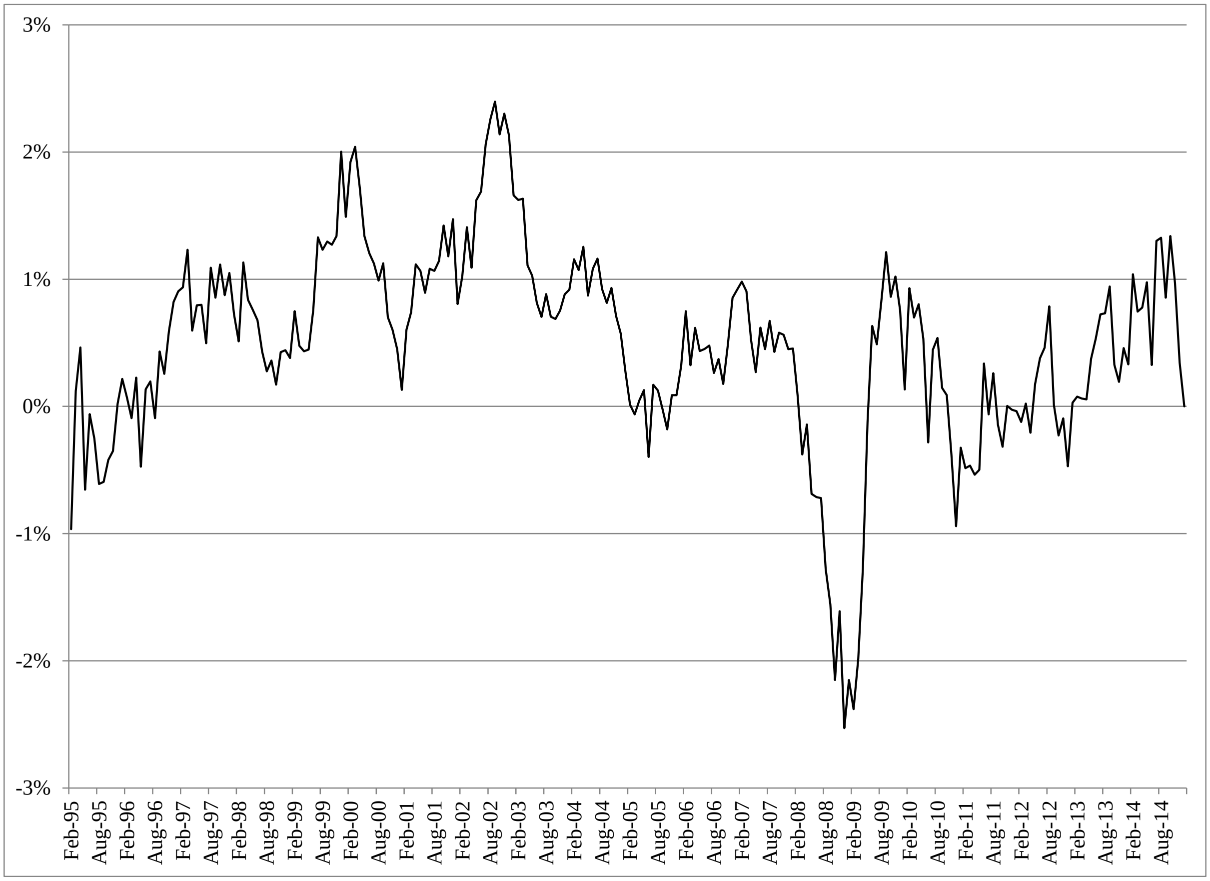

Figure 2: Annualised Return Differences by Time between Transactions