

Reverse mortgages (RM) as a 4th Pillar to complement the pension system¹

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¹ Study commissioned by the International Federation of Pension Fund Administrators (FIAP).

Introduction

Financing old age is a challenge of the utmost importance all over the world. As countries develop and reach the end of their demographic transition, in other words, as the population pyramid inverts and the ratio between pensioners and workers grows, the challenge of how to produce worthwhile pensions in a sustainable manner is a formidable one. On the one hand, the pay-as-you-go systems are beginning to teeter, and on the other, those based on individual funding are not managing to deliver sufficient pensions to enable people to age with dignity, especially in the case of countries and segments of the population that are poor and unstable.

There is evidence for this in countries such as England, the U.S.A. and Spain, among many others, which though they have adequate pensions as a general rule (replacement rates of 33%, 38% and 74%, respectively (OECD, 2014), see the prospects of sustaining their pay-as-you-go systems, which are based on a low ratio of pensioners/workers, as increasingly complicated, due to an increasingly aged population and a delicate economic situation. In fact, as is well known, the pay-as-you-go systems are suffering from serious problems which have left them in a cleft stick. Among those problems are the fall in the ratio of active people to passive, for demographic reasons, and the tendency to under-declare income during most of the working life, since the pension depends mainly on the contributions towards the end of that working life. These problems lead to a trend towards reducing benefits and/or increasing fiscal deficits.

Pillar 1, the pension system based on individual funding with mandatory saving, emerged in order to solve problems of this type. This system establishes a close link between the pension and the contributions paid, so reducing under-declaration. At the same time, since the account is an individual one, it separates the pension from demographic factors. Finally, investment in both equities and fixed income instruments means that the pension benefits from the income earned by those investments. Thanks to these factors, when the systems were first introduced it was suggested (in Chile) that high pensions could be generated (with replacement rates of 70%) if contributions were paid during most of the working life.

Although men who have contributed for a high proportion of their working life (Paredes, 2012) do achieve such replacement rates, the replacement rate for women is substantially lower (around 45%), due to their earlier retiring age and greater life expectancy. In any case, if the replacement rates of all pensioners are calculated, leaving aside their periods of contribution, the replacement rates are substantially lower. For example, replacement rates in Chile and in Mexico are 52% and 32%, respectively (OECD 2013). Despite the real advantages of the funded system, the resulting pensions are quite unsatisfactory, due to long contribution gaps, increased life expectancy and contribution rates that are too low.

On the strength of the above, two additional pillars have been added to the “mandatory” pillar in order to improve pensions: pillar 2, the “solidarity” pillar, based on large fiscal contributions to ensure a certain minimum pension level, and pillar 3, the “voluntary” pillar, in which the individual voluntarily sets aside additional savings for his/her old age, (often with some tax incentive). This is a particularly important instrument in higher income groups. Although this has led to significant improvements in pensions, these are still insufficient.

The future scenario is even worse. In fact, if one makes a forecast for the years ahead, it seems highly likely that three of the four factors that are critical in determining the pension will get worse, so reducing current replacement rates yet further. First, the yield on the AFPs’ investments has been extraordinarily high (around 6% per year after inflation). This has been due in part to the high yields resulting from local investments made during a liberalisation process, and it is unlikely that these yields will be maintained over time. On the contrary, with the increasing internationalisation of investments, the yield will probably be close to that of the stock exchanges of the developed countries (closer to 3.5%). If all else remains unchanged, this in itself would reduce replacement rates by about 11 percentage points, (in other words, if they were at 50%, to 39%).

Second, life expectancies after the age of 65 will probably continue to rise, so it is not surprising that the present generation enjoy 3-5 additional years of life expectancy at retirement. Extending the pension payment period in this way will once again reduce replacement rates by about 5 percentage points, if all else remains unchanged.

Third, the real interest rates at which the accumulated funds have been converted into life annuity pensions have been relatively high so far, about 5.5%. It is highly likely that these will gradually fall to somewhere around the long-term real interest rates of the developed countries, around 3% per year in real terms. Once again, if all else remains unchanged, this will tend to reduce replacement rates by about 6 percentage points.

Only one factor that is relevant in terms of determining the pension is due to grow in the future, and that is the degree of formalisation. In fact, as informal employment decreases in the economy, this will partially reduce contribution gaps and so raise replacement rates. For example, if contributions are paid for 20% more time, in other words, if contributions were to increase to an average of 60% rather than 50% of the working life, the replacement rate would rise 20%. In other words, if it were currently 50%, it would reach 60%.

Anyway, since the cumulative effect of the first three trends on pensions is far greater than the positive effect of increased formality, the net effect of these four trends could reduce current replacement rates as much as 13 percentage points, meaning that pensions that are modest today would become increasingly meagre (at least by comparison with the

pensioners' income when at work)². The long-term solution to the above trends undoubtedly means raising contribution rates, postponing retiring age, making the industry more competitive and widening the range of instruments that are acceptable for investment purposes. Though such measures can substantially improve pensions for young people currently entering the system, it will be very difficult for them to improve pensions for those close to retirement.

The question, then, is: what can be done to increase the income of those approaching retirement? Certainly one solution is to increase the fiscal contribution to pensioners, especially those with lower incomes and pensions, while a further possibility has also arisen, that of complementing the pension with an income derived from transforming a high-value asset – the home – into a monthly income to supplement the pension. This is called a “reverse mortgage”.

As a matter of fact, it is immediately obvious that most retired people own the homes they live in. For example, in England, the U.S.A. and Spain, the percentage of people over 55 who own their homes is 74%, 77% and 87%, respectively (OECD, 2013), while countries such as Chile, Mexico and Peru show values of 82%, 82% and 88%, respectively (IDB, 2013). Therefore, although they are relatively poor in terms of their flow of income (their pension), they are relatively rich in illiquid assets (their own home). As a result they can enjoy services related with housing, but cannot usually obtain monetary income to lighten the load on the pay-as-you-go system or to complement an insufficient pension provided by their personal funding account.

In the light of this scenario, the reverse mortgage (RM) is in a position to be an important mechanism for financing old age.

The reverse mortgage as a 4th Pillar to complement the pension system

The RM is a financial instrument with an unvarying logic and modus operandi, even though it has been given names and characteristics that are specific in each country where it has been adopted³. It is aimed at the third age, enabling a home to become a source of income, with the special feature that the Owner retains the right to use and enjoy that home. In this way the instrument transforms an illiquid asset into a liquid one, allowing the Owner to continue living in his home until he (and his spouse) dies.

