

Equity Release Mortgages in the UK: Regional Characteristics of Demand and Supply

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We consider the factors that affect regional variations in equity release mortgages (ERMs) in the United Kingdom (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 a simultaneous equation framework to analyse the number of ERMs (a proxy for the demand for ER debt) and the average loan-to-value (LTV) ratios, a proxy for supplied loan terms. We include variables that cover demographics, demand, pricing, risk, 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 ratio levels, state benefits, first-time buyer interest rates, female life expectancy, mortgage price differential, house price growth and gross value added (GVA). For the average LTV ratios, 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 who are living in southern, wealthier areas have greater access to, and take greater advantage of, ERM loans but require lower LTV ratios. Our key findings are generalisable across the many countries that offer similar mortgage products and so our analysis offers insights for borrowers, lenders, and regulators.

Keywords

Equity release mortgages, No-negative equity guarantee, Loan-to-value ratio, Time series-cross sectional data design.

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1. Introduction

In recent years, in the United Kingdom (UK) as in many countries, there has been increasing concern among those who are retired, or 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 and Shi, 2022), uncertain state pension provision, low savings rates for most of the last decade, sharp spikes of inflation in 2022¹, which have created a ‘cost of living crisis’ (Buchanan et al., 2022), and the realisation of 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 and Dunn, 2022); travel extensively while they are still relatively fit; or assist family members with the purchase of their first house.

Where pension incomes and savings are inadequate, opportunities exist for homeowners² to re-mortgage their house, and remain in residence, to release the equity which has built up in their property. Homeowners are, thus, able to convert part of their fixed asset wealth into cash, thus realising the product of decades of house price inflation (Nationwide, 2020).³ In the UK, homeowners who are 55 years or older can apply for an equity release mortgage (ERM), more commonly known as ‘reverse mortgages’ in the United States (USA) and internationally. While some of the contractual details vary internationally, the concept is the same. There are two main types of ERMs: the lifetime mortgage and the home reversion plan, which are both regulated by the Financial Conduct Authority (FCA)⁴. These are explained in more detail in Section 2. More 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 that certain conditions are met.

Equity release products are available throughout the UK but there are clearly regional differences in demographic profile, life expectancy, overall economic activity, and house price and wage growth. All of these should affect the market for ERMs 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.

¹ The consumer price 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 (Office for National Statistics, 2022, 2023).

² In 2020 in England, 64% of the 24.7 million dwellings were owner-occupied (Office for National Statistics, 2021) while in Scotland 58% of the 2.6 million dwellings were owner-occupied (Scottish Government, 2022).

³ In the UK, all capital gains are tax free on principal private residences.

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

This paper fills that gap by empirically exploring factors that influence the demand and supply of ER debt by applying a two stage simultaneous equation framework and dealing with data limitations by employing a time series cross sectional (TSCS) 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 governments should be interested to know whether retired households, who are 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 the background to ERMs, Section 4 outlines the research design and empirical modelling, followed by the empirical specifications 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). The theory 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 this 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.

The total wealth of an individual is calculated as the sum of the value of his/her liquid assets, such as savings and pensions, and illiquid assets, such as the equity built-up in his/her home. The latter, housing wealth, often represents a high percentage of total wealth. Taking out an ERM is in line with the life cycle theory of consumption, with built-up in-home equity being used to fund expenditures 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 USA, Moulton et al. (2017) list eight possible uses of the funds: to cover everyday expenses; pay off previous mortgages and non-mortgage debt; pay for home improvements and health and disability expenses; provide financial help to their family; use the funds to postpone retirement (where, for example, for market value or tax reasons, it

may be an inopportune time to realise pension savings); and make a large consumer purchase. Data on the UK market from equity release advisors, Age Partnership⁵, 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.

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 £45 bn (62 bn USD) at the end of 1Q2021 (HM Revenue & Customs, 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 life, thus forcing individuals to look at equity release as a source of income for day-to-day expenses.

For parents with means who wish 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 life 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 suggests 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 (2018) 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 Royal Institution of Chartered Surveyors (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.,

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

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 ERMs.

