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INTERNSHIP REPORT

PROFITABILITY ANALYSIS AND PREMIUM ADJUSTMENT OF MORTGAGE LIFE INSURANCE UNDER IFRS 17

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Abstract

In Portugal, when a policyholder takes out a mortgage, credit institutions require them to take out a life insurance policy linked to the loan. Although this is not compulsory by law, it is a requirement for obtaining the loan, because in the event of death or disability of the borrower, the insurer guarantees payment of the outstanding balance to the credit institution.

As this life insurance is essential for the loan application to be approved, it is expected that various life insurance companies will present different products in terms of the premiums and covers offered, making the market extremely competitive. In the company where the internship took place, *CA Vida*, this challenging environment was manifest, as it led to a significant increase in policy cancellations and therefore to difficulties in retaining the client portfolio for this product associated with home loans.

These events have resulted in increased pressure to review the premiums for this life risk product, as the current premiums are not competitive enough to prevent customers from switching to competitors. This is where the main objective of the internship lies: to analyse the competition's offer, to find the causes of the difficulties in retaining the client portfolio and finally give suggestions to review and adjust the premiums, in order to make the product more competitive and, at the same time, profitable and sustainable for *CA Vida* insurance company.

Once the study had been completed, a potential cause of the problem had been identified, and adjustments to the premiums were recommended to those responsible for decision-making.

Keywords: Mortgage Protection Product; Market Sensibility Analysis; Premium Adjustment; Profitability.

Resumo

Em Portugal, quando um segurado contrai um crédito à habitação, as instituições de crédito exigem-lhe a subscrição de um seguro de vida associado ao empréstimo. Embora esta exigência não seja obrigatória por lei, constitui uma condição para a aprovação do crédito, uma vez que, em caso de morte ou invalidez do mutuário, a seguradora garante o pagamento do capital em dívida à instituição de crédito.

Sendo este seguro de vida essencial para a aprovação do crédito, é expectável que várias seguradoras apresentem produtos distintos, tanto ao nível dos prémios como ao nível das coberturas oferecidas, tornando o mercado extremamente competitivo. Na empresa onde decorreu o estágio, *CA Vida*, este ambiente competitivo tornou-se evidente, tendo levado a um aumento significativo do número de anulações de apólices e, consequentemente, a dificuldades na retenção da carteira de clientes deste produto associado ao crédito à habitação.

Estes acontecimentos resultaram numa pressão acrescida para rever os prémios deste produto de Vida Risco, uma vez que os prémios atualmente cobrados não são suficientemente competitivos para evitar a transferência de clientes para outras seguradoras. É neste contexto que se enquadra o principal objetivo do estágio: analisar a oferta da concorrência, identificar as causas das dificuldades na retenção da carteira de clientes e, por fim, apresentar sugestões para rever e ajustar os prémios, de forma a tornar o produto mais competitivo e, simultaneamente, rentável e sustentável para a seguradora *CA Vida*.

Após a conclusão do estudo, foi identificada uma possível causa do problema, tendo sido recomendados ajustamentos dos prémios aos responsáveis pela tomada de decisão.

Palavras-chave: Produto Proteção Crédito Habitação; Análise de Sensibilidade de Mercado; Ajuste de Prémios; Rentabilidade.

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Chapter 1 - Introduction

This report describes the work carried out during a five-month internship at the Portuguese insurance company Crédito Agrícola Vida, in the Actuarial Management team.

The main objectives of the internship were:

1. Following the observation of a market downward trend in insurance rates associated with mortgage life insurance, to perform a comparative analysis among the different existing products offered by the competitors of *Crédito Agrícola Vida*, in terms of the covers/prices;
2. After completing the analysis, to make the necessary adjustments of the covers/prices marketed by *Crédito Agrícola Vida*, in order to align them in accordance with the observed market trend.

This experience proved to be fundamental, as it allowed me to deepen and apply in practice the knowledge acquired during my master's degree in Actuarial Science, contributing to the completion of this academic stage.

1.1 Context

Taking out life insurance in connection with a home loan is one of the requirements imposed by credit institutions when approving home loans. The purpose of this Life Risk product is to guarantee payment of the capital owed to the institution that granted the loan, in the event of the applicant's death or disability, providing financial stability for the household.

Normally, banks encourage this insurance to be taken out by the credit institution itself, offering a reduction in the loan spread as a bonus. According to the Bank of Portugal, the spread is a component of the interest rate that is freely defined by the credit institution for each contract, taking into account the client's credit risk, the ratio between the value of the loan and the value of the property and its financing cost. As mentioned above, the spread can be reduced in return for purchasing other products (such as life insurance, for example).[1] However, despite this benefit, taking out life insurance may be more advantageous with another insurer, as the difference in premiums and cover offered may offset the reduction in the spread.

Nowadays, with the wide variety of Life Risk products associated with home loans, insurers are adjusting their rates and this type of life insurance can be purchased at very low prices.

This represents a challenge for the insurance market since, although it is desirable to practice a competitive pricing policy, the profitability of the products must not be jeopardised on offer.

