

# Equity release mortgages in the UK: the regional characteristics of demand and supply

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## Abstract

We consider the factors that affect regional variations in equity release mortgages (ERMs) in the UK. These are a growing section of the market, but with regional differences in factors that affect demand and supply.

We estimate a time series cross-sectional (TSCS) model within the simultaneous equations framework to analyse the number of ERMs (a proxy for the demand for ER debt) and the average loan-to-value ratios (LTVs), a proxy for supplied loan terms. We include variables covering demographic, demand, pricing and risk and macroeconomic factors, and regional dummies. For the number of ER loans, we find positive effects from net pension income and holiday costs, and negative effects from the average LTV levels, state benefits, first-time buyer interest rates, female life expectancy, the mortgage price differential, house price growth and GVA. For the average LTVs, there are positive effects from gross pension income, average borrower age, holiday costs, and the risk premium, as well as negative effects from the number of ERM loans, female life expectancy, and the level of real house prices. Overall, households living in southern, wealthier areas have greater access to, and take greater advantage of, ERM loans but require lower LTVs.

Our key findings are generalisable across the many countries offering similar mortgage products and so our analysis offers insights for borrowers, lenders, and regulators.

**Key words:** Equity release mortgages; no-negative equity guarantee; loan-to-value ratio; time series-cross sectional data design.

## 1. Introduction

In recent years, in the UK as in many countries, there has been increasing concern among those who are retired, or are close to retirement, that pension income and savings will not cover their financial needs in retirement. This could be due to a number of factors, including funding deficits and reforms in private and public sector pensions that have reduced the expected funds available on retirement (Lee & Shi, 2022), uncertain state pension provision, low savings rates

for most of the last decade, sharp spikes of inflation in 2022<sup>1</sup>, which have created a ‘cost of living crisis’ (BBC, 2022), and a realisation by retirees that they may live longer than they had expected. Moreover, those who have recently retired often want capital for other specific purposes: to carry out home improvements while they still have sufficient time to enjoy the consumption benefits (Murray & Dunn, 2022); to travel extensively while they are still relatively fit; or to assist family members with the purchase of their first house.

Where pension incomes and savings are inadequate, opportunities exist for homeowners<sup>2</sup> to re-mortgage their house, and remain in residence, to release the equity which has built up in the property. Homeowners are, thus, able to convert part of their fixed asset wealth into cash, realising the product of decades of house price inflation (Nationwide, 2020).<sup>3</sup> In the UK, homeowners, aged 55 or over, can apply for an equity release mortgage, more commonly known as ‘reverse mortgages’ in the USA and internationally. While some of the contractual details vary internationally, the concept is the same. There are two main types of equity release mortgage: the Lifetime Mortgage and the Home Reversion Plan, which are both regulated by the Financial Conduct Authority (FCA)<sup>4</sup>. These are explained in more detail in Section 2. Importantly, they include a no-negative equity guarantee (NNEG) and the right to the occupation of the property until the death of the borrower(s) or transfer to another property or care home, provided certain conditions are met.

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<sup>1</sup> The Consumer Prices Index (CPI) rose by 11.1% in the 12 months to October 2022, falling to a rate of 4.6% in the 12 months to October 2023 (ONS, 2022, 2023).

<sup>2</sup> In 2020 in England, 64% of the 24.7 million dwellings were owner-occupied (ONS, 2021) while in Scotland 58% of the 2.6 million dwellings were owner-occupied (Scottish Government, 2022).

<sup>3</sup> In the UK, all of the capital gain is tax free on an individual’s principal private residence.

<sup>4</sup> In addition, the Equity Release Council (ERC)<sup>4</sup>, a non-profit making organisation, seeks to ensure good practice in the market (<https://www.equityreleasecouncil.com/>).

Equity release products are available throughout the UK but there are clearly regional differences in demographic profile, life expectancy, overall economic activity, house price growth and wage growth. All of these should affect the market for equity release mortgages but little research has been undertaken on the regional variation in the demand for NNEG mortgages, as well as in the supplied ER loan terms. This paper fills that gap by empirically exploring factors influencing demand and supply of ER debt, applying two stage simultaneous equations framework and dealing with data limitations by employing time series cross sectional data design.

For the lending and regulatory market, understanding the regional variations in demand is important, as it reveals the extent to which the loan book is exposed to local economic shocks. Moreover, central government should be interested to know whether retired households, suffering financially due to the cost of living crisis, have access to the equity release market.

The remainder of this paper is structured as follows. Section 2 contains a critical review of the literature. Section 3 provides background to equity release mortgages, Section 4 outlines the research design and empirical modelling, followed by the empirical specification in Section 5. Section 6 outlines the data sources and descriptive statistics, while Section 7 discusses the results followed by the conclusion in Section 8.

## **2. Literature review**

The theoretical background to this paper is derived from the life cycle theory of consumption and savings developed by Modigliani and Brumberg (1954) and Ando and Modigliani (1963). It suggests that individuals plan their consumption over their life-cycle, accumulating funds when they are earning, by paying off their mortgage and putting aside money into pension

schemes and savings accounts, and then spending their accumulated wealth when they retire. The theory suggests that behaviour is dictated solely by utility maximisation with the underlying assumption that wealth will decline to zero by the end of life (Hurd, 1992). However, in reality, it would appear many retirees favour financial security over drawing down all of their assets, a point which will be elaborated later in this section.

An individual's total wealth is calculated as the sum of the value of liquid assets, such as savings and pensions, and illiquid assets, such as the equity built-up in their home. The latter, housing wealth, often represents a high percentage of total wealth. Taking out an equity release mortgage is in line with the life cycle theory of consumption, with built-up in-home equity being used to fund expenditure over the final stages of the life cycle.

Owners have a wide variety of possible purposes for the equity released. In a survey of the reverse mortgage market in the US, Moulton et al. (2017) list eight possible uses of the funds: to cover everyday expenses; to pay off previous mortgages; to pay off non-mortgage debt; to pay for home improvements; to pay for health and disability expenses; to provide financial help for their family; to use funds to postpone retirement (where, for example, for market value or tax reasons, it may be an inopportune time to realise pension savings); and to make a large consumer purchase. Data on the UK market from equity release advisors, Age Partnership<sup>5</sup>, suggest that 37% of the funds are used to clear debt and existing mortgages, 25% for home and garden improvements, 13% to pay for day-to-day living costs, and 12% to help family, with the balance used for high cost consumer items.