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 who save, rather than spend all their income and capital in their later years (Danziger et al., 1982, Chen and Jensen, 1985, Davidoff et al., 2017, Haurin and Moulton 2017). Many reasons have been suggested for this, which can be summarised under five key headings: a precautionary, health or bequest motive; financial illiteracy; the high costs of equity release products; and 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 (Office for National Statistics, 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 they 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 that compares the elderly with and without children has, in general, not found a strong bequest motive (Rouwendal and de Graff, 2012) and it would appear that substantiating evidence is weak (Davidoff et al., 2017).

The same authors examine the financial literacy of homeowners with respect to reverse mortgages in the US and find a lack of knowledge about both the structure of the product and some of the potential financial benefits. Linked to this, Davidoff et al. (2017) find evidence of a perception among consumers that reverse mortgages are a high-cost product that does 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) consider whether age-related cognitive decline might impair financial decision-making, with the implication that those who are not familiar with mortgage products may find entering such arrangements daunting in their senior years.

Further reasons for seniors who save in their later years and refrain from taking out further debt may be related to the specific circumstances of the individual, such as his/her marital status, the number of dependents, composition and fluctuating value of his/her other wealth assets (such as equities and bonds), the value of his/her own home, adequacy of his/her pension provision (both private and state), and debt aversion in his/her senior years (Chen and Jensen, 1985). For example, those married with children are more likely to save than individuals who are single⁶ with no dependents, as the latter only have their own circumstances to consider and are less likely to have a bequest motive.

Haurin and Moulton (2017) state that household savings may also occur if consumption is reduced because of physical limitations that restrict the ability to leave home. 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, extra funds made available to an individual in the UK by equity release affect his/her 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 means⁷. Moreover, inheritance tax rules vary between different asset classes in the UK⁸, with certain specific allowances related to housing assets, thus discouraging equity release.

The suitability of the product depends to an extent on whether the owner intends to live in his/her house for an extended period because of the upfront costs. Research on the US market by Munnell et al. (2020) has found that most households exhibit sufficient stability in their housing patterns to make them well suited to enter into a reverse mortgage contract. The results in Munnell et al. (2020) show that seventy percent of households do not change residence, 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 from those that are operating in the UK, and cultural attitudes to taking on long-term debt in retirement may vary by country. A report from EY (2020) that examines practices across 13 countries highlights differences across several headings including the number of lenders, source of funding, requirement for customers

⁶ Interestingly, households that consist of only one person have been the most common type in Scotland since 2010, mostly due to increasing numbers of older people who are living alone (National Records of Scotland, 2019).

⁷For 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 considers the income and savings of the resident, but not the value of his/her property unless he/she is going into a care home.

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

to seek independent advice, existence of NNEG, youngest eligible date to take an ERM, and potential of the market for future growth. For example, NNEG is not found in Germany and Spain but is a requirement in the UK and USA. The main source of funding is securitisation in the USA and Australia, while funding in the UK is predominantly from insurance companies. In a macro sense, the growth of ERMs 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 ERMs 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 an NNEG so that should the amount borrowed plus compound interest exceed the sale proceeds, neither the borrower nor his/her beneficiaries are liable for any shortfall. The homeowner remains responsible for insurance and maintenance and must seek the permission of the lender if somebody else moves into the house. The mortgage can be transferred over to another property, subject again to the consent of the lender.

The home reversion plan is a much smaller part of the market and allows the individual(s) to exchange 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.

The 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)⁹. Interest rates depend on the age of the applicant, property value and amount of money borrowed. Interest rates are higher for ERMs compared with standard mortgages as 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 of time, as well as risk of changes to the home value and increased borrower longevity (Whait et al. 2019). However, these issues can be managed by setting an appropriate loan-to-value (LTV) ratio.

Davidoff and Welk (2004), as referenced in Rouwendal de Graff (2012), also suggest that the lender takes on adverse selection and moral hazard risk, as it is likely that only those who 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 requirements for this to be done. As with all mortgages, the lender takes security over the property and requires a robust land registration system with a guaranteed title. We now turn to our approach to the research design and empirical modelling.

4. Research Design and Empirical Modelling

4.1 Modelling Framework

As discussed above, the key idea that guides 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 LTV ratios) (Chen and Jensen, 1995; Dungey et al., 2018). The LTV ratio will be restricted by lending risk considerations and the quality and value of the collateralised house (Dawkins, 2002).

