How Suitable are Equity Release Mortgages as Investments for Pension Funds?

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Introduction

An Equity Release Mortgage is a loan made to older home-owning borrower collateralized by their home

Loan repaid when borrower permanently leaves their home

In the UK, ERMs almost always embody a No-Negative Equity Guarantee (NNEG)

- amount due for repayment capped at the minimum of rolled-up loan amount and property value at the time of repayment
- NNEG involves put options granted by lender to borrower

The valuation of the NNEG guarantee boils down to how to price a put option and UK actuaries have a history of problems with option valuation

'Financial Economics Wars', e.g.

Equitable Life Fiasco

Recent controversy over NNEG valuation

Central Issue

Often claimed ERMs are a suitable asset class for pension funds e.g.

> LTMs are a good match for our long term liabilities and are an appropriate asset for annuity providers to invest in. (Just Group, 2018)

Similar statements can be found in a 2014 report by the Institute and Faculty of Actuaries Equity Release Member Interest Group, and elsewhere

We suggest that these claims are indefensible and that the ERMs are **anything but** a suitable investment for PFs

We suggest that for any investment asset to be suitable for a pension fund then it needs to meet the following criteria: (i) it should bear a reasonable return; (ii) it should function as a good hedge for an annuity book; and (iii) it should not be highly exposed to other risks to which annuity books are not

We present results to suggest that ERMs meet none of these criteria

Road Map

Years to Home Exit

ERM Valuation

Model Calibration

ERM returns

Stress Tests and Scenario Analyses

- House price stress test
- Longevity stress test
- House price scenario analysis

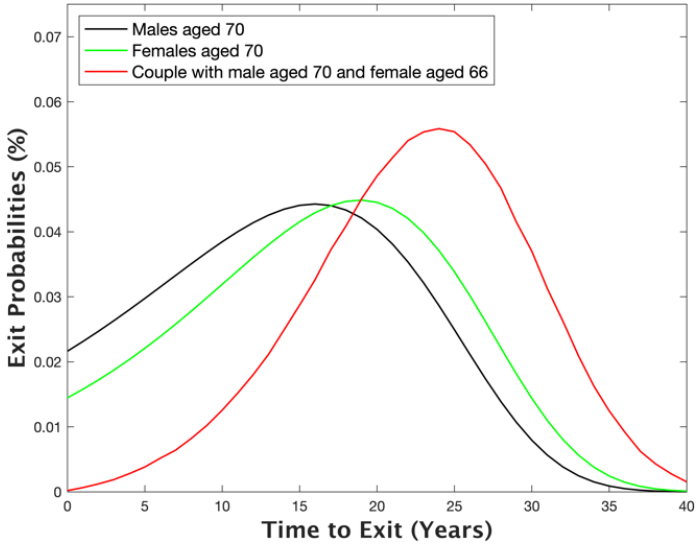
Conclusions

Years to Exit

We consider loans to a single male, a single female and a male-female couple. Excepting early repayment, ERM contract specifies that loan is repaid when borrower permanently exits their home. Assuming no prolonged stay in care, exit occurs when single borrower dies or last surviving member of couple dies.

Figure 1: Density Functions for the Years to House Exit

The expected years to exit for the couple is longer than that for single borrowers because house exit for couple occurs when second surviving member dies but house exit for a single borrower occurs after only one death



Notes: Obtained from 10,000 Monte Carlo simulations of the mortality rates using the M5-CBD stochastic mortality model (Cairns *et al.*, 2009) calibrated on Life & Longevity Markets Association death rates data for England & Wales

Years to Exit, Cont.

Table 1 gives expected years to exit for different borrowers

Table 1: Expected Years to House Exit

Borrower	Expected Years to Exit
Male aged 70	15.0
Female aged 70	17.1
Couple male aged 70, female aged 66	23.2

Male aged 70 can expect to exit in 15 years' time, etc

ERM Valuation

(1) $ERM = L - NNEG$

L is PV of a risk-free loan and given by

(2) $L = \sum_t [exit\ prob_t \times amount\ loaned \times e^{(l-r)t}]$ and

(3) $NNEG = \sum_t [exit\ prob_t \times NNEG_t]$

Each 'nneglet' $NNEG_t$ involves a put option on the value of the property in year t, struck at the rolled-up loan amount in t

$NNEG_t$ is valued using a Black '76 option pricing model (Black, 1976), where the underlying price, F_t, is the forward house price for t

(4) $F_t = Se^{(r-q)t}$

where S is spot property price and q is the deferment rate

ERM Model Calibrations

$r = 1\%$

$l = 4\%$

$q = 4.2\%$

Loan to Value ratio (LTV) follows an 'age minus 30' rule of thumb, i.e. the LTV ratio will be the difference between the borrower age and 30 divided by 100