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<sup>5</sup> See: <https://www.agepartnership.co.uk>

Those who have insufficient pension provision may find that their annual income is inadequate to maintain the standard of living that they were expecting in retirement and may feel that they have no option but to use the equity in their home, even if this was not planned (Chen and Jensen, 1985), a state that could be described as ‘house rich but cash poor’ (Davidoff et al, 2017). In the UK, pension freedoms, introduced in 2015, have encouraged withdrawals from pension schemes, recorded as more than £45bn by the end of 1Q2021 (HMRC, 2021). This has raised fears of overzealous spending and concerns that there will be insufficient funds left in pension portfolios to support pensioners for the balance of their lives, thus forcing individuals to look at equity release as a source of income for day-to-day expenses.

For parents with means, wishing to cascade wealth down to their children, equity release provides the opportunity to bring forward the timing of bequests, thus potentially assisting children earlier in their lives when it is more advantageous for them, for example, at a time when they seek to enter the housing market (Haurin and Moulton, 2017).

While downsizing would also release equity, there are significant psychological and emotional frictions which prevent moving house. The evidence would suggest that older people do not wish to move home as they age and prefer to ‘age in place’ (Communities and Local Government Committee Report, 2018). Moreover, even if there is a desire to downsize, there is a distinct shortage of housing suitable for seniors. There are just under eight million households aged 65 and over in the UK. International benchmarks suggest that there should be specialist housing for around 15% (1.2 million) of these households. Recently, there were only 726,000 such homes available (Savills, 2018).

Further analysis by Savills suggests that, across the UK, 18,000 senior homes will be required each year, based on existing levels of provision and current trends in ageing. This represents more than double the level of current new annual supply (Bryant, 2016). In a report published by the RICS, McMeeken (2017, 1) states that ‘a lack of accommodation for older people is set to be the next great housing crisis. If we are to avoid it, we need a retirement-home revolution’. There is clear evidence that there is a national shortage of specialist housing for seniors (Fyfe et al., 2023) and, with households unable to find suitable alternative housing in order to downsize, this must be an important factor in the increasing interest in equity release mortgages.

However, many authors have questioned whether seniors do actually spend their savings to the extent suggested by the life cycle theory and, indeed, there is evidence of seniors saving, rather than spending all their income and capital in their later years (Danziger *et al.*, 1982, Chen & Jensen, 1985, Davidoff *et al.*, 2017, Haurin and Moulton 2017). A large number of reasons has been suggested for this, which can be summarised under five key headings: a precautionary motive; a health motive; a bequest motive; financial illiteracy; the high costs of equity release products; and the specific circumstances of the individual. These points are now considered in turn.

Life expectancy at birth in the UK from 2016 to 2018 was 79.3 years for males and 82.9 years for females, compared to 74.49 for males and 79.55 for females born between 1996 to 1998 (ONS, 2019). While the rate of improvement has slowed down over the last decade compared to the previous one, hidden behind these averages are significant regional and socioeconomic differences. In consequence, individuals are naturally concerned that they will live longer than

the average life expectancy and have inadequate funds, so may adopt a cautious approach to running down their wealth (De Nardi *et al.*, 2009, Haurin and Moulton, 2017).

Longer life expectancy brings with it the risk of increasing years of declining health and the need for funds to be set aside for medical expenses and long-term nursing home costs (Harper, 2019). It is recognised that there may be differences in outcomes across the devolved nations and regions of the UK, but keeping aside wealth for medical expenses and private nursing home provision is an active consideration and a common theme.

Some individuals may see greater utility in saving in order to pass on their wealth to their family as a bequest at the end of their life (Danziger *et al.*, 1982). However, research comparing elderly with and without children has, in general, not found a strong bequest motive (de Graff and Rouwendal, 2012) and it would appear evidence substantiating this is weak (Davidoff *et al.*, 2017).

The same authors examined the financial literacy of homeowners with respect to reverse mortgages in the US and found a lack of knowledge about both the structure of the product and of some of the potential financial benefits. Linked to this, Davidoff *et al.*, (2017) found evidence of a perception among consumers that reverse mortgages were a high-cost product that did not represent good value. While some of this lack of understanding might be due to poor communication of the features and characteristics of the product, Li *et al.*, (2013) considered whether age-related cognitive decline might impair financial decision-making, with the implication that those not familiar with mortgage products may find entering such arrangements daunting in their senior years.

Further reasons for seniors saving in later years and not taking out further debt, may be related to the specific circumstances of the individual, such as their marital status, the number of dependents, composition and fluctuating value of their other wealth assets (such as equities and bonds), the value of their own home, the adequacy of their pension provision, both private and state, and debt aversion in their senior years (Chen and Jensen, 1985). For example, those married with children are more likely to save than individuals who are single<sup>6</sup> with no dependents, as the latter only have their own circumstances to consider and are less likely to have a bequest motive.

Household savings may also occur if consumption is reduced because of physical limitations restricting the ability to leave home (Haurin and Moulton, 2017). The same authors, taking an international perspective raise the issue of whether institutional factors, such as entitlement thresholds and fiscal rules, might discourage further borrowing. For example, in the UK, extra funds made available to an individual by equity release affect their entitlement to some means-tested state benefits, as cash in hand is treated differently to non-easily accessible wealth locked in housing equity, when calculating means<sup>7</sup>. Moreover, inheritance tax rules vary between different asset classes in the UK<sup>8</sup>, with certain specific allowances related to housing assets, thus discouraging equity release.

Because of the upfront costs, suitability of the product depends to an extent on whether or not the owner intends living in their house for an extended period. Research on the US market by

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<sup>6</sup> Interestingly, households consisting of only one person have been the most common type in Scotland since 2010, mostly due to increasing numbers of older people living alone (National Records of Scotland, 2019).