[1] https://clientebancario.bportugal.pt/pt-pt/taxas-de-juro-no-credito-habitacao

1.2 Problem Statement and Research Motivation

The current downward trend in life insurance rates associated with home loans represents a complex challenge for insurers, as they are forced to constantly review their rates to keep up with market prices. This premium review requires a careful and demanding analysis because, as mentioned above, there needs to be a balance between affordable premiums and product profitability.

CA Vida, the insurance company where this study was carried out, has suffered consequences as a result of this market trend, namely the difficulty in retaining customers for this product associated with home loans and the increase in policy cancellations, also associated with this product. Against this backdrop, it is essential to analyse the possibility of reducing the premium without compromising the sustainability of the product. This is the problem to be solved.

1.3 Main goals and approach

The main objective of the work carried out at *CA Vida* was to analyse the problem mentioned above and present a possible solution to the product marketed.

To achieve this objective, a market study was carried out to ascertain both the conditions of this Life Risk product in the various insurance companies and to compare the premiums charged by the competition. Next, an analysis was made of the company's total portfolio of life insurance associated with home loans, to gain a better understanding of the ages and types of this insurance where the highest number of cancellations was found. Both of these analyses were crucial to understanding how *CA Vida* is positioned in the competing insurance market and identifying areas for improvement, both in terms of the pricing structure and the cover offered.

Based on the results of the initial analyses, we carried out a premium review of this product and then applied some measures, in order to achieve scenarios where the price charged by the company is on par with the market price. Bearing in mind that the price of insurance is not the only factor to consider, it was necessary to analyse the impact that the rate change would have on the company's results, because, as mentioned above, the product must also be profitable and sustainable.

The framework for the study is IFRS 17, a standard that applies to all entities but primarily to insurance companies. IFRS are accounting standards that companies must adhere to when preparing and publishing their financial statements. By embracing the standard, insurance companies can achieve transparency, accountability and economic efficiency.

1.4 Structure of the document

Chapter 2 presents a descriptive analysis of the IFRS 17 framework, with special emphasis on the measurement of groups of contracts through the projection of cash flows; Chapter 3 presents the results of the market study carried out in terms of coverage and premiums for the risk product associated with home loans; Chapter 4 analyses the portfolio associated with this product and presents the cash flow projections of the contracts of interest to the study, which will serve as a basis for

measuring the impact of the premium adjustments developed in Chapter 5; in Chapter 5, different scenarios for the premiums to be charged are subsequently assessed and compared once again with the values observed in the market; Chapter 6 presents the final conclusions of this report.

Chapter 2 - Analysis of Mortgage Life Insurance under IFRS 17

2.1 IFRS 17 Insurance Contracts

The International Accounting Standards Board[2] (IASB) is an independent, private-sector body, based in London, that develops and approves International Financial Reporting Standards (IFRS).

IFRS are a set of accounting standards that companies must follow when preparing and publishing their financial statements. This standardised way of describing a company's financial performance allows for a more accurate comparison between companies in the same sector.

In line with this objective of standardisation and comparability, IASB issued IFRS 17 Insurance Contracts[3] in an effort to standardise the recognition, measurement, presentation and disclosure of insurance contracts by insurance firms in their financial reports.

On January 1st of 2023 IFRS 17 became effective and replaced IFRS 4 - that allowed companies to continue using local accounting practices, leading to non-comparability among entities in the sector across different jurisdictions.

By embracing IFRS 17, insurance companies can achieve transparency, accountability and economic efficiency, which improves international comparability, enabling investors and other market participants to make informed economic decisions.

2.1.1 Scope

IFRS 17 applies to all entities, but mainly insurance companies, which issue insurance contracts.

According to IFRS 17, an insurance contract[4] is defined as "A contract under which one party (the issuer) accepts significant insurance risk from another party (the policyholder) by agreeing to compensate the policyholder if a specified uncertain future event (the insured event) adversely affects the policyholder."

IFRS 17 also applies to reinsurance contracts, as this is a type of insurance contract where one entity (the reinsurer) agrees to compensate another entity (the insurer) for claims arising from one or more insurance contracts issued, and to investment contracts that have the characteristics of discretionary participation. According to the IFRS Foundation (2020), these investment contracts are defined as financial instruments that provide an investor with the contractual right to receive, as a supplement to an amount not subject to the issuer's discretion, additional amounts expected to constitute a significant portion of the total contractual benefits. The amount or timing of the

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[2] https://www.ifrs.org/groups/international-accounting-standards-board/

[3] https://www.ifrs.org/issued-standards/list-of-standards/ifrs-17-insurance-contracts/

[4] https://www.ifrs.org/projects/completed-projects/2025/guarantees-issued-on-obligations-of-other-entities/tad-and-cls-guarantees-issued/

additional amounts is contractually at the issuer's discretion and are based on the returns on a given group of contracts or a given type of contract, the returns on investment, realised or unrealised, in a given group of assets held by the issuer or the profit or loss of the company issuing the contract.