Each 'nneglet' $NNEG_t$ has its own volatility and in principle each of these volatilities is different i.e. one should not use the same volatility parameter in each $NNEG_t$. More details in Buckner and Dowd (2020, pp. 50-63)

ERM Returns

Table 2: *ERM/Amount Loaned*

Borrower	*ERM/Amount loaned*
Male aged 70	95.3%
Female aged 70	89.9%
Couple male aged 70, female aged 66	81.5%

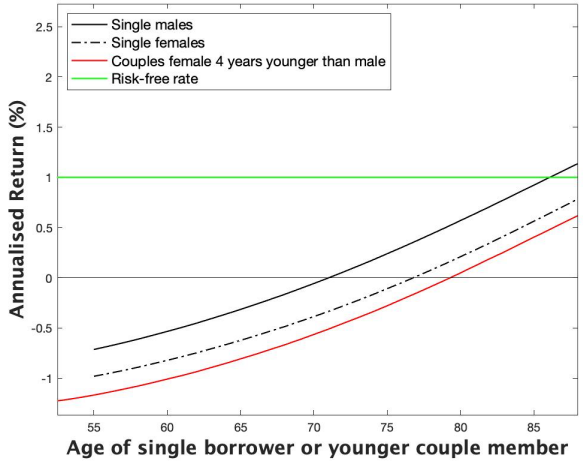
ERM/amount loaned ratio is 95.3% for a male borrower aged 70, 89.9% for a female borrower of the same age and 81.5% for a couple of the specified ages

These are very low and imply negative returns

Projected annualised returns are obtained from the projected internal rates of return on the loan

ERM Returns, Cont.

Figure 2: Projected Annualised Returns



Loans to single males have positive projected returns only for borrowers in **aged 71 or older**, those to single females have positive projected returns only for borrowers **77 or older**, and loans to couples have positive projected returns only if the younger female member is **79 or older**

Except for male borrowers older than 85, projected returns on ERM loans are **lower than the risk-free rate**

Other Points to Note

First, comparison of Figures 1 and 2 shows that a longer period to exit (or a higher longevity) is associated with a lower projected return to ERM lenders i.e. 'longevity is bad' for lenders.

Second, if there were no NNEG, then the return to an ERM would simply be $l - r = 4\% - 1\% = 3\%$. That the plots in Figure 2 are well below 3% indicates that the valuation of the NNEG has a considerable impact on ERM valuation and highlights the importance of getting the NNEG valuation model and its calibration 'right'

House Price Stress Test

Suppose house prices fall five minutes after the ERM loan has been made

Table 3 gives the impact of an alternative immediate one-off house price falls

Table 3: Impact on *ERM* of an Immediate Fall in House Prices

House Price Fall (%)	Male	Female	Couple
25	-14.2	-15.3	-44.3
50	-34.5	-36.1	-67.4

Results indicate that ERM valuations are sensitive to house prices, more so for the females than the males, and especially so for borrower couples

Longevity Stress Test

Suppose expected longevity unexpectedly increases by 3 years.

Table 4: Impact on *ERM* of An Increase in Expected Longevity

Exp. Longevity increase	Male	Female	Couple
3 years	-5.5%	-6.6%	-8.6%

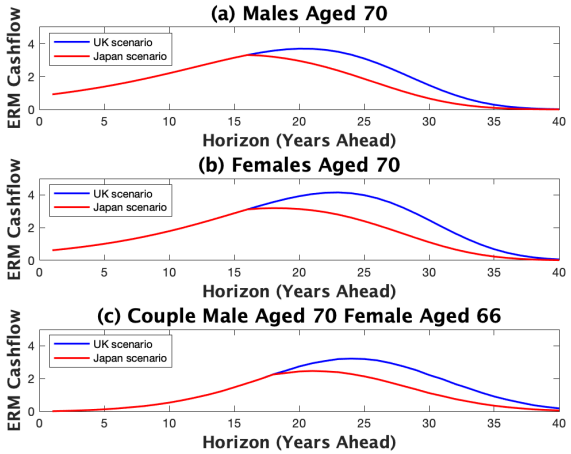
The results in Table 4 show that the longevity shock has a notable *negative* impact on ERM valuations

Consider that the principal liabilities of pension funds are their annuity books, the values of which increase with expected longevity. A hedge for an annuity book would also increase in value with expected longevity. So the fact that the values of ERMs fall with expected longevity means that they are **unsuitable assets** to use as hedges for annuity books

House Price Scenario Analysis

We can project how ERM cashflows would evolve under alternative HPI scenarios, e.g. UK over last two decades (HPI=5.8%) vs Japan since 1990 (HPI=1.7%)

Figure 3: Projected ERM Cashflows Under UK and Japanese HPI Scenarios



If investor invests in ERMs on the expectation that UK high HPI scenario will occur, investor will expect the blue CFs. If the JP scenario occurs, investor will receive lower red CFs

Investor is thus exposed to HPI risk

House Price Scenario Analysis, Cont.