Within the current modelling framework, we consider that, in the presence of credit constraints, the demand of retirees for NNEG debt is simultaneously determined with supplied loan terms; that is, the LTV ratios available to them at the time of the borrowing decision (Philips and Yezer, 1996). Arguably, in a world of imperfect markets, the simultaneity of demanding/taking a mortgage and level of mortgage debt arises from the interdependence (co-joint determination) of the demand for mortgage uptakes and appropriateness of supplied LTV ratio levels, which may be restricted in accordance with the age of the borrower, house value and other lending risk considerations (Rachlis and Yezer, 1993). Thus, to account for the simultaneity that arises from mortgage

⁹. In 2023, 64,448 active customers took out new plans, a decline of 31% year-on-year. The total annual lending in 2023 was £2.6 bn (3.1 bn USD), which followed a record breaking £6.2 bn (7.5 bn USD) in 2022 (Equity Release Council, 2024).

market imperfections (such as the simultaneity in the mortgage demand and available levels of LTV ratios), 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 average LTV ratio 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 appropriateness of the supplied LTV ratio 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 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 NNEG loan uptakes (Y_1, it)) is a function of the average LTVratio 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 LTV ratios (Y_2, it) (supplied loan terms) is a function of the 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 (uit) is the individual effect of the (ith) entity (idiosyncratic error) and ε_{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 equation 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 Krueger, 2001; Wooldridge, 2008).

4.2 Estimation Features

The 2SLS approach involves several econometric features that reflect the specific requirements for the two simultaneous equation 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 effect (FE) or random effect (RE) estimators (Arelano, 1993; Baltagi et al., 2003; Baltagi, 2006). The Hausman (1978) test is used to determine whether an FE or RE model is appropriate, which suggests

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. Importantly, when an RE model is appropriate, the RE estimator can have much smaller variances compared to FE estimators, thus enabling slowly changing variables to be included, while also considering both within and between entity effects (Wooldridge, 2010).

In addition, the application of 2SLS estimations requires the use of instrumental variables (IVs) 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 IVs, which should be highly correlated with the endogenous variable and must have zero correlation with the error term, thus 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 IV 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 the instruments are adequately strong. In this research, the relevance of the IVs is tested by 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 exceeds 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 by 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 the number of excluded instruments for each equation to be more than or equal to that of the endogenous variables included on the right 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^2 results are presented in Section 7 with the results.

5. Empirical Specifications

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 ratio levels (the proxy for supplied loan terms). From a regional perspective, the empirical specifications follow analyses conducted in previous research (Alai et al., 2014; Jang et al., 2022;

Leece, 2004; Koblyakova et al., 2014). The demand for NNEG loans, (denoted as Equation (3)) and the supplied mortgage terms (denoted as Equation (4)) are given as follows:

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

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

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

[Instrumental Variable: 5-year 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-side of one equation simultaneously appear as explanatory variables on the right-side of the other equation, which makes them endogenous covariates (Maddala, 1983; Wooldridge, 2008). Instrumental variables are used to instrument right-side endogenous variables included in the equation.

For the sake of convenience in presenting the model, we aggregated the explanatory variables into five groups. Note 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 the demographic characteristics of households, which concern 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, 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, IVs are used to replace the estimated values of right-side endogenous variables to remove correlation with the error term (Basmann, 1960).

That is, the 5-year lagged ER property value in Equation (3) is used as an instrument for the independent endogenous variable (LTV ratios), 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 LTV ratios. 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 pensioners who are over 75 years old are used to instrument the right-side endogenous variable (number of ER NNEG loan uptakes), which is excluded from the LTV ratio equation (Wooldridge, 2002). The lags for the proportion of pensioner units for individuals aged 75 or over are relevant to the regressor, which affect the average ER NNEG LTV ratios by influencing the number of ER NNEG loan uptakes. However, ER NNEG LTV ratios 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 IVs involved in the estimation process follows the identification rule, being equal to the number of right-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, thus 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. The study constructs a research data file by extracting (and merging) data from a range of reliable sources, including the product sales data (PSD) of the FCA, statistics of the Equity Release Council, Council of Mortgage Lenders dataset, Office for National Statistics (ONS) information, 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 the national and regional levels. The period of interest for the current study covers 2009–2019, which are years of economic changes and growing demand for the NNEG loans but exclude the disruptions caused by COVID-19. At the regional level, the Equity Release Council data include information on the number of NNEG loan uptakes; average LTV ratios, value of a loan, ER property values and borrower age; region of residence; and information on pricing factors.