<sup>7</sup>For example, in both England and Scotland, local authorities assess whether those in need of personal care at home are required to contribute to the cost of their homecare. The assessment is means-tested and the council consider the resident's income and savings but not the value of their property unless they are going into a care home.

<sup>8</sup> See Residence nil rate band for Inheritance Tax - <https://www.gov.uk/guidance/inheritance-tax-residence-nil-rate-band>

Munnell *et al.*, (2020) found that most households exhibit sufficient stability in their housing patterns to make them well suited to enter into a reverse mortgage contract. Their results show that seventy percent of households do not change residences, even over several decades as they want to age in place and move only in response to a shock, such as widowhood or long term care requirements.

It is recognised that care must be taken in comparing evidence from other countries as the institutional rules and regulations are often different to those operating in the UK, and cultural attitudes to taking on long-term debt in retirement may vary by country. A report from EY (2020) examining practice across 13 countries, highlights differences across several headings including the number of lenders, the source of funding, the requirement for customers to seek independent advice, the existence of NNEG, the youngest eligible date to take an ERM, and the potential of the market for future growth. For example, NNEG is not present in Germany and Spain but is a requirement in the UK and USA. The main source of funding is securitization in the USA and Australia, while in the UK funding is predominantly from insurance companies. In a macro sense, the growth of ERM mortgages in each country, depends on the estimated total housing wealth of individuals over 60. EY (2020) estimates that figure to be over \$3 tn in the UK and USA but less than \$1tn in, for example, Australia and Spain. A more detailed cross-country comparison of the different market characteristics is beyond the scope of this paper and will form part of future research.

Having reviewed the reasons why elderly households may find ERMS attractive, we now consider the characteristics of the products available in the UK.

### **3. Equity Release Mortgages in the UK**

There are two main types of equity release mortgage in the UK, the Lifetime Mortgage, which is the more popular, and the Home Reversion Plan. With a Lifetime Mortgage, homeowners aged 55 or over, can release a lump sum or draw down cash from the equity in their home. The borrowers still own the property and can live in the house until they die, move into long term care or permanently leave the property. There is no requirement to pay off any interest, although it is possible to do so, instead the amount borrowed plus interest is rolled forward and the amount due is repaid from the proceeds when the property is sold. The mortgages have a no negative equity guarantee (NNEG) so that, should the amount borrowed plus compound interest exceed the sale proceeds, neither the borrower nor their beneficiaries is liable for any shortfall. The homeowner remains responsible for insurance and maintenance and must seek the lender's permission if somebody else moves into the house. The mortgage can be transferred over to another property, subject again to the lender's consent.

The Home Reversion Plan is much smaller part of the market and allows the individual(s) to exchange the ownership of all or part of the property for a lump sum and effectively enter a lifetime lease, rent free. Generally, because they are living in their home rent free, the amount that the individuals receive for their property is lower than its market value.

Levels of fees vary but are around 2% to 3% of the initial amount of money borrowed, subject to a minimum fee. Interest rates are fixed for life but have jumped significantly from an average of 4% in January 2022 to 6.1% in November 2023 (Equity Release Council, 2023)<sup>9</sup>. Interest rates depend on the age of the applicant, the property value and the amount of money borrowed. Interest rates are higher for equity release mortgages compared with standard mortgages as

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<sup>9</sup>. In 2023, 64,448 active customers took out new plans, a decline of 31% year-on-year. 2023 saw total annual lending of £2.6bn, which followed a record breaking £6.2 bn in 2022 (Equity Release Council, 2024).

there is increased risk and uncertainty to the lender. As the interest rate is fixed for life on a deferred capital repayment loan, the lender takes on market interest rate risk over an uncertain period, as well as home value change risk and the risk of increased borrower longevity (Whait et al. 2019). However, these issues can be managed by setting an appropriate loan-to-value ratio (LTV).

Davidoff and Welk (2004), as referenced in De Graaf and Rouwendal (2012), also suggest that the lender takes on adverse selection and moral hazard risk, as it is likely that only those that expect to live for a long time will take out equity release. For them, there is little consequence of a fall in house value (except the level of equity remaining which could be passed onto their heirs) and the house may not be properly maintained, despite it being a requirement to do so. As with all mortgages, the lender takes security over the property and requires a robust land registration system with guaranteed title. We turn now to our approach to the research design and the empirical modelling.

#### **4. Research design and empirical modelling**

##### **4.1 Modelling Framework**

As discussed above, the key idea guiding the empirical modelling is that, at the later stage of their life, retired households may experience liquidity constraints or a need for cash. Accordingly, they face the need for additional funds which can be obtained by taking NNEG loans, which are constrained by supplied loan terms (the appropriate level of LTVs) (Chen and Jensen, 1995; Dungey *et al.*, 2018). The LTV will be restricted by lending risk considerations and by the quality and value of the collateralised house (Dawkins, 2002).

Within the current modelling framework, we consider that, in the presence of credit constraints, retirees' demand for NNEG debt is simultaneously determined with supplied loan terms, that is, the LTVs available to them at the time of borrowing decision (Philips and Yezer, 1996). Arguably, in a world of imperfect markets, the simultaneity of demanding/taking a mortgage and the level of mortgage debt arises from the interdependence (co-joint determination) of the demand for mortgage uptakes and the appropriateness of supplied LTV levels, which may be restricted in accordance with a borrower's age, house value and other lending risk considerations (Rachils and Yezer, 1993). Thus, to account for the simultaneity arising from mortgage market imperfections (such as the simultaneity in the mortgage demand and the available level of LTVs), the model takes the form of two simultaneous equations. This focuses on the formulation and estimation of two interrelated factors: the number of NNEG loan uptakes (demand for ER debt) and the average LTV levels (supplied loan terms) (Gerardi *et al.*, 2010). The explicit inclusion of interdependent variables in a system of simultaneous equations aims to deal with the imperfect nature of the mortgage market, as reflected by the inseparability of the demand for ER loans and the appropriateness of supplied LTV terms (Leece, 2004; Koblyakova *et al.*, 2022). In our model, equations (1) and (2) represent the formal structure of the model, while equations (3) and (4) represent the empirical specifications.