However, an insurance contract may have components that should be separated and excluded from the scope of IFRS 17, which are investment components, embedded derivatives or service components. These should be accounted for in accordance with the relevant IFRS standards, as an alternative to IFRS 17. Unbundling is not necessary if there is a strong interrelationship between both components and if the component cannot be supplied separately in a non-insurance contract in the same market or jurisdiction.

2.1.2 Level of aggregation

Following IFRS Foundation (2019), an entity is required to recognize and measure individual contracts, when applying IFRS standards. However, this general requirement is not applied in IFRS 17. An important part of the standards defined in IFRS 17 is the level of aggregation of insurance contracts, which establishes clear rules for how insurance companies should group their contracts to measure and recognise their profit.

This aggregation is based on three criteria: firstly, the insurance company must identify a *portfolio* of insurance contracts that are subject to similar risks and are managed together; secondly, the portfolio should then be divided up based on the *level of profitability* of the contracts, i.e. separating the contracts into those that are onerous at the time of initial recognition, and those that, at the time of initial recognition, have no significant possibility of becoming onerous and the remaining; thirdly, insurance companies are also subject to the *annual cohort requirement*, which establishes an extra segmentation of groups of contracts based on their date of issue.

The groups of contracts, which were established according to the segmentation presented above, were defined at the time of initial recognition, and there is no possibility of subsequently reassessing the composition of the groups. Likewise, adding contracts to existing groups is done on the date they are recognised.

Given that insurance companies, in accordance with this new level of aggregation imposed by IFRS 17, measure and recognise results by groups of contracts, these constitute the unit of account for measurement purposes.

2.1.3 Measurement Models for Groups of Contracts

Within IFRS 17 there are three models for measuring groups of contracts. These are: the General Measurement Model (GMM), also known as Building-Block Approach (BBA), the Premium Allocation Approach (PAA) and the Variable Fee Approach (VFA).

General Measurement Model

The GMM is the standard measurement model for insurance contracts, excluding those with direct profit sharing.

At initial recognition an entity shall measure a group of contracts as the total of the amount of Fulfilment Cash Flows (FCF), which comprises: (i) estimates of future cash

flows; (ii) an adjustment to reflect the time value of the money and the financial risks associated with those future cash flows; (iii) the Risk Adjustment (RA) for nonfinancial risk; (iv) the Contractual Service Margin (CSM) representing the unearned profit from the contract.

The first component, estimate of expected future cash flows, represents the expected cash inflows and outflows that are directly related to fulfilment of the contract and should only consider cash flows within the contract boundary. The estimates of future cash flows should be unbiased, current and explicit, i.e., not consider the effect of discounting or risk adjustment. They also should include all information on amount, timing and uncertainty of cash flows and reflect the entity's perspective. In this segment, the definition of contract boundary is very important, as it establishes the cash flows that will be included in this calculation. Therefore, cash flows within the contract boundary are understood to be the ones arising from substantive rights and obligations that exist during the reporting period in which the entity can compel the policyholder to pay the premiums or has a substantive obligation to provide the policyholder with insurance contract services.

The second component, the discount rate, is applied to the estimates presented above, to reflect the time value of money and the financial risks attached to the cash flows. The result is called Best Estimate Liability (BEL). According to IFRS Foundation (2018a), the discount rate shall reflect the time value of money, the characteristics of the cash flows and the liquidity characteristics of the insurance contracts; it should be consistent with observable market prices for financial instruments with cash flows whose characteristics are consistent with those of the insurance contracts, in terms of, for example, timing, currency and liquidity and exclude factors that influence such observable market prices but do not affect the future cash flows of the insurance contracts.

The third component of the fulfilment cash flows is the **risk adjustment**. IFRS Foundation (2018b) states that the risk adjustment reflects 'the compensation an entity requires for bearing the uncertainty about the amount and timing of the cash flows that arises from non-financial risks as the entity fulfils insurance contracts'.

IFRS 17 does not describe any calculation method for this component, but insurance companies must specify the method and confidence level they are using to calculate the RA.

According to IASB (2010) – *Exposure Draft*, the risk adjustment shall have the following characteristics: risks with low frequency and high severity will result in higher risk adjustments than risks with high frequency and low severity; for similar risks, contracts with a longer duration will result in higher risk adjustments than those of a shorter duration; risks with a wide probability distribution will result in higher risk adjustments than those risks with a narrower distribution; the less that is known about the current estimate and its trend, the higher the risk adjustment shall be and to the extent that emerging experience reduces uncertainty, risk adjustments will decrease and vice versa.

Also, according to this source, three approaches have been proposed for calculating the risk adjustment component, which are Value at Risk, Tail Value at Risk and Cost of Capital.

As previously stated, the entity should measure the group of contracts as the total amount of fulfilment cash flows and an additional component, which is the CSM, the fourth component. On initial recognition, the CSM represents the expected profit of a group of contracts that the insurance company will recognise in Profit and Loss (P&L) as services are provided.

For groups of profitable contracts, CSM is positive and corresponds to the difference between the present value of outflows and the present value of inflows (BEL), considering the risk adjustment.