In fact, the RM is a mortgage loan designed for the third age, based on the life-cycle theory of Modigliani and Miller. This states that individuals attempt to smooth their consumption

² In fact, even though replacement rates would be significantly lower than at present, since wages grow at around 2% per year, future pensions will in any case be greater than current ones in absolute terms.

³ “Home Equity Conversion Mortgage” in U.S.A., “Equity Release Mechanisms” in the United Kingdom, “Viager” in France and “Basic Reverse Mortgages” in Singapore, to quote a few examples.

over the course of their lives, meaning that they save and then “un-save” according to their stage in the life cycle. When a person is born and studying, he “un-saves”, because he is consuming without generating income; then he works and saves for the future and, in most cases, acquires his home; finally, in old age he retires and consumes while drawing on his savings, including his home.

The RM connects the Owner of a property with an Investor, giving the former liquidity, and the latter the right to dispose of that asset in the future in order to make a profit. The RM starts with the Owner and the Investor agreeing on the present value of the future sale of the home, known as the “net principal limit” and continues by deciding which of 3 methods will be used to deliver that value: 1) a lump sum of money equivalent to the net principal limit, to be delivered immediately, 2) a credit line, or 3) a life annuity, the present value of which is equivalent to the net principal limit. It is also possible to agree on a combination of these alternatives.

In whichever of these cases, the special feature of the exchange is that the Owner can remain in his home until he and his spouse die. And this is a not insignificant benefit. In fact, without a RM there is the alternative of selling the house, converting the proceeds into monthly income, and renting a property of a lower value. However, with a RM the owner and his spouse can remain in the home until the death of both, and this is important because most elderly people do not want to be uprooted from their neighbourhood and live in a home other than the one they have known all their lives.

The benefits for the Owner of the property depend on the type of exchange that is put in place, but derive naturally from having access to liquid resources for covering expenses. In the case where the exchange chosen is the total value of the net principal limit at the beginning, the benefit consists in the availability of those resources to meet emergencies, catastrophic illnesses, to make major improvements to the home, or other circumstances that require large amounts of money in order to respond appropriately. In the event of exchanging for a credit line, the benefits consist in being able to access resources as and when needed. And in the case of exchanging for a life annuity – which is what concerns us most on this occasion, the benefits emerge from an increase in the monthly pension available to the Owner and his spouse to cover their day-to-day living expenses.

It has the additional benefit that when one of the couple dies, the survivor is fully entitled to remain for the rest of his/her life. By contrast, if the property is owned under conjugal law (without separation of goods), many inheritance laws grant 50% to the surviving spouse and 50% to the children, meaning that the latter can force the survivor to sell up and move away.

For the Investor, meanwhile, the benefits consist in being able to acquire the property in the future at a fraction of its market price, so achieving an appropriate yield for the level of risk involved in this operation.

The cost for the owner is that from a RM on 100% of the value of the property (in the “plain vanilla” case at least) he leaves no inheritance. Though there may be reluctance on the part of the owner to sacrifice his heirs in order to achieve a better standard of living for himself and his spouse, the truth is that such an intergenerational exchange is exactly what is required ethically. Since it is highly likely that the future generation will live considerably better than the generation that is currently retiring, the ethical approach is to transfer resources from the generation that is going to be richer (the coming one) to the poorer generation (the present one). At the end of the day, the present generation may prefer to leave its property as an inheritance. No problem! The RM creates this option of transferring income to the needier present generation, but there is no obligation.

In simple terms, a well-designed contract between the parties in this exchange should ensure the following condition: the present expected sale price of the property must be equal to the present expected value of the resources transferred from the Investor to the Owner.

In order to define the present expected sale price of the property, it is necessary to identify the key variables that have a bearing on it. These are:

- 1) The age of the Owner: the older the person, the shorter the expected duration of the contract, so there is an increase in the net principal limit.
- 2) The longevity of the Owner: the longer he lives, the longer the duration of the loan, meaning that the amount of accumulated interest is greater, as is the period for providing the life annuity. This brings down the net principal limit and the amount of life annuity provided.
- 3) The current value of the home. The higher the current value of the home, the higher the net principal limit (though there is generally a high correlation between the value of the home and people’s income).
- 4) The annual appreciation of the home. The higher the annual appreciation, the greater the expectation for the sale of the property at the end of the loan. The net principal limit is consequently higher.
- 5) The interest rate on loans. The higher the interest rate, the higher the discount rate on future values, and this reduces the net principal limit. However, as forecasts indicate that the interest rate will fall in the future, if all other factors remain unchanged, this will mean an increase in the life annuity.
- 6) Payments associated with the operation (insurance premiums, operating costs, etc.): the more payments associated with the operation, the lower the value of the net principal limit.

One aspect of the RM to be emphasised is that the net principal limit is substantially lower than the current value of the home. Obviously this is due to the fact that the seller is not only receiving his monthly income but also occupying the residence. Since the Investor receives the property only after many years and due to the effect of compound interest, that amount is usually around 50% of the current value of the home, a percentage that can vary substantially depending on the specific terms of the contract. Nevertheless, in the case of setting up a life annuity contract, the RM can contain a clause granting the heirs the residual value of the home if the death of the Owner occurs sooner than expected.

In order to provide the funds for this industry, a key step is the securitisation of the debts created. This means the grouping and risk certification of a large number of RMs belonging to a single Investor, so that they can be sold to Institutional Investors capable of injecting fresh resources into the operation.

In order to understand the basic logic behind this instrument and obtain orders of magnitude, some illustrative calculations are provided in the next section.

Logic behind Calculation and Orders of Magnitude (“Plain Vanilla”)

In order to illustrate the logic with which the values and potential of this instrument are obtained, we shall recreate the circumstances of an *average* citizen (percentile 50% in Chile), for a “plain vanilla” RM, in other words, converted into a life annuity (and not an initial amount) on 100% of the property (not a part) and at a fixed (non-floating) interest rate.

The method of obtaining the present value of the property or net principal limit is as follows: first it is necessary to know the current value of the Owner’s property, in the case of the median Chilean household, US\$44,000. Then the average annual appreciation expected for the duration period of the contract is added to this, to obtain the expected sale price of the property at the closure of the contract. This appreciation is estimated at 2.6% per year (based on the real increase in property values in Chile in the past 15 years). Meanwhile, the duration period of the contract is estimated on the basis of the life expectancy of the Owner or his spouse, whichever is older, and for purposes of this example we shall take it as being 28 years. This duration period is consistent, for example, with a couple where the husband is 65 years old when he takes out the RM and the wife 60, and in which he is expected to live to around 83 years of age and she to 88. It is therefore assumed that both will be alive for 18 years, receiving both his and her pensions, and that for the last 10 years only the wife will be alive, living on her pension alone.