Applying the time series cross-sectional (TSCS) data design, the modelling explores relationships between the response variable ( $Y_{it}$ ), and a set of explanatory variables ( $X_{it}$ ) that are anticipated to be statistically significant. In equation (1), demand for ER debt (proxied as the number of the NNEG loan uptakes ( $Y_{1, it}$ )) is a function of the average LTV levels (proxy for supplied loan terms ( $Y_{2, it}$ )), and a set of the explanatory variables ( $X_{1, it}$ ), with ( $X_{1, it} \neq X_{2, it}$ ). In equation (2), the average LTVs ( $Y_{2, it}$ ) (supplied loan terms) is a function of a number of

NNEG loans ( $Y_{1,it}$ ) (demand for ER loans), and a set of the explanatory variables ( $X_{2,it}$ ), with ( $X_{2,it} \neq X_{1,it}$ ). In these equations, (i) denotes entity (region) and (t) denotes time (year), while ( $u_{it}$ ) is the individual effect of ( $i^{\text{th}}$ ) entity (idiosyncratic error) and  $\varepsilon_{it}$  is the error term. Thus:

$$Y_{1,it} = \alpha_{12}Y_{2,it} + \beta_{11} X_{1,it} + u_{1,it} + \varepsilon_{1,it} \quad (1)$$

$$Y_{2,it} = \alpha_{21}Y_{1,it} + \beta_{22} X_{2,it} + u_{2,it} + \varepsilon_{2,it} \quad (2)$$

In a two simultaneous equations model, the dependent variables are treated as endogenous when they appear as explanatory arguments in the other equation, being correlated with the error term (Heckman 2008; Heckman and Serletis, 2014). This makes the Ordinary Least Squares (OLS) regressor inconsistent, as simultaneity bias produces inconsistent results, because some of the effect of the error term is wrongly attributed to the regressors (Amemiya 1974; Hahn 2001). To resolve the endogeneity issue, the estimation must employ an alternative Two-Stage Least Squares (2SLS) estimation technique (Angrist and Kreuger 2001; Wooldridge, 2008).

#### 4.2 Estimation Features

The two stage estimation approach involves several econometric features, reflecting the specific requirements for the two simultaneous equations model, with additional features associated with the TSCS data design (Wooldridge 2002; Ebbes et al. 2011). The literature on panel data analysis emphasises that the estimation method should apply either fixed effects (FE) or random effects (RE) estimators (Arelano, 1993; Baltagi et. al., 2003; Baltagi, 2006). The Hausman (1978) test is used to determine whether an FE or an RE model is appropriate, suggesting that, if there are statistically significant differences between the FE and RE coefficients, an FE model should be used, while non-significant differences would suggest an RE model ( Hausmann, 1978). Importantly, when an RE model is appropriate, the RE estimator can have much smaller variances when compared to FE estimators, enabling slowly changing

variables to be included, while also considering both within and between entities effects (Wooldridge, 2010).

In addition, the application of 2SLS estimations requires the use of instrumental variables to replace problematic causal variables with calculated values instead of their actual values (Amemiya 1974; Angrist and Krueger 2001; Baum et al. 2007). In a panel context, a notable point here is the availability of time-variant instrumental variables, which should be highly correlated with the endogenous variable and must have zero correlation with the error term, satisfying relevance and exogeneity (validity) conditions (Stock *et al.*, 2002; Wooldridge 2002; Verbeek 2000; Stock and Yogo 2005; Baum *et al.*, 2007). The literature on the instrumental variables approach suggests sources for the selection of instruments derived from theoretical considerations, intuition and the relevance of instruments (to the endogenous variable) and exogeneity assumptions (Hahn and Hausman 2002; West *et al.*, 2009). Several tests have been proposed to check if instruments are adequately strong. In this research, the relevance of the instrumental variables was tested using the Rule of Thumb, as detailed by Staiger and Stock (1997), which suggests that instruments are adequately strong if the first stage F-statistics exceed 10 for the 2SLS estimates (Verbeek 2000; Hall *et al.*, 1996).

In addition, partial  $R^2$  measures were used to establish the robustness of the 2SLS estimates (Shea 1993, 1997). Further checks exploited the advantages of the STATA software program, applying post-estimation checks (Baum 2007). The two simultaneous equation model was identified by applying the exclusion restriction condition, that is, a necessary and sufficient condition (order condition) for the models with the one independent endogenous variable (Wooldridge, 2010; 2008). This requires that, for each equation, the number of excluded instruments should be greater than or equal to the number of endogenous variables included on

the right-hand side of the other equation (Greene 2010; Ross 2000; Gujarati and Porter 2008; Davidson and Mackinnon 1993; Chao *et al.*, 2014). Discussion on the excluded instruments and identification of the model is presented in the next section, while the first stage F-statistics and partial R<sup>2</sup> results are presented in Section 7 with the results.

## 5. Empirical specification

The empirical specifications provide the basis for the empirical testing of the interdependence between the demand for the NNEG loans (proxied by the NNEG loan uptakes) and average LTV levels (the proxy for supplied loan terms). From the regional perspective, the empirical specifications followed analyses conducted by previous researchers (Alai *et al.*, 2014; Jang *et al.*, 2022; Leece 2004; Koblyakova, et al., 2014). The demand for NNEG loans, (denoted as the Number of Loan Uptakes equation (3)); and the supplied mortgage terms (denoted as the Loan-to-Value (LTVs equation (4)). These are given by expressions:

$$\text{Log (Number of Loan Uptakes)} = F (\text{LTV, Dem, Other Demand Factors, Pricing/Risk, Macro, Region}) \quad (3)$$

*[Instrumental Variable: 5-year Lag for the Average Property Value (NNEG)]*

$$\text{LTV} = F (\text{Number of Loan Uptakes, Dem., Other Demand Factors, Pricing/Risk, Macro, Region.}) \quad (4)$$

*[Instrumental Variable: 5year Lag for the Proportion of Pension Units with Pensioners aged 75 or over].*

As explained above, in the two-equation simultaneous model, the dependent variables on the left-hand side of one equation simultaneously appear as explanatory variables on the right-hand side of the other equation, making them endogenous covariates (Maddala 1983; Wooldridge, 2008). Instrumental variables are used to instrument right-hand side endogenous variables included in the equation.