Following Berry, T. et al (2020), in order to determine how much profit should be recognised in each period, the entity is required to identify the amount of service provided by the group of contracts (known as 'coverage units'). The number of coverage units in a group is determined by considering, for each contract, the quantity of the benefits provided under a contract and its expected coverage period.

The release of CSM is then calculated as follows

$$\text{Release of CSM} = \frac{Coverage\ units\ in\ the\ period}{Total\ coverage\ units} \quad (1)$$

When CSM is negative for a group of contracts, this means that the group is onerous and a loss component (LC) should be recognised immediately in Profit and Loss with no CSM being recognised, i.e. the group's CSM is equal to zero.

All the GMM components presented above are essential for estimating insurance contract liabilities. However, IFRS 17 establishes two types of liability: Liability for Remaining Coverage (LRC) and Liability for Incurred Claims (LIC).

The Liability for Remaining Coverage is related to the insurer's obligation to provide insurance coverage in the future. It is calculated as the sum of the BEL, that is the present value of cash inflows and outflows, RA and CSM.

On the other hand, the Liability for Incurred Claims is related to the insurer's obligation to settle claims that have already been incurred but are not paid yet. Under IFRS 17, it is calculated as the sum of the Best Estimate Liability and the Risk Adjustment.

Premium Allocation Approach

The PAA model is a simplified version of the GMM for measuring the LRC. It is an optional approach for short-term contracts, i.e. contracts with a maximum coverage period of one year. In this model, at initial recognition, the LRC is equal to the amount of unearned premiums, so that at the moment there is no profit or loss.

Variable Fee Approach

The VFA model is based on the general model, but has additional features for contracts with direct participation, to deal with contracts where payments depend on underlying assets.

At initial recognition, no difference is visible between the GMM and the VFA, but in subsequent measurements the VFA allows the movement on the fair value of the underlying items to impact the CSM each period, recognising that future profitability is significantly impacted by market movements.

2.2 IFRS 17 and premium review

As mentioned in the previous chapter, a premium review was carried out on the Mortgage Protection risk product, with the aim of making *CA Vida* more competitive in the market. To analyse the impact of the premium change on the company, using the portfolio in force on 31 December 2024, cash flow projections were made (using the GMM model, considering the product's characteristics) and the respective CSM and LC analysis.

This knowledge of the IFRS 17 standard was crucial to conduct the research and ultimately solve the problem stated in Chapter 1, namely by the use of sensibility analysis.

Chapter 3 - Comparative Analysis of Insurance Coverages and Premiums

Following the objectives defined in Chapter 1 and considering the need to reposition *CA Vida's* Mortgage Protection product on the market, a comparative analysis was made of the cover available in the products marketed by other insurance companies and the premiums applied by them. Information was collected from five insurance companies, selected because they are the main competitors of the insurance company where the internship took place and because they provided the necessary data for the analysis in an accessible way, based on consultation of public documents, including commercial documents, product data sheets, and simulations accessible through online platforms. The insurance companies have not been identified to guarantee impartiality and confidentiality in the analysis.

3.1 Coverages Offered in the Market

The coverage available in the risk products associated with home loans may differ between insurance companies, but in general they follow a common pattern that corresponds to the minimum protection required by banks when granting a home loan. The following table (Table 1) shows the results of the comparative analysis of the cover offered by the selected insurance companies. These coverages are divided into Basic Coverages, which correspond to the minimum protection offered by the product, and Complementary Coverages, which are optional and generally offer more extensive protection. For clarity the following abbreviations are used throughout the table: ADD (Absolute and Definitive Disability), DDPCA (Definitive Disability for the Profession or Compatible Activity) and DTA (Death by Traffic Accident).

Insurance Company	Basic Coverages	Complementary Coverages
Insurance A	Death and ADD	DDPCA (60%) or DDPCA (65%) and DTA
Insurance B	Death and ADD	DDPCA (60%) or DDPCA (65%)
Insurance C	Death and ADD	DDPCA (65%)
Insurance D	Death, ADD and Dependent Minor Children	DDPCA (60%)
Insurance E	Death and ADD	DDPCA (60%)
CA Vida	Death and ADD	DDPCA (66%), DTA and DDPCA by Traffic Accident

Table 1. Coverage Comparison Across Insurers
Source: CA Vida. Manual de Produto CA Proteção Crédito Habitação and anonymised insurers' websites

From the analysis carried out, despite some differences, the aforementioned pattern can be seen in both the basic and complementary coverages. The main basic covers are Death and Absolute and Definitive Disability, which make up the minimum protection

required by the bank. Both coverages guarantee the payment of the insured capital in the event of death, whether due to illness or accident, and in the event of Absolute and Definitive Disability, which covers events that, also due to illness or accident, result in a disability equal to or greater than 85%. The same can be said for complementary coverages. These covers are optional, making the premiums for this product more expensive, as they provide more comprehensive protection. The most common complementary cover is Definitive Disability for the Profession or Compatible Activity, which guarantees payment of the insured capital following events which, due to illness or accident, prevent the insured from carrying out their professional activity or a compatible professional activity and which cause an incapacity equal to or greater than a certain percentage. Here, it is possible to identify a greater difference between the insurance companies analysed, as the percentage of disability varies. However, it should be noted that the most common percentage applied is 60%. This could be a factor to take into consideration when changing the Home Loan Protection product marketed by *CA Vida*.