With an expected sale price for the property of US\$91,000 at the close of the contract, that amount (magnitude) is reduced to present value, by using the real interest rate agreed on in

the contract, where 5.4%⁴ was estimated as a reasonable figure. As a result of the above, the initial principal limit of US\$21,000 is obtained for an average citizen, or 47% of the value of the home on retirement. Finally, various expenses involved in originating, servicing and closing the contract must be subtracted from the initial principal limit, to obtain the net principal limit, amounting to US\$16,800.

Last of all, in the event of the Owner's deciding to use the whole of that amount as a life annuity, the sum of the future payments deducted at an appropriate interest rate, (here taken to be the same as the rate of the loan), must be equal in value to the net principal limit. With the parameters used, the household taken as an example, consisting of two people for 18 years and one for ten, might see their pension increased from US\$330 per month *on average for the household*, to almost US\$460 per month, signifying an increase of about 39%. This is equivalent to raising the current replacement rate from 52% to 72%!

To complement the view of the RMs' potential, a simulation of their impact on Chilean pensions is given in the appendix, not only for average individuals (percentile 50), but also for percentiles 25, 75 and 90 of pensions and homes, together with a sensitivity analysis in cases of longer (shorter) life expectancies, higher (lower) interest rates and greater (lesser) increases in property values over time.

It is important to note that the impact on pensions is greater in the more modest groups. In fact, while the average household (percentile 50) sees a pension increase of 39%, percentile 25 of the population (the neediest quartile) sees its pension increased by 49%, while percentile 75 (the wealthiest quartile of the population) sees a pension increase of 36%. This occurs because the people who are less well-off tend to be relatively richer in housing than people with higher incomes (who have many other possible uses for their savings). At the same time, the RM becomes more attractive with a low real interest rate, with rapid property appreciation and higher value, and a low life expectancy.

Theoretical risks associated with RM and how to solve them

In technical terms, the RM presents a series of risks for both the Owner and the Investor, which inhibit the development and expansion of this financial instrument.

The main risks

For the Investor

- a) Due to accumulating contracts

⁴ To obtain this figure, the typical interest rate for RMs in Great Britain was used. Added to this was the difference in the interest rates for mortgage loans between that country and Chile. Then an inflation of 2% (in England) was subtracted from that figure of 7.4% to arrive at the real rate.

For this industry, the risk that is most difficult to deal with is the uncertainty of achieving the critical level⁵ of contract origination that will allow the debt to be securitised. By the fact of operating, the Investor accumulates contracts that he has to respect, meaning a constant outlay of resources without any compensation in terms of income. In the interim period between when his operation begins and when he achieves the volume mentioned for refinancing the activity, he is in a delicate position: if he does not manage a sufficiently rapid start-up, he can easily be left bankrupt. In fact, a very small market or a very slow operational start-up may be one of the fundamental limitations of this industry.

While the narrowness of the potential market would not appear to be a realistic problem, at least in Chile, a slow start may occur for a number of reasons, such as cultural reluctance about leaving no inheritance, distrust of new financial instruments that are hard to understand, lack of key actors for large-scale operation, among others.

It is worth underlining the fact that it is possible to refinance the debt contract by contract, but this threatens the large scale and efficiency of the operation.

Minimising this risk is very complex, and should perhaps come hand-in-hand with government support in the form of regulation to standardise and give Owners confidence, to create liquidity facilities to cope with lags between expenditure and income, to provide guarantees to cover losses caused by retained contracts, among other things. The solution for this risk, together with the justification for government intervention, will be dealt with in detail and at length in the final section “Exploring the enigma: what do RMs need in order to get off the ground?”

b) Due to cultural reluctance

It is also worth highlighting the existence of a potentially critical element that may inhibit the development of this industry. It originates from the Owner but involves risks for the Investor and has to do with cultural resistances to this mechanism. The value attached to inheritance may mean that, in spite of the fact that all the risks have been adequately covered, that there is support from the government, that key actors are available throughout the length of the industry chain, and that this is a mutually beneficial economic exchange for both the Investor and the Owner, the latter may not want to take the RM. The prospect of robbing their sons and daughters of the right to inherit the family home, which in many cases is the bulk of the inheritance they would leave, may deter a considerable number of elderly people from agreeing to a contract of this nature. It is also true that this instrument has a bad reputation, due to earlier failures or by association with poverty, which may produce this same inhibiting effect.

For the Owner

⁵ It is estimated for reference that a critical level is around US\$12 million.

a) Due to the need to leave his home

The most serious risk for the Owner is the situation in which he has to move into an old-people's home for health reasons. In such circumstances he will have to leave his home, and the contracted debt will therefore fall due. This situation may leave the Owner with the need to live in an old-people's home but without the means to pay for it. In order to avoid this happening, a let-out clause can be stipulated in the original contract.

Another reason that might force an Owner to leave his home may be the inability to pay the property taxes on the home. In this case the Owner is left without his home and with considerably less capital because of the RM. To avoid this, the contract typically stipulates that the taxes be deducted directly, before the monthly payment is made.

Secondary risks

For the Investor

a) Due to a client's unusual longevity

An obvious risk of this instrument is that, given its nature, the point at which it will be possible to sell the asset in order to make a profit is uncertain. It is possible to find out probabilities of occurrence, given the known statistics on life expectancies and mortality, but each particular case can have great deviations. In the case where the longevity of an Owner is such that the resources provided plus the accumulated compound interest is more than the sale value of the home after his death, the Investor will make a loss.

Managing this risk is closely linked with the use of insurance policies that cover the losses if this extended longevity actually occurs. The feasibility of this solution, however, depends on the necessary scale having been achieved to enable the law of large numbers to come into play or alternatively on the existence of government support.

b) Due to fluctuation in interest rates

In the event of the agreed interest rate being fixed, this risk varies depending on whether the market rate rises or falls. If it rises, the risk has to do with the fact that the Investor will have greater difficulty in managing to sell his RMs to the institutional investors as a securitised instrument, and this may even end up pushing him into bankruptcy. If the rate falls, the risk has to do with pressures from Owners to renegotiate the terms of the contract, given the new favourable conditions, though this latter is a minor risk that does not threaten the success of the operation.

One way of confronting the risk of a rise in the rate is for the Investor to sell his debts one at a time or in small packages, though this is a less than optimum solution, as was mentioned above.

On the other hand, if the agreed interest rate is variable according to market rates, then the risk arises only if the rate increases. In that scenario, the debt accumulates more quickly, increasing the probability that the debt exceeds the sale value of the home, and so producing a loss for that reason that is comparable with the loss caused by longevity risk.