For the sake of convenience in presenting the model, we aggregated the explanatory variables into five groups. It should be noted that by applying the exclusion restriction condition, the variables included in these specifications differ across equations. Reflecting life cycle effects, the first group of variables (*Demographics*) includes demographic characteristics of households, involving average borrower age and pension incomes and benefits. The second set of variables (*Other Demand Factors*) is derived from the need for additional spending or consumption (for example, covering increases in holiday costs), bequest motives (such as the ability to help children or younger relatives obtain a mortgage, for example, proxied by the First Time Buyers Loan-to-Income ratio (FTBs LTI), or simply reflecting general economic conditions that would increase or decrease demand for further funds (for example, Gross Value Added (GVA) volume). The third set of variables (*Pricing and Risk Factors*) includes lending risks/costs of funding factors. The fourth group of variables (*Macro*) includes macroeconomic indicators, such as average house prices for owner-occupied properties, year-on-year average house price changes, the number of owner-occupied properties, and GVA. The fifth group of empirical variables (*Region*) includes regional dummies.

To deal with endogeneity issues and satisfy an exclusion restriction condition, instrumental variables are used to replace the estimated values of right-hand-side endogenous variables to remove correlation with the error term (Basmann, 1960).

That is, in equation (3), the 5-year lagged ER property value is used as an instrument for the independent endogenous variable (LTVs), which is excluded from the demand equation (Wooldridge, 2002). The lag of the average value of ER property seems to be relevant to the regressor because it affects the number of loan uptakes through the average LTVs. At the same time, the aggregate number of NNEG uptakes does not influence the lagged value of ER

property, so there are no reverse causality effects (Atlas *et al.*, 2017; Hall *et al.*, 1996; Leece, 2004; Wooldridge, 2010).

In equation (4), 5-year lags of the proportion of pension funds with over 75-year-old pensioners is used to instrument the right-hand side endogenous variable (Number of ER NNEG Loan Uptakes), which is excluded from the LTV equation (Wooldridge, 2002). The lags for the proportion of pensioner units for individuals aged 75 or over are relevant to the regressor, affecting the average ER NNEG LTVs via influencing the number of ER NNEG loan uptakes. However, ER NNEG LTVs do not affect 5-year lags for the proportion of pensioner units for individuals aged 75 and over. Therefore, there are no reverse causality effects (Bollen, 2012; Hahn and Hausman 2002; Antonakis *et al.*, 2012).

The number of instrumental variables involved in the estimation process follows the identification rule, being equal to the number of right-hand side endogenous variables (Angrist and Krueger, 2001). This strategy satisfies the order condition, which is necessary and sufficient for the identification of the two-simultaneous equation model, suggesting that the equations are perfectly identified (Wooldridge, 2010; Hall *et al.*, 1996; Hahn and Hausman, 2002).

## **6 Data sources and descriptive statistics**

Information on NNEG mortgage loans is limited in the UK. This study fills the data gap. It constructs a research data file by extracting (and merging) data from a range of reliable sources, including the Product Sales Data Base (PSD) collected by the Financial Conduct Authority (FCA), UK Equity Release Council Statistics, Council of Mortgage Lenders Dataset, ONS, Department for Work and Pensions Statistics Dataset, Regulated Mortgage Survey Data, and the Bank of England (BoE) statistical database.

The primary source is Equity Release Council data that covers NNEG mortgages originated in the UK at both national and regional levels. The period of interest for the current study covers 2009-2019, years of economic changes and growing demand for the NNEG loans but excluding the disruptions caused by COVID-19. At the regional level, the Equity Release Council data includes information on the number of NNEG loan uptakes, average LTVs, average value of a loan, average ER property values, average borrower age, region of residence, information on average borrower age and pricing factors.

The second main data source is the PSD (FCA) dataset, which provides information on various mortgage products/mortgage rates by borrower age characteristics and LTV bands, disaggregated at the regional level from 2014 onward. Before 2014, similar observations were extracted from the statistical database of the Council of Mortgage Lenders (2009-2013). Data on BoE rates and the 10-year Government Securities yield (the reference rates) were taken from the BoE Data Archive. These datasets allowed us to calculate risk premiums/profitability margins for the NNEG loans, taken as the difference between the average NNEG rates and corresponding reference rates (Schaaf, 1966; Cruz-Garcia *et al.*, 2019).

To measure house price appreciation, we use year-on-year changes in average nominal prices for owner-occupier properties at the regional level (ONS, 2022). Information on average nominal house prices and average loan-to-income ratios for first-time buyers (by region) have been taken from the Mortgage Regulated Survey and ONS databases, respectively. Data on Gross Value Added (chained volume for all industries), life expectancy rates, and holiday package costs come from the ONS, while information on pension incomes and pension benefits comes from the Department for Work and Pensions Statistics. The time series cross-sectional

design involves 12 UK regions observed from 2009 to 2019 years. The nomenclature and descriptive statistics of the key variables involved in the estimation process are presented in Table 1 below.

**INSERT Table 1. Nomenclature of the Key Variables and Descriptive Statistics**

## **7. Results**

### **7.1 Overview**

To investigate which factors drive or restrict the NNEG mortgage sector in UK nations and regions, the econometric specifications include a combination of demand, demographic, pricing, risk, and macro factors at the regional level. It is considered that the number of NNEG loan uptakes and LTV levels are jointly determined and driven by interrelated factors. A distinctive feature of this analysis is the inclusion of regional dummies (within the TSCS data design) to evaluate those locational effects in the NNEG mortgage sector.

Table 2 presents the results for the demand for the NNEG Loans (equation 3), measured as the Log of the Number of NNEG Loan Uptakes). The Hausmann (1978) test results (establishing whether an FE or RE estimator should be employed) show a p-value of 0.9712, suggesting an RE estimator (Baltagi and Li 2004; Clark and Linzer, 2015). Within the context of the TSCS data design, and for the consistency of the results, the estimation procedure uses both the 2SLS RE and Baltagi's 2SLS error-component (EC) RE effects instrumental variable (IV) estimation techniques (Baltagi and Baltagi, 2021; Wooldridge, 2008).