3.2 Insurance Premiums in the Market

One of the main objectives of this work is to make the necessary adjustments to the pricing of the Mortgage Protection product marketed by *CA Vida* so that the company's prices are more aligned with those practised on the market. However, as mentioned in Chapter 1, this adjustment should not compromise the product's long-term sustainability.

Therefore, it was essential to analyse the premiums charged by some insurers to understand *CA Vida's* position in relation to the competition in terms of cost. To this end, commercial proposal simulations were carried out for people aged 20 to 60 and with an insured capital of 100.000 euros. The following table (Table 2), shows the results obtained, in euros, for the same group of insurers, considering Basic Cover, Death and Absolute and Definitive Disability.

Age	Insurer A	Insurer B	Insurer C	Insurer D	Insurer E	*CA Vida*
20	39,21	56,17	63,19	45,77	46,08	59,64
30	35,18	49,94	56,18	38,36	45,60	66,00
40	79,34	87,65	103,12	86,23	97,92	126,96
50	208,36	233,23	274,39	226,57	279,24	347,16
60	569,80	755,32	755,32	618,09	347,16	1.201,56

Table 2. Annual premium, in euros, for basic coverages (Death and ADD) by age and insurer
Source: CA Vida. Simulador CA PCH and anonymised insurers' websites

Table 2 shows that annual premiums vary significantly between the companies analysed, with insurer A standing out as the most competitive, both for younger and older ages. A possible reason for the fact that premiums at 20 are higher than premiums at 30 is the mortality hump, see Dickson, Hardy and Waters (2019).

CA Vida has higher premiums for most of the ages analysed, which highlights the need for a premium review, to make the product marketed by this company more attractive, given the need to retain the portfolio.

It is also important to compare the premiums that insurers charge when the insured person takes out complementary coverages. The following two tables, Table 3 and Table 4, show the results obtained, in euros, considering the most common complementary covers, Death and Definitive Disability for the Profession or Compatible Activity, for the same group of insurers and the same ages. However, as the insurers have different percentage levels for this type of disability, to simplify the comparison, two tables are presented below, where Table 3 shows the premiums charged by insurance companies for a disability of 60% or more and Table 4 shows the premiums charged by insurance companies for a disability of 65% or more. As the final objective is to compare insurance companies with *CA Vida*, the amounts charged by this insurer are found in both tables, even though the degree of disability is equal to or greater than 66%.

Age	Insurer A	Insurer B	Insurer C	Insurer D	Insurer E	*CA Vida*
20	76,36	82,31	-	80,08	74,64	83,04
30	67,23	76,67	-	67,12	73,20	91,92
40	121,45	132,22	-	135,88	137,52	176,64
50	319,46	404,62	-	341,04	358,80	483,00
60	873,23	1.437,79	-	950,58	840,84	1.561,20

Table 3. Annual premiums, in euros, for complementary coverages (Death and DDPCA -60%) by age and insurer
Source: CA Vida. Simulador CA PCH and anonymised insurers' websites

Age	Insurer A	Insurer B	Insurer C	Insurer D	Insurer E	*CA Vida*
20	70,20	74,18	86,34	-	-	83,04
30	61,84	69,46	81,27	-	-	91,92
40	114,42	118,67	139,61	-	-	176,64
50	300,99	313,92	369,31	-	-	483,00
60	822,66	1.043,45	1.094,29	-	-	1.561,20

Table 4. Annual premiums, in euros, for complementary coverages (Death and DDPCA - 65%) by age and insurer
Source: CA Vida. Simulador CA PCH and anonymised insurers' websites

The conclusions drawn from analysing Tables 3 and 4 align with the conclusions drawn earlier from Table 1. There is also a significant difference between the annual premiums of the different companies and *CA Vida* stands out as charging the highest ones.

Table 3 compares insurance companies that consider disability to be equal to or greater than 60% with *CA Vida's* practice that applies the 66% criterion. A lower percentage of disability implies more comprehensive cover. However, despite this situation, the premiums charged by *CA Vida* to its policyholders are higher than the insurers analysed under these conditions for most ages. The same can be seen in Table 4, where insurance companies that set the disability threshold at 65% are compared with *CA Vida*, which

charges a slightly higher percentage. Although the difference is minimal, it can be seen that *CA Vida* also charges higher premiums than its competitors. This once again emphasises the need for a premium review, but first an analysis based on public information should be carried out to try to justify the observed differences among the premiums.

One of the factors that may contribute to such a significant difference between the risk product premiums charged by the different insurers analysed is the distribution model, since insurers that operate through mediation networks have additional costs with commercial commissions, while companies that exclusively use direct channels do not have. However, even for insurers operating through mediation networks, the associated costs can change, considering the size of the business and the kind of Reinsurance treaties applied.