In this case, the risk can be tackled in a way similar to longevity risk, namely by taking out an insurance policy that will be activated if such a loss occurs.

c) Due to depreciation of the property

This risk arises from the possibility of a fall in the price of the home included in the contract, both because of a general downward trend, and because of a negative shock at the time of sale associated with the economic cycle and real estate market. This fall in price is very substantial for the yield of the instrument, given its nature, and will cause losses to the extent that the fall exceeds the original level at which the home was valued. Nonetheless, it must be borne in mind that property prices generally show an upward trend in aggregate terms and in the long term.

In order to minimise this risk, there is diversification and reinsurance. In addition, the Investor can have access to data bases about the values of homes, can apply a conservative valuation policy, find out about public works that are relevant for the home, and increase selectivity of clients (this latter makes it possible to cope with the risk of a fall in price in a sector or neighbourhood, but not a general one).

d) Due to accidents and home maintenance

The risk of an accident is a random, unpredictable event that drastically reduces the value of the home, the most common being a fire.

For this type of risk there are various insurance policies that can complement the original contract, requiring additional premiums that have to be included when determining the net principal limit.

The maintenance risk, meanwhile, arises from the wear and tear caused by climate, time and the use of the home. Given the lengths of term usually included in RMs, this risk represents an element to be taken into account.

For this reason, there is a possibility of designing guarantee funds with deferred availability in the contracts. These reduce the amount of the life annuity at the outset but are returned to the Owner as routine inspections confirm that the home is in a satisfactory condition.

For the Owner

a) Due to interest-rate fluctuations

In cases where the agreed interest rate is fixed, this risk is associated with a reduction in the market interest rate. In that case, the conditions agreed in the contract will be worse than those existing after the reduction.

In order to minimise this risk, the Owner can find out about long-term levels of interest rates, so as to avoid agreeing on extraordinarily high rates which will therefore tend to fall.

On the other hand, if the agreed interest rate varies in relation to market rates, the risk arises if there is an increase in the rate. In that scenario, the debt builds up more quickly, meaning that the net worth (the value of the home minus the accumulated debt) falls more rapidly. This does not have any implications for the Owner unless he decides to sell the property, or in terms of the inheritance that he might be able to leave.

b) Due to the bankruptcy of the Investor

If the Investor goes bankrupt there are effects for the Owner, depending on the method of payment that has been put in place. If the agreement involved the complete payment of the net principal limit at the beginning, the risk has to do with the uncertainty of becoming part of the asset liquidation of the bankruptcy process. In the other two cases, there is the additional risk that the life annuity and credit line will be terminated. Nevertheless, this is a limited risk. Since the contract guarantees that the home continues to be the Owner's property until the end of the contract, the bankruptcy can be overcome by re-financing.

To minimise this risk, it is therefore sufficient to have an appropriate contract that foresees the possibility of bankruptcy and transfers the ownership of the home only when the contract ends.

International experience

The RM is a mechanism that has been used in a series of countries, but in none of them has it become widespread in a way that measures up to the potential foreseeable for it. The RM has been used with varying levels of penetration in many countries: the United States, Canada, France, Great Britain, Germany, the Netherlands, Spain, Sweden, Australia, New Zealand, Singapore, Thailand, South Korea and Hong Kong, for example. Described below are the experience and present position of the U.S.A. and Great Britain, since these are the countries where this instrument has the longest history and has developed most.

United States

History and Level of Penetration

Until quite recently, the penetration of the RM in this country has been insignificant and even today its use is far below its potential. The first RM took place in 1961, and in 1987 a government programme called Home Equity Conversion Mortgage (HECM) was created. A year later this programme was given the means to insure these mortgages, to promote their spread. The HECM programme operates by insuring Investors against the risks of Owner longevity and property depreciation, by covering the difference between the amount paid out and the sale of the home. Even so, during the first decade of its existence, it achieved less than 10,000 originations (new contracts) each year.

Then, at the beginning of the 2000s, the instrument got into its stride, reaching over 50,000 originations in 2005 and growing at a considerable pace. The year 2009 saw its peak with 115,000 originations, with a decline following the 2008 crisis to the present figure of 70,000 originations per year. That acceleration was probably due to a considerable rise in house prices, a fall in interest rates, a deepening of knowledge about this instrument and changes in regulation that made it more attractive in the short-term (though they made it less secure⁶).

Even so, a little less than 400,000 RMs had been originated between 1989 and 2007 via HECM, with a potential of tens of millions. Considering that 90% of all RMs originated through the HECM programme before the sub-prime crisis and virtually 100% after it, it is possible to conclude that this instrument has not spread in a way that matches its potential. In fact, at nationwide level, the National Reverse Mortgage Lenders Association (NRMLA) and The Hollister Group calculated that the level of penetration in 2007 was less than 1%, calculated as the ratio between the number of RMs and the number of homes belonging to elderly people. In 2010 that figure reached over 2%, which shows both the upward trend described, and the low level.

The following are just a few of the problems facing RMs in the United States. On the one hand, the characteristics of the HECM programme may interact unfavourably with other government programmes. One example given is the fact the additional income received via the HECM may disqualify the Owner from other benefits such as “Supplemental Security Income” (SSI) or even Medicaid. In the same way, it is important that monthly payments from the RM are not regarded as income for taxation purposes.

To continue, it is frequently considered that the premiums charged at the beginning and end of the contract, plus the costs of servicing it, are too high compared with the pension that

⁶ Prior to 2008, the interest rates used for RM via HECM were variable, which meant that the instruments were used primarily for life annuity (in 1990, barely 36% of the net principal limit was requested as initial amount). After 2008, the Federal Housing Administration made a change that allowed fixed interest rates, which resulted in far more resources being withdrawn as initial amounts. That same year, 80% of the net principal limit was withdrawn at the start of the contract. This scenario led to vulnerabilities that emerged after the sub-prime crisis and the general fall in house prices, when Investors and Owners found themselves with a debt that substantially exceeded the value of their underlying asset.

can be obtained, all of which makes the instrument less attractive. For example, an Owner aged 65 with a house worth US\$300,000 can obtain a pension of US\$850 per month, but will have to pay a starting premium of US\$5,000 for it. Although the premiums amount together to only about 5% of the initial principal limit, heavy starting premiums may discourage people from adopting the instrument.