Table 5: Present Values of Cashflows Under UK and JP HPI Scenarios

Scenario	Male	Female	Couple
UK PV	94.00	104.58	71.94
Japan PV	74.74	77.05	51.13
Diffference	19.26	27.53	20.81
Difference as % of UK PV	20.46	26.32	28.93

Differences between PVs under the two scenarios are 20% to 30% of the UK PVs. From the perspective of investor who expected the UK scenario to hold when the JP scenario unfolded instead, these differences are the expected cashflows that failed to materialise

ERMs *Not* Suitable Investments for Pension Funds

First, a good investment asses should bear a good return. However, our results suggest that the projected returns of ERMs are very low, and below the risk-free rate except where borrowers are in their late 70s. A pension would do better to avoid ERMs altogether and invest in government bonds instead. Indeed, the same goes for any other investor

Second, a suitable investment asset for a pension fund should be a good hedge of the annuity book's risk exposure. However, our results suggest that an ERM is not even a hedge for an annuity book, let alone a good one

Third, a good investment asset for a pension fund should not be highly exposed to other risk factors to which annuity books are not. However, the results of our stress tests and scenario analyses suggest that ERMs are heavily exposed to house price risk

ERMs do not satisfy any of these conditions and are close to being dominated by government bonds

References

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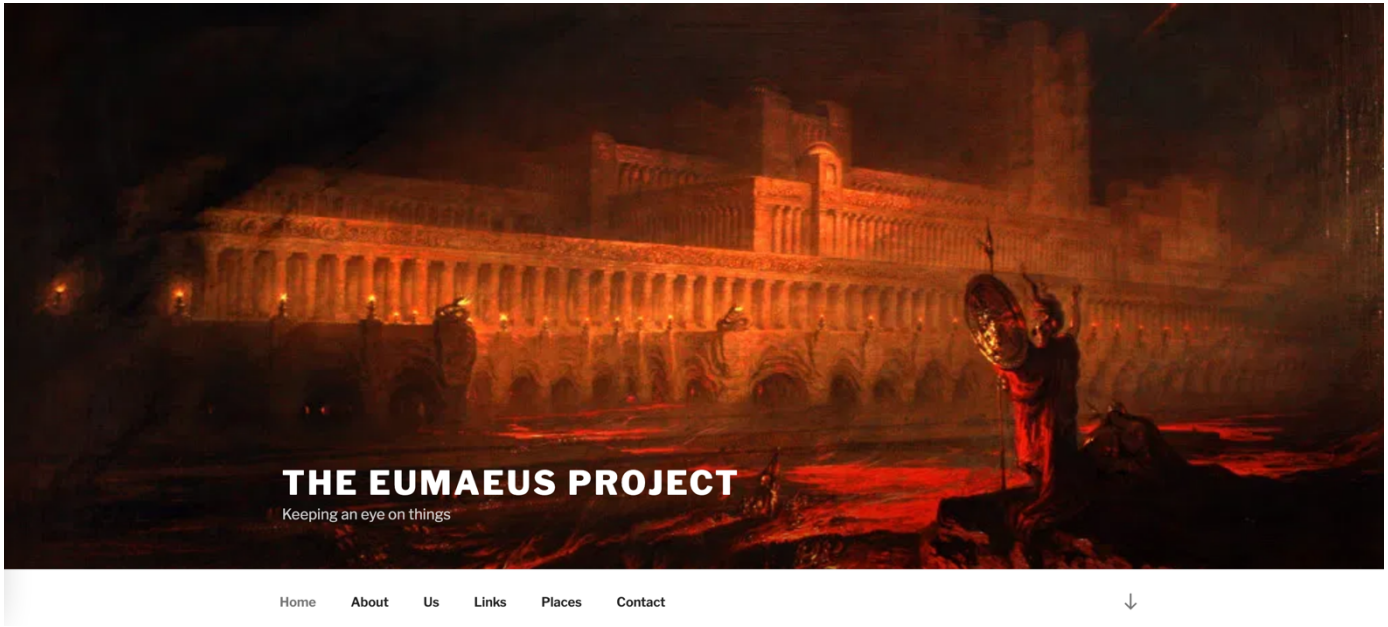
Thank You!



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