**INSERT Table 2. Number of NNEG Loans (Equation (3))**

7.2 The number of ER NNEG loan uptakes (demand for NNEG debt) (Equation (3)).

In the ER NNEG loan uptakes equation (3), a negative sign for the ER average loan-to-value ratio (LTV) may indicate an elderly person's risk aversion, the effect of higher ER loan costs (for higher LTVs), and house price risk considerations (Sharma *et al.*, 2022).

The estimated coefficient for the net pension income (proxied by the couples' net pension income after housing costs) is positive, possibly showing the desire of higher-income retirees to maintain a certain style of life and consumption levels (Redfoot *et al.*, 2007). Positive coefficients may also reflect that higher-income households may live in a better/bigger (less risky for a lender) home, thus being able to access more attractive options while releasing housing equity funds (Fisher *et al.*, 2007; Lords, 2013).

A higher level of state benefits (proxied by the average pension income benefits, singles) negatively affects the number of NNEG equity releases. An explanation may be that, for poorer retirees, receiving benefits is an important source of income, while any income or capital raised through an equity release product could negatively affect entitlement to means-tested state support (Terry and Gibson, 2006). Another explanation may be that homeowners with the lowest incomes are likely to possess low value properties, implying those in the greatest need for equity release may not have access to housing equity funds, as they cannot meet lending underwriting criteria (Morris, 2005).

The estimated coefficient for better accessibility to mortgage funds by younger households (proxied by average loan to income ratios for the first-time buyers (FTB LTIs)) negatively affects aggregate demand for the NNEG loan arrangements, perhaps indicating that, when

lending conditions for the FTBs are relaxed, an elderly person's bequest motive to help relatives or friends to get on to the property ladder declines (Leece, 2004, Mitchell and Pigott, 2004).

As expected, changes in current consumption prices (proxied by year-on-year changes in holiday package costs) increase demand for the NNEG funds, while a better economic environment (proxied by gross value added (GVA) volume) suppresses the need for extracting the additional capital funds (Calza *et al.*, 2009).

However, attempts to include changes in energy costs or increases in health-related expenses did not produce statistically significant results, confirming that housing equity funds may be needed for maintaining a certain quality of life and suggesting that NNEG funds are more likely to be used for holidays and similar consumption for lifetime enjoyment.

Reflecting life stage effects, an increase in average borrowers' age reflects life stage and demographic effects, showing positive effects upon demand for equity release funds (Huan and Mahoney, 2002). The mortgage price differential (proxied as the difference between the average equity release rate and the standard variable rate), has a negative effect (reflecting high NNEG mortgage pricing levels), as would meet the expectations.

House price dynamics (proxied as the annual change in average house prices) also have a negative effect. It is possible that borrowers perceive recent changes in house prices as a sign of further future price appreciation. As a result, they may choose to wait until prices will increase to withdraw higher equity amounts. Long-term price growth, such as in the southern regions, is associated with high current values, which are featured in the LTV equation. An

increase in the number of owner-occupied properties positively affects the number of NNEG loan uptakes. This shows that a higher level of owner-occupied properties increases the demand for ER funds, resulting in a larger number of eligible households for ER, while also controlling for regional size.

The regional dummies account for both national and regional effects, highlighting substantial variations among UK regions. The demand for NNEG loans is significantly lower for residents in Wales and Northern Ireland and significantly higher in London and the South East. It could be that in areas with higher house prices, there is a greater demand for NNEG funds. This is because households have more equity to release, even at lower LTVs in areas with high house price growth. This ultimately helps in reducing loan costs.

### **INSERT Table 3. NNEG LTV (Equation (4))**

Table 3 presents the results reflecting the supply of the NNEG Loans, proxied by the average NNEG LTVs.

#### **7.3 LTV (supplied mortgage terms) (Equation (4))**

In the average ER NNEG LTVs equation (4), an increase in the number of ER NNEG loans results in lower LTV levels, possibly reflecting lenders' risk management policies and house price risk considerations.

Results also show that higher gross pension income increases the LTV. This may reflect a tendency for those with higher incomes to wish to maintain high levels of consumption and better quality of life. Older age also has a positive effect on the LTV. Lender appetite for better matching the risk profile (by lending more to the older borrowers) and lower charges of risks

(for borrowers) may explain this positive age effect. These results may also reveal the need to release funds for adapting homes for the special needs of the elderly, addressing pension shortfalls at the later stage of the retirees' life (FCA, 2017). Further, in line with the above, changes in package holiday costs positively affect the size of LTV for the NNEG loan, compared to non-significant results for energy costs and other associated expenses.

As expected, an increase in life expectancy rates negatively affects the level of housing equity (relative to the value of a house) being released, thus reflecting a lender tendency to consider higher loan maturity risks, related to a possibility of that homeowner remaining in permanent occupancy longer than anticipated, and the likelihood of loan balance exceeding the equity part (Mitchell and Piggot, 2003).

A higher lender risk premium (proxied by the difference between the average NNEG mortgage rate and the reference rate (10 years Government Security Yield), positively affects the average NNEG LTV levels, capturing lender risk appetite (Hosty *et al.*, 2008).

An increase in real house prices dampens LTV levels, possibly reflecting borrower expectations for future price appreciation resulting in the possibility of better deals while borrowing against value of a house (Chen and Thompson, 2010)<sup>10</sup>.

The estimated coefficients for the regional dummies reflect regional variations within the NNEG market. The coefficients for the average LTV levels show positive signs for Scotland and the Northern parts of the country, suggesting that higher LTVs may be demanded and

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<sup>10</sup> We also considered the impact on the number of NNEGs and on LTV of a one standard deviation change in each of the independent variables. The impacts are relatively small, from a decline of 100 to an increase of 1,920 in the number of NNEG loans equation, and from a decline of 6.04% to an increase of 1.16% in the LTV equation.

available in regions with lower house prices, and are available as the loan amounts may be lower in comparison to higher house price areas. Taken with the results for the regional dummies for the number of NNEGs equation, this suggests that richer areas have more NNEGs with lower LTVs. This is consistent with the nature of the housing markets in the nations and regions – richer southern areas have high-value properties and wealthy occupants, more able to access NNEGs but, because of their wealth and house values, accepting a lower LTV, thus reducing associated with house prices lending risks.