On the Investor's side, the obstacles have been as follows:

- First, in the United States the "Fair Housing Act" prohibits discrimination between men and women, even though the life expectancies of the two genders are substantially different and this is a key variable for this instrument.
- Second, given the unique nature of this instrument, new Investors have to cope with unfamiliar regulatory demands and paperwork. For example, the documents that must be prepared for an ordinary mortgage and for a RM are different, to meet the requirements of the "Truth-in-Lending Act". For this reason, the operation requires employees who specialise in RMs, and as the HECM programme limits the origination premium, its viability depends on the existence of a critical volume.
- Third, since different states in the United States have different laws, with regard to RMs in particular, Investors who wish to operate in more than one state, which would allow them to reach a critical volume of origination, have to bear the additional cost of coming to terms with the differing legislation.
- Fourth, given the unconventional cash-flow pattern generated by this instrument, it is difficult to securitise and fund. In fact, Szymanoski et al. (2007) report that loans via HECM were not securitised until August 2006. This provides evidence on the one hand for the problem just mentioned, and probably also for that of the critical volume required for securitisation.

Great Britain

History and Level of Penetration

RMs began to be used in Great Britain in the mid-sixties in a way similar to the U.S.A., but they remained at a very low level of penetration until the 80s. Then a type of non-guaranteed RM called the "Home Income Plan" began to become popular. This provided an initial amount at a variable rate, invested in shares, which had to produce sufficient yield to pay the interest on the RM and leave a positive balance for the Owner. However, this scheme collapsed with the financial crisis in 1984, when interest rates soared and share prices plummeted. The scandal produced by this situation led to that instrument's being

declared illegal in 1990, and the general image of RMs – known in this country as Equity Release Mechanisms (ERMs) - was seriously damaged.

In response to the above, not only was that instrument declared illegal in 1990, but also a large proportion of those affected received compensation, and in 1991 the “Equity Release Council” (ERC) was set up with the ability to grant a series of guarantees. For example, the Owner is not obliged to leave his home until he dies, and the debt may not exceed the value of the home (in other words, debt cannot be left to the heirs). Later, during the 2000s, the “Financial Service Authority” (FSA) proceeded to introduce increasing numbers of regulations for the various types of RM.

Today the industry has achieved a certain degree of dynamism, with loans of £1 billion in 2013, representing a growth of 36% in less than two years (though this level is equivalent to the figures immediately prior to the sub-prime crisis). Nevertheless, the fact that the wealth of English Owners aged 65-plus has been estimated at £801 billion in 2014 puts that figure into perspective, especially if one considers that this increased by £33 billion during 2013 alone as a result of price recovery. In fact, although the originations have passed the £1 billion per year mark, studies have shown that the potential is £4-5 billion per year (Terry & Leather, 2001).

In any event, the level of penetration of this instrument in Great Britain has been low, around 20,000 per year, which represents less than 3% of the potential market of pensioners. The above figures reinforce the impression that RMs have not taken off in the way promised, especially in view of the fact that Great Britain is the European country with the most developed RM market in terms of its transactions and providers (Hendriks, 2013).

One of the main problems of the RM market in Great Britain is its bad reputation. The traumatic experience of the 80s caused serious damage to this instrument’s image, making the population very cautious about the advisability of using it. This point is systematically repeated as a fundamental problem for getting RMs off the ground in this country.

Another problem in Great Britain, as in the United States, has to do with the possibility of losing social benefits as a result of using a RM. Unlike other countries, such as Australia for example, taxation and social benefit policies are not adequately coordinated with this instrument, and this makes it less attractive. This problem is contained within another on a larger scale, which has to do with the non-existence of decisive, explicit support from the government to back the launching of this market.

A third problem specific to this country is the high degree of housing mobility among the elderly compared with their European peers, which reduces the benefits associated with a RM (Michelangeli, 2008).

The fact that various big players in the English financial market have still not entered the RM market may also represent a considerable problem for its expansion. However, this

point of view becomes less convincing when one realises that some important actors, such as Scottish Widows, Northern Rock and Prudential, are participating in it.

Practical Problems for Expansion

On the Owner's side, there have been various problems for widespread acceptance. First, there are cultural factors that inhibit the owner's interest. Among these is the desire to leave an inheritance, a desire that certainly contrasts with the fact that the most appropriate course from the distributive point of view is to transfer income from the future generation (which will live better) to the present generation (which will live worse).

Second, many owners see their home as an asset that provides protection for addressing major needs (a long illness, hospital expenses that are not covered), and for this reason they are reluctant to transform it into a reverse mortgage. In fact, the increase of medical expenses with age and the probability of unexpected major expenses have meant that, in the absence of other methods of protection such as "Long-Term Care Insurance", people in the third age prefer to keep the entire net worth of their home as a form of self-insurance. In fact, Munnell et al. (2007) report, on the basis of a survey of 2,673 individuals between 50 and 65 years of age, that almost half were not planning to use the net worth of their home as a form of pension, in order to have insurance against living and health expenses. To be sure, no one is suggesting making RM compulsory, the idea is to create the option for those people who would find it beneficial.

Third, RMs are complex financial instruments that may be particularly puzzling for elderly Owners. That is why it is necessary to create consumer protection systems (as in the U.S.A. with certified independent advisors), making it mandatory for people to consult certified advisory bodies to enable them to find out properly about the advantages and disadvantages of RMs.

Fourth, it is important that the income from a RM should not be considered as "income", either for taxation purposes, or for eligibility for a social benefit. There will therefore need to be legal adjustments to avoid such risks.

Fifth, the costs of a RM depend on the degree of competition and the diversification of the possible risk. This is why the costs may look unattractive if there are low volumes.

Sixth, as a new instrument, the RM suffers the problem of all social innovations, namely, that few people want to be pioneers; they prefer to see how others get on first. Since they do not have friends with RMs, a vicious circle occurs. Seen as a social innovation, there would be justification for subsidising the first people who take RMs until this social innovation becomes more familiar.

On the investors' side there are other problems, or perhaps the same ones with the opposite sign.

First, there is a series of risks against which the investor has to protect himself: longevity, growth in the value of the properties, inflation, variations in the interest rate, etc. In principle, it is possible to work out systems to insure against such eventualities. However, this requires a sufficient volume of contracts of enable risks to be diversified. In fact, every insurance scheme – and at the end of the day, that is what RM is – depends on the principle of the law of large numbers for diversifying risks. The system therefore requires a critical mass of mortgages to enable it to work well.

Second, this is a long-term investment which is illiquid for the investor, so the possibility of generating a deep secondary market (such as securitisation) is desirable, to make the instrument more attractive in terms of both potential yield and liquidity. Once again, this depends on having a large volume of RMs.

Third, there may be a tax issue for the investor, depending on the scheme, because he may have to pay income tax – on accrued income, as yet unpaid, - while in fact he is making yearly payments before laying hands on the property. This calls for a clear decision from the Inland Revenue service.