The second main data source is the PSD (FCA) dataset, which provides information on various mortgage products/mortgage rates based on borrower age characteristics and LTV ratio 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 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 (Office for National Statistics, 2022). Information on average nominal house prices and average LTI ratios for first-time buyers (by region) have been taken from the Regulated Mortgage Survey and ONS databases, respectively. Data on GVA (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 TSCS design involves 12 UK regions observed from 2009 to 2019. The nomenclature and descriptive statistics of the key variables involved in the estimation process are presented in Table 1.

7. Results

7.1 Overview

To investigate which factors drive or restrict the NNEG mortgage sector in the UK nationally and regionally, the econometric specifications include a combination of demand, demographics, pricing, risk, and macro factors at the regional level. It is considered that the number of NNEG loan uptakes and LTV ratio 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 the locational effects in the NNEG mortgage sector.

Table 2 presents the results for demand of NNEG loans (Equation 3), measured as the log of the number of NNEG loan uptakes. The Hausmann (1978) test results (which establishes whether an FE or RE estimator should be employed) show a p-value of 0.9712, thus suggesting an RE estimator (Baltagi and Li, 2004; Clark and Linzer, 2015). Within the context of the TSCS data design, and for consistent results, the estimation procedure uses both the 2SL and 2SLS error-component (EC) RE IV estimation techniques (Baltagi, 2021; Wooldridge, 2008).

Table 1 Nomenclature of the Key Variables and Descriptive Statistics

Variable	Definition of variable	Avg. (S.D.)
Log Number NNEG Loans	Log of Number of the NNEG Loans Uptakes (thousands)	3.2385 (0.3761)
Av. LTV ratio	Average NNEG LTV ratio (%)	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 Holiday 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)

7.2 Number of ER NNEG Loan Uptakes (Demand for NNEG Debt) (Equation (3)).

In Equation (3), a negative sign for the ER average LTV ratio indicates the risk aversion of an elderly person, effect of higher ER loan costs (for larger LTV ratios), and house price risk considerations (Sharma et al., 2022).

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

Independent Variable	2 SLS RE Estimator		Baltagi EC 2SLS RE Estimator	
	Coefficient	t-value	Coefficient	t-value
Endogenous Variable				
Av. NNEG LTV	-0.0510***	-6.71	-0.0463***	-4.75
Demographic Factors				
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
Other Demand Factors				
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
Pricing/Risk Factors				
Mortgage Price Differential	-0.252***	-5.95	-0.345***	-3.98
Macro Factors				
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
Region				
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 ² (within)	0.6590		0.4911	
R ² (between)	0.4790		0.5320	
R ² (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	

Notes: Robust standard errors in parentheses $p < 0.05$ ***, $p < 0.1$ ** . First-stage F-statistics is > 145.3 . Partial R² of the excluded instrument is 0.312 and 0.404, respectively. Instrumented: right-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.

The estimated coefficient for the net pension income (proxied by the net pension income of a couple after housing costs) is positive, which likely shows the desire of higher-income retirees to maintain a certain life style and consumption level (Redfoot et al., 2007). Positive coefficients may also reflect that higher-income households 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; House of 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 have low value properties, thus 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 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, the bequest motive of an elderly person to help relatives or friends to step onto 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 NNEG funds, while a better economic environment (proxied by GVA volume) suppresses the need to extract 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, thus 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 the life stage effects, an increase in the age of the average borrower reflects life stage and demographic effects, which have positive effects on demand for equity release funds (Huan and Mahoney, 2002). The mortgage price differential (proxied as the difference between the average equity release rate and standard variable rate), has a negative effect (which reflects high NNEG mortgage pricing levels), which would meet 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 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 ratio equation. An increase in the number of owner-occupied properties positively affects the number of NNEG loan uptakes. This shows that more owner-occupied properties increase the demand for ER funds, thus 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, thus highlighting substantial variations across the 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 LTV ratios in areas with high house price growth. This ultimately helps in reducing loan costs. Table 3 presents the results which reflect the supply of NNEG loans, proxied by the average NNEG LTV ratios.