These results correspond with the findings from the number of ER NNEG loan uptakes (equation 3), showing greater demand for the NNEG funds and lower ER LTVs (less risky for a lender supply terms) within the central and southern parts of the UK. Overall, it seems that the ER market is characterised by a broad north-south divide, implying regional inequality in access to the ER NNEG funds.

## **8. Conclusion**

This paper has contributed to the analysis of equity release (ER) loans, which are a growing section of the UK mortgage market, and an important financial vehicle internationally. In the UK, ERMs typically come with a no-negative equity guarantee (NNEG). There are important regional differences in the demographic profile, including variations in life expectancy rates, levels and types of economic activity, and levels and growth in wages and house prices, all of which should affect the demand for and supply of equity release mortgages. Accordingly, our interest has been regional variations in the UK market.

We have contributed to the literature in terms of data construction, methods and empirical understanding of the dynamics of the regional markets. We have constructed a database from a wide range of sources, including extracted from the Product Sales Data Base (PSD) collected by the Financial Conduct Authority (FCA), UK Equity Release Council Statistics, Council of Mortgage Lenders Dataset, ONS, Department for Work and Pensions Statistics Dataset, European Mortgage Federation Statistics, Regulated Mortgage Survey Data, and the BoE statistical database.

We have applied two simultaneous equations modelling framework, detecting the market imperfections reflected by the interdependence of the number of NNEG loans and average LTVs. For the former, we found positive effects from net pension income and holiday costs and negative effects from the average LTV, state benefits, first-time buyer lending terms, female life expectancy rates, the mortgage price differential, house price growth and GVA. Similarly, the average LTV was affected positively by gross pension income, average borrower age, holiday costs, and the NNEG risk premium, and negatively by the number of NNEG loans, female life expectancy, and the level of real house prices. These all have plausible economic, financial or behavioural explanations.

We also found pronounced north-south differences linked to regional economies and associated housing markets, which is a familiar feature of the economic geography of the UK. In summary, pensioner households living in southern, wealthier areas had greater access to, and took greater advantage of, NNEG loans, but required lower LTVs.

Such analysis is important for borrowers, lenders and regulators. It offers insights into the exposure of the loan books to economic shocks, and into access by elderly households, suffering financially, to the equity release market.

**Table 1: Nomenclature of the Key Variables and Descriptive Statistics**

Name of variables	Definition of variables	Avg. (S.D.)
Log Number NNEG Loans	Log of Number of the NNEG Loans Uptakes (thousands)	3.2385 (0.3761)
Av. LTV	Average NNEG LTV (%)	25.60 (2.986)
Net Pension Income, couples	Net Average Weekly Pension Income (after housing costs), couples (pounds)	507.46 (69.201)
Gross Pension Income, couples	Gross Average Weekly Pension Income, couples (pounds)	649.22 (101.33)
Av benefit PI, singles	Average weekly benefit Pension Income, weekly, singles (pounds)	184.05 (15.111)
Borrowers Age	Average NNEG Borrowers Age (years)	70.43 (1.599)
Av FTB LTI	Av. First Time Buyers Loan to Income Ratio (FTB LTI), (multiplier)	2.988 (0.338)
Changes in Holidays Package Costs	Year on Year Change in the Holidays Package costs (%)	3.136 (1.8471)
GVA Chained Volume	GVA Chained Volume, (thousands)	150168 (102438)
Real Av HP	Average House Prices, Nominal (thousands)	142.479 (58.960)
Life Expectancy rates, females	Life Expectancy Rates, Females (years)	82.815 (1.8358)
Av. Value of NNEG Property	Av. Value of NNEG Property, (thousands)	233.736 (100.014)
NNEG Risk Premiums	Spread between the average NNEG Mortgage Rate and corresponding Reference Rates (10-year Gov. Securities yield) (%)	5.1018 (0.4991)
Mortgage Price Differentials	Difference between the Average ER and Standard Variable Mortgage Rate (%)	2.068 (1.003)
Number of O/O Properties	Number of O/O Properties (thousands)	1500.6 (543.93)
Dwelling O/O Stock	Dwelling O/O Stock (%)	64.507 (5.434)

**Table 2. Equation 3, Dependent Variable - Log Number of ER NNEG Loan Uptakes.**

Independent Variables	2 SLS RE Estimator		Baltagi EC 2SLS RE Estimator	
	Coefficient	t-value	Coefficient	t-value
<u>Endogenous Variable</u>				
Av. NNEG LTV	-0.0510***	-6.71	-0.0463***	-4.75
<u>Demographic Factors</u>				
Net Pension Income, after housing costs, couples, weekly.	0.0019***	7.18	0.0013***	5.12
Av benefit PI, (weekly), singles	-0.0251***	-4.27	-0.0143***	-2.94
Av. Borrowers Age	0.0519***	2.15	0.0742***	3.56
<u>Other Demand Factors</u>				
Av FTB LTI	-0.0127***	-6.93	-0.0211***	-8.15
Holidays Package Costs (year-on-year change)	0.0296***	3.17	0.0321***	4.08
GVA Chained Volume	-0.013***	-4.75	-0.0091***	-6.15
<u>Pricing/Risk Factors</u>				
Mortgage Price Differential	-0.252***	-5.95	-0.345***	-3.98
<u>Macro Factors</u>				