Fourth, there is a potential problem of “moral hazard”. In point of fact, the owner may have no interest in maintaining the house as he gets older and approaches the end of his life. This calls for schemes involving compulsory maintenance assessments by third parties, with deductions from the yearly payment in case of deficiencies and/or restrictions on the percentage of the home that can be given in RM. For example, if the owner can only convert 80% of the home into RM, then the 20% will serve as a guarantee for carrying out adequate maintenance.

Exploring the enigma: what do RMs need in order to get off the ground?

The RM market involves an apparent enigma: it provides benefits for Owners, generates profits for Investors, helps to solve a complex social problem for governments and nevertheless fails to get off the ground. In fact, industry agents in both the U.S.A. and Great Britain are urging that now is the moment for lift-off, but they recognise that this has been said too often before.

In this last section, we first set out the basic conditions needed for a RM market to work well in a country, in the light of the experience of countries with a track record in this line of business. Then we shall explore what needs to be done to enable RMs to get off the ground at a vigorous pace that matches their potential, in other words, what has lacked in countries such as the U.S.A., Great Britain and so many others, in achieving a developed RM market.

Needs when fully operational

Bearing in mind the analysis of theoretical risks and the experience of countries that have entered the RM field, it is possible to identify a series of specific elements necessary to enable them to operate, over and above the conditions that any industry requires in order to take off.

In the first place, it is essential to have the network of operators needed to make a market of this nature work. This means agents with the logistical ability and technical skill to be able to operate an instrument of this nature at an appropriate scale, such as Banks, Insurance Companies, Benefit Societies, among others. Naturally, it is not enough to have just one or a few: there must be a variety of agents that allow the emerging market to be truly competitive. It is worth stating clearly that an RM industry requires a cluster of agents, grouped for the sake of simplicity under the heading of Investor throughout this work, such as estate agencies, notaries, law firms, among others. Nevertheless, it is assumed that agents of this type will be widely available in a country that hopes to start up a RM industry, and this is not therefore a special element required to achieve it successfully.

In the second place, there must be a credible regulatory body, whether public or private, which fixes the rules of the game. Standardisation of contracts, establishment of codes of conduct, setting of minimum criteria, among other elements, are vitally important when installing a market of this nature, which requires a high degree of trust on the part of Owners. The fact that this instrument operates with people's homes, possibly their greatest wealth, and during the most vulnerable period of their lives, is not a minor issue. In particular, the adoption of criteria such as fixed or "with maximum" interest rates, the right to remain in the home until death, and the "non-negative net worth guarantee", have been shown to be extremely important in enabling the industry to operate in the United States and Great Britain. By contrast, the scandal that occurred in Great Britain in the 1980s in the absence of these criteria and a regulatory authority to establish and enforce them, proved to be a powerful depressant to the development of the industry, even decades after the crisis.

In the third place, there needs to be a public body that provides guarantees for certain risks associated with the industry, which, because of their nature, would not be undertaken appropriately by private institutions. In particular, the new and innovative aspect of the industry in terms of payment structure means that it is logical for there not to be private companies offering insurance for the longevity of the Owner and the depreciation of the property. In other words, the long periods of time between the payments that occur first and the income that accrues long afterwards imply a structure that is uncomfortably inverted compared with other similar instruments (life insurance policies, pensions, life annuities, and others). In the final analysis, this is what justifies the existence of a public agency that recognises this flaw in the market and provides these key guarantees for the industry. In fact, HECM, the programme introduced for this purpose in the U.S.A., has

been the backbone of the industry, introducing not only guarantees for the Investor, but also the regulations mentioned in the previous paragraph to provide guarantees for Owners.

Getting off the ground

However, the facts show that all the above, though necessary when the system is fully operational, is not enough to achieve a robust RM industry at the height of its potential. In our opinion, there are two underlying reasons for this: i) the fact that RM is an emerging industry, forced to contend with a series of challenges, and unless the government adopts a clear, decided position, there are no guarantees of its being able to meet them; and ii) the social innovation characteristic of the instrument means that it has to interact with a much larger set of state institutions than other industries.

The RM market as an “Infant” Industry

To get this industry off the ground, giving a few guarantees to the two parties in the exchange is simply not enough. That approach comes nowhere near understanding the complexity of setting up the universe of new relationships required. In fact, what is at stake is the creation of a new market – that of RMs – with a critical mass level sufficient to support the existence of a diversity of specialised actors, with scales sufficient to reduce unit costs and of a number sufficient to generate competition in price and service quality. This does not happen naturally: it is a sort of an infant industry in which the fruits are not fully revealed until the market is deep and specialised.

On analysing the RM from the infant industry approach, one is immediately struck by the Marshallian externalities, also known as external scale economies, which implies that the productivity of an industry increases as it grows in size and is concentrated in a geographical area. In detail, positive externalities of this type can occur as a result of four factors:

- 1) specialisation of labour which occurs as an industry grows and matures, making it more productive and reducing the costs involved in matching jobs with workers;
- 2) specialisation of providers that may be generated as a result of the size of the emerging industry and its obvious benefits;
- 3) competition in terms of the services and costs of that industry;
- 4) ease of dissemination of know-how, ideas and technology among participants, encouraging the adoption of the best techniques and practices available, as also innovation.

On the other hand, the growth of a new market and industry allows systemic synergies to take place among similar industries (insurers, banks, benefit societies) as a result of being

able to share inputs, procedures and know-how, and also produces linkages, forward (securitisation), backward (appraisers) and diagonal (law firms).

Theoretically, the benefits deriving from these various associations should lead companies to achieve such efficiencies spontaneously, but this assumes that they are capable of adequate coordination. In practice, coordination costs that hinder beneficial collective action are a strong, classic argument in favour of public intervention to create this market.

Far from being merely a theoretical interpretation, the RM context matches the conditions just described very closely. The main point, which has already been mentioned repeatedly, is that there is a fundamental risk for the Investor: namely that of not having the critical mass of originations that will allow him to achieve securitisation and refinancing. At the same time, the volume of the operation is what makes it possible to standardise processes and reduce costs, such as the premium charged at the beginning and end of contracts, and for their servicing. Finally, familiarity with the instrument, which comes about precisely as levels of volume increase (together with successful, correct operation) is vital in overcoming the cultural barriers that may be critical restraints on the industry. And so one arrives at a chicken and egg situation: the industry does not get off the ground because the market does not manage to reach the critical volumes that will allow companies to securitise, reduce costs and become providers of a known product, and at the same time it does not reach a critical level because it does not succeed in getting off the ground.