To investigate this possibility, a search was made of insurers' 2024 annual reports. However, only *CA Vida* and insurers D and E had this document publicly available. As a first analysis, these three insurers were compared based on information relating to production in 2024, i.e. premiums received and mediation remuneration, as these three companies operate using this model. To do this, the percentage of premiums allocated to mediation fees was calculated.

According to *Relatório e Contas CA Vida (2024)*, *CA Vida* has the highest percentage, approximately 22,33%, followed by insurer D which has a much lower value of approximately 4,46% and finally insurer E which has a slightly lower value than the previous one, approximately 3,24%. *CA Vida* has a significant cost associated with the mediation model compared to the other insurers, which have a more moderate remuneration strategy. The difference observed in this analysis is notable and is one of the factors that justifies *CA Vida's* high premiums, since the premium charged must support the associated costs, otherwise the product will not be sustainable, and an insurer with higher costs will not be able to achieve premiums as low as those shown above in Tables 2, 3 and 4. In fact, if *CA Vida* adopted a mediation remuneration system similar to those practised by insurers D and E, with a 3,92% commission rate (the average for the aforementioned insurers), it would be possible to reduce premiums for basic and complementary cover by around 15%. This would put *CA Vida* in a stronger position, aligning it with market trends. In addition, since it was not possible to access the 2024 annual report of insurers A, B and C the 2023 annual report was used, as it is the most updated publicly available information to analyse the same factor mentioned above. However, as the aim is to compare *CA Vida* with its competitors, its 2023 annual report was also analysed.

According to *Relatório e Contas CA Vida (2023), CA Vida* is the insurer with the highest percentage of premiums allocated to mediation fees, approximately 9,32%, followed by insurer A with 2,84% and finally insurers B and C with approximately 1,64% of premiums allocated to mediation fees. Although the difference is less significant, it is still evident and proves again that this factor may be one of the reasons why *CA Vida's* premiums are higher. Once again, if *CA Vida* had adopted the same mediation remuneration as insurers A and B and if the percentage of premiums allocated to commissions had been set at the average of 2,24% practised by these two insurers, it would have been possible to decrease the premiums applied to basic and complementary coverage by

approximately 6,48%. The smaller decrease in premiums compared to the 2024 scenario is due to mediation remuneration as a percentage of the premiums being significantly higher in 2024 than in 2023.

From the last analysis made, it is important to note that insurers B and C are separate companies operated by the same entity, so the annual report is produced to reflect the group's results for the year, and for this reason only one value is mentioned for both insurers. However, they were analysed separately, since insurer C is positioned as a digital insurer, focused on direct sales, and insurer B adopts a more traditional approach and operates through mediation networks. Another important observation is the difference in the percentage of premiums allocated to mediators from 2023 to 2024 at *CA Vida*. Following *Relatório e Contas CA Vida (2024)*, this is a difference of approximately 13,01 percentage points, which was due to the fact that over 2024 the company realized that the production was falling and consequently decided to increase the mediation fees, because of the cooperation and commitment made to boosting the Company's products among the Mediation Network. This resulted in an increase of approximately 4% in mediation remuneration compared to 2023. In the end, the volume of business in 2024 fell by approximately 53% compared to 2023.

As can be seen from the analysis carried out, the insurers mentioned in this report operate through mediation networks. However, as said above, the type of reinsurance treaty applied is also a factor that may explain the observed difference in premiums.

According to Centeno and Simões (2014), reinsurance, often referred to as insurance for insurance companies, is a contract between a reinsurer and an insurer. In this contract, the insurance company - known as the ceding party or cedent - transfers some of its insured risk to the reinsurance company. The reinsurance company then assumes all or part of one or more insurance policies issued by the ceding party.

Reinsurance operations can be organised on either a proportional or a non-proportional basis. With proportional reinsurance, the insurer and reinsurer share the risk and premium proportionally. With non-proportional reinsurance, there is no fixed proportion for the division of premiums, and the reinsurer only assumes risk above a certain limit.

CA Vida adopts a mixed reinsurance strategy that includes proportional reinsurance (namely Quota Share and Surplus) and non-proportional reinsurance for Excess Damage per event (Catastrophe cover). In Quota Share reinsurance, the distribution of premiums and claims payable is established according to a fixed percentage. This type of reinsurance is only available for certain covers, and it will not be mentioned throughout the report. Surplus differs from Quota Share in that no percentage is set on each risk; rather, there is a limit on the insurer's retention, known as *pleno* (in *CA Vida's* case, this is a fixed amount corresponding to €55.000). Above this amount, the risk is covered by reinsurance. The proportionality of this reinsurance is established for each risk depending on the insured amount.