Annual Change in Av. HP	-0.0152***	-3.78	-0.016***	-2.24
Number of O/O Properties	0.0041***	6.53	0.0025***	8.14
<u>Region</u>				
NE	Omitted		Omitted	
NW	n/sig	n/sig	n/sig	n/sig
Y&H	0.0712***	5.11	0.0843**	4.78
EM	0.0121***	4.15	-0.0179***	-3.14
WM	n/sig	n/sig	n/sig	n/sig
EA	0.0235***	2.44	0.0124***	2.15
London	0.0433***	3.57	0.0534***	2.96
SE	0.0564***	6.52	0.0328***	4.94
SW	n/sig	n/sig	n/sig	n/sig
Wales	-0.0281***	-2.54	-0.0301***	-1.99
Scotland	0.072***	3.19	0.0591***	4.18
NI	-0.0562**	-14.12***	-0.0384***	-12.28
R <sup>2</sup> (within)	0.6590		0.4911	
R <sup>2</sup> (between)	0.4790		0.5320	
R <sup>2</sup> (overall)	0.4987		0.5109	
Sigma_u	0.62967515		0.715413	
Sigma_e	0.34853162		0.316205	

rho	0.76547785	0.693812
Number of observations	124	124

Robust standard errors in parentheses p<0.05\*\*\*, p<0.1\*\*

First-stage F-statistics is > 145.3.

Partial R<sup>2</sup> of the excluded instrument is 0.312 and 0.404, respectively

Instrumented: right-hand side endogenous variable (Av. LTV) by the 5-year Lag of average ER NNEG Property Value.

The Variance Inflation Factor (VIF) is less than 2.1 for all variables, and the tolerance is 0.74.

**Table 3. Equation 4, Dependent Variable - Average ER NNEG LTVs.**

	Dep. Variable Number of NNEG Loans		Dep. Variable Av. NNEG LTVs	
	Coefficient	t-value	Coefficient	t-value
<u>Endogenous Variable</u>				
Log Number NNEG Loans	-0.6346***	-4.08	-0.395***	-3.73
<u>Demographic Factors</u>				
Net Pension Income, after housing costs, couples, weekly.	Non/sig	Non/sig	Non/sig	Non/sig
Gross pension Income	0.365***	5.81	0.323***	3.98
Av. Borrowers Age	0.531***	3.86	0.481***	4.54
<u>Other Demand Factors</u>				
Holidays Package Costs (year on year change)	0.314***	43.89	0.285***	2.95
<u>Pricing Risk Factors</u>				
Life Expectancy rates, females	-0.327***	-4.08	-0.231***	-2.44
Mortgage Price Differential	Non/sig	Non/sig	Non/sig	Non/sig
NNEG Risk Premium	1.385***	4.85	1.256***	3.99
<u>Macro Factors</u>				
Real Av. House Prices	-0.165***	-5.92	-0.178***	-6.28

<u>Region</u>				
NE	Omitted	Omitted	Omitted	Omitted
NW	0.671***	2.68	0.891***	1.99
Y&H	0.275***	2.53	0.392**	1.75
EM	0.831***	2.87	-0.798***	-2.14
WM	-0.853***	-2.46	-0.789***	-3.11
EA	-1.493***	-1.92	-1.242**	-1.98
London	-1.985***	-5.62	-2.017***	-4.26
SE	-5.132***	-3.18	-4.012***	-2.67
SW	-3.724***	-3.36	-3.115***	-3.22
Wales	n/sig	n/sig	n/sig	n/sig
Scotland	0.577***	4.71	0.691***	3.47
NI	-3.184	-2.56	-3.568**	-1.87
R <sup>2</sup> (within)	0.4152		0.4724	
R <sup>2</sup> (between)	0.5950		0.5180	
R <sup>2</sup> (overall)	0.4888		0.5478	
Sigma_u	1.911425		1.915318	
Sigma_e	2.18688		2.296512	
rho	0.58344		0.532861	
Number of observations	124		124	

Robust standard errors in parentheses  $p < 0.05^{***}$ ,  $p < 0.1^{**}$

First-stage F-statistics is  $> 240.5$ .

Partial  $R^2$  of the excluded instruments are 0.312 and 0.404.

Instrumented: right-hand side endogenous variable (Number of NNEG Loans) instrumented by the 5-year Lag of the proportion of pension units with pensioners 75 years of age and older.

The variance Inflation Factor (VIF) is less than 2.1 for all variables, and the tolerance is 0.81.

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## Appendix

### **Regional Lending 2023**

Data from Key (2024), on equity release lending in 2023 reveals that large regions, including London, South East and South West accounted for over 54% of all lending. The average loan to value ratio across the UK was 20%, with a high of 24% in Scotland and a low of 18% in the South East. While the average property value was £364,586, there was a wide range of values by region, with the most expensive region being London at £716,799, followed by the South East at £450,706 and South West at £403,576. Northern Ireland was the region with the lowest average house price at £216,201, with the North East at £219,081. Customer average age was fairly consistent at around 72, except for Northern Ireland where it fell to 67.

## Regional Analysis of ERM take up in 2023.

Region	Value of Plans	% of market	No of plans	Average Release Amount	Average Loan-to Value	Average Property Value	Average Customer Age
East Anglia	£99,183,604	4.65%	1,705	£58,185	19%	£309,491	72
East Midlands	£148,561,833	6.97%	2,462	£60,352	20%	£297,014	72
London	£404,614,631	18.98%	2,652	£152,552	21%	£716,799	73
North East	£44,811,745	2.10%	918	£48,821	22%	£219,081	71
North West	£175,098,632	8.21%	3,099	£56,496	22%	£262,559	72
Northern Ireland	£15,223,045	0.71%	310	£49,117	23%	£216,201	67
Scotland	£122,357,602	5.74%	2,074	£58,991	24%	£243,988	71
South East	£500,661,570	23.48%	6,103	£82,031	18%	£450,706	72
South West	£249,968,732	11.73%	3,213	£77,809	19%	£403,576	73
Wales	£89,639,703	4.20%	1,579	£56,753	21%	£271,381	71
West Midlands	£155,366,575	7.29%	2,426	£64,047	22%	£291,364	71
Yorkshire & Humberside	£126,422,372	5.93%	2,211	£57,172	23%	£249,687	72
<b>Total</b>	<b>£2,131,910,045</b>		<b>28,752</b>	<b>UK Average £74,148</b>	<b>20%</b>	<b>£364,586</b>	<b>72</b>

Source: Key (2024)