In order to deal with the emerging industry challenge, the specific way adopted by the public institution in charge must be adapted to suit the circumstances of each country, but obviously, quite apart from the method used, it must succeed in promoting RMs in an explicit and decisive manner. This involves establishing communicational support to give eligible Owners confidence in the instrument, and at the same time establishing a set of regulations to ensure that they receive a competitive, safe and suitable product. It also means granting guarantees for longevity and property devaluation. Finally, the development policy could also include the use of transitory subsidies (temporary, or until a certain minimum volume - e.g. 10,000 contracts – is reached), such as reducing the starting premium on the contract or the interest rate on the loan, to contribute to the initial principal limit or to the monthly pension.

RM as a social innovation

The RM is in fact a sort of social innovation, the benefits of which do not accrue in their entirety to whoever creates the market, but benefit for all those who come afterwards. Public support for creating such a market is therefore justified. The innovation consists in giving liquidity to assets that are currently illiquid, so that they can serve to raise elderly

people's standard of living by making use of their home, and so complement their pensions. It is not a substitute for the pension system, but a complement to it. This is necessary where pensions are low and is desirable as an option for anyone who wishes to take advantage of it.

Furthermore, the instrument interacts with a series of state institutions and policies that can potentiate, but should definitely not stand in the way of its development. For example, the health policy may or may not include flows from RMs when estimating those who qualify as beneficiaries of the public system; in the same way, the social security policy may or may not include that income for estimating the amount to be paid by the State towards the lowest pensions. The taxation policy may or may not tax the flows originated by the RM; or require, or not require, the payment of contributions on homes under RM. The housing policy may encourage rental of other people's properties or the purchase of a home of one's own. In the one case or the other, public policy hinders or supports the development of the industry, substantially modifying the incentives and the possibility of using the instrument.

The same public institution as is justified in the arguments about the emerging industry, and whose target is therefore to achieve the scale needed to generate Marshallian externalities and system efficiencies, is the one to take charge of establishing coordination between the public sector and the industry. Endowed with powers to reconcile the RMs with the whole range of public policies, it would be well-placed to enable this industry to become the real fourth pillar of the pension system, rather than continuing to operate as a foreign element, battling against the public social security mechanisms already in existence.

The justification of the above, it should be emphasised, does not flow from the same infant industry argument. The reconciliation of public policies with the RM industry in particular is based on the fact that it promises to help solve a social challenge which is of the first importance: how to finance old age.

Conclusion

The reverse mortgage is an innovation that has the potential to transform an illiquid asset (the owned home) into a significant flow of income for elderly people, who are often poorer in flows of income than in assets. The conversion of a person's own home into a RM may mean a very significant complement to pensions: around 40% for average families and around 50% for the families in the poorest quartile of the population. Given the current low replacement rates and the prospect that these will fall before they rise, this is a powerful potential instrument for complementing pensions, which we have called a 4th Pillar of the pension system.

Obviously, the RM is not a substitute for an improvement in the pension system. In fact, given the prospect that current replacement rates are likely to fall rather than rise, in the long term, our systems do require significant changes: increased contribution rates, retiring ages adjusted to increasing life expectancy, a wider range of investment instruments to

allow higher yields and incorporation of more competition. Since these changes will only benefit the generations entering the labour market now, the RM may be a valuable complement for the current pensions of those already retired and those approaching retirement.

The idea is a powerful one, but putting it into practice is more complicated. In fact it requires a critical mass of customers, specialised providers, competition and regulation, as described earlier, in order to achieve the potential fruit. As long as this fails to materialise, it will remain in the limbo of good ideas yet to be put into practice.

Appendix

This appendix presents the details of the impact of RMs in Chile for the couple described in the text, but assuming that they belong to percentile 25, 50, 75 and 90 and the average of Chilean homes. Just as before, an expected contract period of 28 years is assumed for all calculations, with the man living for 18 years and the woman, for 28 years. An interest rate of 5.4% is assumed and an annual appreciation of 2.6% on the homes. All monetary values are in US\$ from the year 2011.

It is worth noting that the estimation of the percentile of pensions and house prices came from two different databases, so representing a strong assumption for the exercise. As far as the distribution of the value of pensions is concerned, the information was obtained from the Social Security Institute, and that of house prices from the distribution of the price of home rentals, as reported by the Survey on Employment and Unemployment made by the University of Chile. On this last point, it is worth underlining the fact that, depending on the base or variable used (The Family Budget Survey of the INE, for example), it was found that the housing price adopted varied between -11 and 20%, according to the percentile, as shown in the following table:

Variation in housing prices according to other databases found

| Percentile | BBVA Base | Family Budget Survey 2012 INE Base (attributed rent for main home) | Family Budget Survey 2012 INE Base (Total household expenditure on rent for the main home) |
|------------|-----------|--|--|
| 25 | 2.2% | 10.0% | 20.0% |
| 50 | 9.8% | 0.0% | -4.2% |
| 75 | 17.4% | -11.1% | -11.1% |
| 90 | 7.6% | -8.3% | 0.0% |
| Average | 13.3% | -5.4% | 6.1% |

Results

Impact of the RM for an average Chilean citizen (US\$)

| | |
|----------------------------------|-----------------|
| Current value of the home | \$61,550 |
| Future value of the home | \$126,250 |
| Net principal limit | \$29,200 |
| Pension of the household today | \$500 per month |
| Pension of the household with RM | \$683 per month |
| Percentage increase | 37% |

Responsiveness

| Increase in Pension | Current value of home (US\$) | | | | | |
|---------------------------|------------------------------|--------|--------|--------|--------|---------|
| | | 20,000 | 40,000 | 60,000 | 80,000 | 100,000 |
| Interest rate of loan (%) | 2.0 | 29% | 65% | 104% | 138% | 174% |
| | 4.0 | 13% | 34% | 57% | 77% | 98% |
| | 5.4 | 7% | 22% | 37% | 51% | 65% |
| | 6.0 | 5% | 17% | 30% | 42% | 54% |
| | 8.0 | 0% | 7% | 15% | 22% | 29% |
| | 10.0 | -3% | 1% | 6% | 10% | 14% |

| Increase in Pension | Annual appreciation expected (%) | | | | | |
|---|----------------------------------|------|------|------|------|------|
| | | 0.6% | 1.6% | 2.6% | 3.6% | 4.6% |
| Expected duration of the contract (years) | 20 | 30% | 38% | 48% | 60% | 74% |
| | 25 | 22% | 30% | 41% | 54% | 71% |
| | 28 | 18% | 26% | 37% | 51% | 70% |
| | 30 | 16% | 24% | 35% | 49% | 68% |
| | 35 | 11% | 19% | 30% | 45% | 66% |