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

Independent Variable	Dep. Variable Number of NNEG Loans		Dep. Variable Av. NNEG LTVs	
	Coefficient	t-value	Coefficient	t-value
Endogenous Variable Log Number NNEG Loans	-0.6346***	-4.08	-0.395***	-3.73
Demographic Factors 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
Other Demand Factors Holidays Package Costs (year on year change)	0.314***	43.89	0.285***	2.95
Pricing Risk Factors 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
Macro Factors Real Av. House Prices	-0.165***	-5.92	-0.178***	-6.28

(Continued...)

(Table 3 Continued)

Independent Variable	Dep. Variable Number of NNEG Loans		Dep. Variable Av. NNEG LTVs	
	Coefficient	t-value	Coefficient	t-value
Region				
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 ² (within)	0.4152		0.4724	
R ² (between)	0.5950		0.5180	
R ² (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	

Notes: Robust standard errors in parentheses $p < 0.05$ ***, $p < 0.1$ **.

First-stage F-statistics is > 240.5 . Partial R² of the excluded instruments are 0.312 and 0.404.

Instrumented: right-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.

7.3 LTV Ratio (Supplied Mortgage Terms) (Equation (4))

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

The results also show that higher gross pension income increases the LTV ratio. This may reflect the tendency of those with higher incomes to maintain high levels of consumption and better quality of life. Older age also has a positive effect on the LTV ratio. Lender appetite for better matching the risk profile (by lending more to 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 to the special needs of the elderly, which

addresses pension shortfalls at the later stage of the life of retirees (Financial Conduct Authority, 2017). Furthermore, in line with the above, changes in package holiday costs positively affect the size of the LTV ratio for the NNEG loan, compared to non-significant results for energy costs and other associated expenses.

As expected, an increase in life expectancy rate 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 the possibility that homeowner remain in permanent occupancy longer than anticipated, and the likelihood of the 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 year government security yield), positively affect the average NNEG LTV ratio levels, thus capturing lender risk appetite (Hosty et al., 2008).

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

The estimated coefficients for the regional dummies reflect regional variations within the NNEG market. The coefficients for the average LTV ratio levels show positive signs for Scotland and the northern parts of the country, which suggests that larger LTV ratios may be demanded and 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 NNEG equation, this suggests that richer areas have more NNEGs with smaller LTV ratios. 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, are more able to access NNEGs but, because of their wealth and house values, accept a lower LTV ratio, thus reducing association with house price lending risks.

These results correspond with the findings from the number of ER NNEG loan uptakes (Equation 3), thus showing greater demand for NNEG funds and lower ER LTVs (less risky for a lender supply terms) within the central and southern

¹⁰ We also considered the impact on the number of NNEGs and LTV ratio 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 a number of NNEG loan equations, and from a decline of 6.04% to an increase of 1.16% in the LTV equation.

parts of the UK. Overall, it seems that the ER market is characterised by a broad north-south divide, which implies regional inequality in access to the ER NNEG funds.

8. Conclusion

This paper has contributed to the analysis of 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 an 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 ERMs. Accordingly, our interest has been in the 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 extracting information from the PSD collected by the FCA, statistics of the Equity Release Council, Council of Mortgage Lenders data, ONS information, Department for Work and Pensions statistics dataset, European Mortgage Federation Statistics, Regulated Mortgage Survey Data, and the BoE statistical database.

We have applied a two simultaneous equation modelling framework, which detects the market imperfections reflected by the interdependence of the number of NNEG loans and average LTV ratios. For the former, we find 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 ratio is positively affected 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 have 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 have greater access to, and took greater advantage of NNEG loans, but require smaller LTV ratios.

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

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Appendix

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 and Humberside	£126,422,372	5.93%	2,211	£57,172	23%	£249,687	72
Total	£2,131,910,045		28,752	UK Average £74,148	20%	£364,586	72

Notes: Regional Lending 2023. Data from Key (2024), on equity release lending in 2023 reveal that large regions, including London, South East and South West, accounted for over 54% of all lending. The average LTV 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 (\$464,446 USD), the values varied by region, with the most expensive region being London at £716,799 (\$913,130) followed by the South East at £450,706 ((\$574,154 USD) and South West at £403,576 (\$514,115 USD). Northern Ireland had the lowest average house price at £216,201 (\$275,418 USD), with the North East at £219,081 (279,087 USD). Customer average age was fairly consistent at around 72, except for Northern Ireland where it fell to 67.