Although direct access to the type of reinsurance contract adopted by each company is not possible, it was possible to calculate the percentage of premiums allocated to premiums ceded to reinsurers through each insurer's annual report. According to *Relatório e Contas CA Vida (2024)*, *CA Vida* ceded approximately 16,81% of its premiums

to reinsurers. This was followed by insurer D with 3,21%, and finally insurer E with less than 1%. Due to some insurers not having their 2024 annual report publicly available, the 2023 annual report was analysed instead. According to *Relatório e Contas CA Vida (2023)*, *CA Vida* ceded approximately 7,44% of its premiums to reinsurers in 2023, while insurers B and C ceded 19,87%. It should be noted that insurer A does not present this value in its report, possibly because it operates as an insurance broker rather than a direct underwriter. These figures reveal significant differences in the percentage of premiums allocated to reinsurers, reflecting the various risk management strategies employed by different insurers, which may be reflected in the premiums they charge.

The above analysis was conducted to try to justify the significant difference between *CA Vida's* observed premiums and those of different insurers, based on publicly available information. However, it is also important to consider each insurer's position in the national life market, as this may affect their ability to offer lower prices. To complement the previous analysis and better understand *CA Vida's* positioning, the life market shares of the insurers included in this chapter were compared.

According to *Autoridade de Supervisão de Seguros e Fundos de Pensões* (ASF) (2024), *CA Vida* held a market share of around 0,95%, placing it in a relatively modest position compared to some competitors. The group comprising insurers B and C had a market share of 3,02%, while insurer D achieved a market share of 5,08%, establishing itself as one of the most significant entities among those analysed. Insurer E achieved a market share of 0,92%, very close to that of *CA Vida*. As mentioned before Insurer A does not appear in the official ASF statistics regarding market share because it operates as an insurance broker and not as a direct underwriter. Therefore, its production is accounted for the insurers it represents. Smaller insurers such as *CA Vida* may find it more difficult to keep up with the prices of more consolidated insurers who benefit from greater negotiating power with partners and greater capacity to absorb costs because of the greater volume of business.

The previous analysis attempted to partially justify the differences observed in the premiums charged by the different insurers, but it is important to recognise that there are other important variables that influence premiums, such as the actuarial assumptions adopted, the pricing structure or the calculation formula. These aspects – adequacy of mortality and disability assumptions – will be further explored in Chapter 5, where the technical adjustment of premiums is addressed in detail. Nevertheless, the analysis is constrained by the limited availability of public information, which prevents a fully exhaustive comparison. Given the values presented, it is likely that *CA Vida* may not be able to match the lowest premium levels observed in some competitors. Even so, a premium revision remains essential to ensure greater market competitiveness. Before addressing this matter in Chapter 5, Chapter 4 will present a detailed analysis of the portfolio’s behaviour which will support the decision-making process for the premium adjustment.

Chapter 4 - Foundations for Premium Adjustment: Product and Portfolio Analysis

This chapter aims to analyse the behaviour of the portfolio associated with the Mortgage Protection product. There are different versions of the product, each of them corresponding to alterations made over time, for example in terms of the premiums applied. The version currently in force and available on the market is version 8 and has been available since the beginning of 2023. All versions will be mentioned in this chapter, as in some cases a comparison with the current version is appropriate. It is important to note that, in the adopted nomenclature, higher numbers correspond to the most recent versions. When there are two insured people, number 2 is added; for instance, version 8 refers to one life insured and version 28 is the same version with two lives.

This chapter is divided into two subsections, with analyses that are crucial to the premium adjustment carried out in Chapter 5. Firstly, the behaviour of the portfolio linked to this product will be analysed in terms of new business and cancellations over the last two years, to understand the dynamics of withdrawals and identify relevant patterns. Secondly, the results of the projection of future cash flows of version 8 contracts in force on 31 December 2024 will be presented. This provides a complete view of the long-term performance of the portfolio and will serve as a comparison to measure the impact of the premium adjustment in Chapter 5. This study of the current situation is essential to ensure that the proposed decisions are based on a rigorous diagnosis of the reality observed.

4.1 Portfolio Analysis

This section presents the results of the descriptive analysis carried out on the total portfolio of *CA Vida's* Mortgage Protection product, with particular emphasis on its behaviour over the last two years, 2023 and 2024. Recall that 2023 is the starting year for version 8, the one currently offered by the company. This type of analysis is fundamental to understanding in which age groups the product is losing competitive advantage.

Firstly, the evolution of new business and cancellations was compared for the years 2023 and 2024. In 2023, 6.461 policies were issued and 2.138 were cancelled, of which 5.192 and 59, respectively, were version 8 policies. This number increased slightly in 2024 to 6.778 new policies and 2.368 cancellations, of which 5.085 and 117, respectively, were version 8 policies. Despite the increase in cancellations there was also an increase in new business, showing a certain balance.

To better understand the profile and behaviour of policyholders, analyses were carried out on insurance contract issuance and cancellations. The analysis began with observing the distribution of new business, contracts issued in 2023 and 2024, by age. This analysis is shown in Figure 1, and it makes it possible to characterise the insured's profile and assess whether the premium adjustment in Chapter 5 is appropriate for this product's target audience.