Impact of RMs for a Chilean citizen at percentile 25 (US\$)

| | |
|----------------------------------|-----------------|
| Current value of the home | \$36,550 |
| Future value of the home | \$74,950 |
| Net principal limit | \$17,330 |
| Pension of the household today | \$210 per month |
| Pension of the household with RM | \$313 per month |
| Percentage increase | 49% |

Responsiveness

| Increase in Pension | Current value of home (US\$) | | | | | |
|---------------------------|------------------------------|--------|--------|--------|--------|--------|
| | | 10,000 | 25,000 | 38,300 | 50,000 | 65,000 |
| Interest rate of loan (%) | 2.0 | 29% | 93% | 143% | 201% | 266% |
| | 4.0 | 11% | 48% | 77% | 111% | 148% |
| | 5.4 | 3% | 29% | 49% | 72% | 98% |
| | 6.0 | 0% | 22% | 39% | 59% | 81% |
| | 8.0 | -6% | 7% | 18% | 29% | 42% |
| | 10.0 | -9% | -1% | 5% | 12% | 20% |

| Increase in Pension | Annual appreciation expected (%) | | | | | |
|---|----------------------------------|------|------|------|------|------|
| | | 0.6% | 1.6% | 2.6% | 3.6% | 4.6% |
| Expected duration of the contract (years) | 20 | 39% | 50% | 64% | 81% | 101% |
| | 25 | 28% | 39% | 54% | 73% | 97% |
| | 28 | 22% | 34% | 49% | 69% | 95% |
| | 30 | 19% | 31% | 46% | 66% | 93% |
| | 35 | 12% | 23% | 38% | 60% | 89% |

Impact of RMs for a Chilean citizen at percentile 50 (median) (US\$)

| | |
|----------------------------------|-----------------|
| Current value of the home | \$4,250 |
| Future value of the home | \$90,750 |
| Net principal limit | \$21,000 |
| Pension of the household today | \$330 per month |
| Pension of the household with RM | \$460 per month |
| Percentage increase | 39% |

Responsiveness

| Increase in Pension | Current value of home (US\$) | | | | | |
|---------------------------|------------------------------|--------|--------|--------|--------|--------|
| | | 20,000 | 35,000 | 46,350 | 60,000 | 75,000 |
| Interest rate of loan (%) | 2.0 | 45% | 86% | 111% | 154% | 195% |
| | 4.0 | 22% | 46% | 60% | 85% | 109% |
| | 5.4 | 12% | 29% | 39% | 56% | 72% |
| | 6.0 | 9% | 23% | 31% | 46% | 60% |
| | 8.0 | 1% | 9% | 15% | 23% | 31% |
| | 10.0 | -3% | 2% | 5% | 10% | 15% |

| Increase in Pension | Annual appreciation expected (%) | | | | | |
|---|----------------------------------|------|------|------|------|------|
| | | 0.6% | 1.6% | 2.6% | 3.6% | 4.6% |
| Expected duration of the contract (years) | 20 | 31% | 40% | 50% | 63% | 79% |
| | 25 | 22% | 31% | 43% | 57% | 75% |
| | 28 | 18% | 27% | 39% | 54% | 73% |
| | 30 | 16% | 24% | 36% | 52% | 72% |
| | 35 | 10% | 19% | 30% | 47% | 69% |

Impact of RMs for a Chilean citizen at percentile 75 (US\$)

| | |
|----------------------------------|-----------------|
| Current value of the home | \$67,300 |
| Future value of the home | \$138,100 |
| Net principal limit | \$31,900 |
| Pension of the household today | \$570 per month |
| Pension of the household with RM | \$780 per month |
| Percentage increase | 36% |

Responsiveness

| Increase in Pension | Current value of home (US\$) | | | | | |
|---------------------------|------------------------------|--------|--------|--------|--------|---------|
| | | 40,000 | 55,000 | 70,550 | 90,000 | 110,000 |
| Interest rate of loan (%) | 2.0 | 57% | 81% | 100% | 136% | 168% |
| | 4.0 | 30% | 44% | 55% | 76% | 95% |
| | 5.4 | 19% | 28% | 36% | 51% | 64% |
| | 6.0 | 15% | 23% | 30% | 42% | 53% |
| | 8.0 | 6% | 11% | 15% | 22% | 29% |
| | 10.0 | 1% | 4% | 6% | 10% | 14% |

| Increase in Pension | Annual appreciation expected (%) | | | | | |
|---|----------------------------------|------|------|------|------|------|
| | | 0.6% | 1.6% | 2.6% | 3.6% | 4.6% |
| Expected duration of the contract (years) | 20 | 29% | 37% | 47% | 58% | 72% |
| | 25 | 22% | 30% | 40% | 53% | 69% |
| | 28 | 18% | 26% | 36% | 50% | 67% |
| | 30 | 16% | 24% | 34% | 48% | 66% |
| | 35 | 11% | 19% | 29% | 43% | 63% |

Impact of RMs for a Chilean citizen at percentile 90 (US\$)

| | |
|----------------------------------|-------------------|
| Current value of the home | \$111,550 |
| Future value of the home | \$228,850 |
| Net principal limit | \$52,900 |
| Pension of the household today | \$970 per month |
| Pension of the household with RM | \$1,320 per month |
| Percentage increase | 36% |

Responsiveness

| Increase in Pension | Current value of home (US\$) | | | | | |
|---------------------------|------------------------------|--------|---------|---------|---------|---------|
| | | 80,000 | 100,000 | 116,950 | 130,000 | 150,000 |
| Interest rate of loan (%) | 2.0 | 69% | 88% | 98% | 116% | 134% |
| | 4.0 | 37% | 48% | 55% | 65% | 75% |
| | 5.4 | 24% | 32% | 36% | 43% | 50% |
| | 6.0 | 19% | 26% | 30% | 35% | 42% |
| | 8.0 | 9% | 13% | 15% | 19% | 22% |
| | 10.0 | 3% | 5% | 7% | 9% | 11% |

| Increase in Pension | Annual appreciation expected (%) | | | | | |
|---|----------------------------------|------|------|------|------|------|
| | | 0.6% | 1.6% | 2.6% | 3.6% | 4.6% |
| Expected duration of the contract (years) | 20 | 29% | 37% | 46% | 57% | 70% |
| | 25 | 22% | 30% | 39% | 52% | 68% |
| | 28 | 18% | 26% | 36% | 49% | 66% |
| | 30 | 16% | 24% | 34% | 47% | 65% |
| | 35 | 11% | 19% | 29% | 43% | 62% |

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