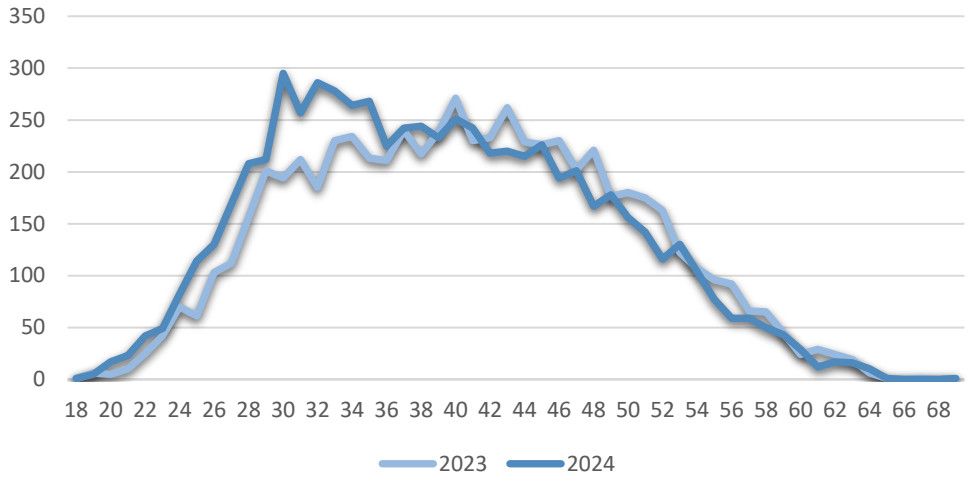

Figure 1. New Policies issued by age
Source: CA Vida

As can be seen in Figure 1, the most common ages of policyholders when policies are issued are between 30 and 45. This result is consistent as it corresponds to the stage of life when many individuals purchase their first home or renegotiate their credit. This concentration reinforces the importance of ensuring that premiums applied to these ages are competitive, as they represent the main driver of growth for this risk product.

It is also important to understand which age groups most frequently cancel their policies. Figure 2 analyses the distribution of cancellations by age in 2023 and 2024 to this end.

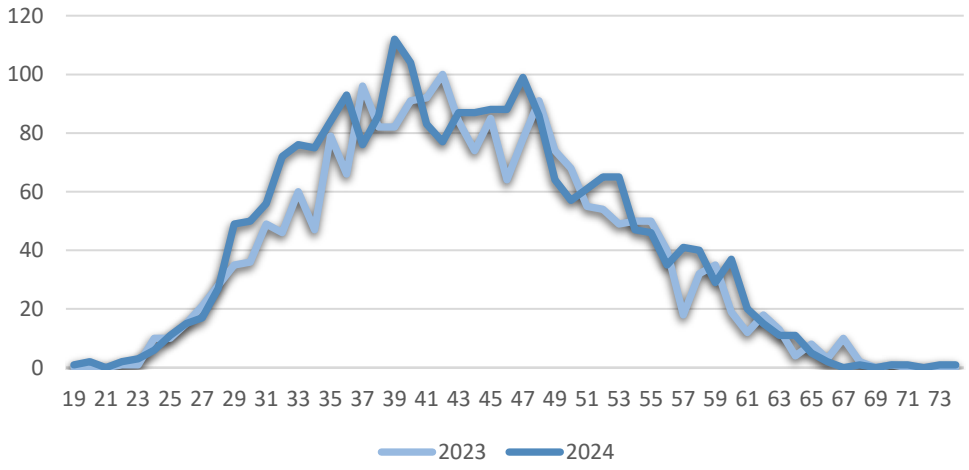

Figure 2. Policy Cancellations by age
Source: CA Vida

Figure 2 shows a greater concentration of cancellations among individuals aged 35 to 50, suggesting that this segment of the portfolio has a greater propensity to cancel the policy before its expected term. However, it should be noted that from the age of 45 onwards the number of cancellations tends to decrease progressively, indicating greater loyalty from this age onwards, possibly due to older policyholders being less inclined to pursue alternative solutions than younger individuals. Following the premium

adjustment carried out in Chapter 5, this information will also be essential to assess the alignment of the new premiums with the observed behaviour of the portfolio.

The crossover observed in the most common ages for issuing and cancelling policies may indicate that policyholders between ages 30 and 50 are more price-sensitive or have more active behaviours in searching for better solutions for their life insurance associated with home loans.

However, to further analyse the behaviour of the portfolio associated with this risk product the percentage of cancelled policies for each product version was calculated. This was achieved by considering the total number of policies in force in each year and within this set of policies those that were cancelled were identified.

Product Version	Cancellation Rate (2023)	Cancellation Rate (2024)	Variation in Cancellation Rate
2	3,42%	3,21%	-0,21 pp
3	4,17%	3,34%	-0,83 pp
4	-	-	-
5	4,17%	3,64%	-0,53 pp
6	4,79%	4,41%	-0,38 pp
7	4,08%	4,87%	0,79 pp
8	1,70%	2,36%	0,66 pp
9	0,79%	0,67%	-0,12 pp
22	4,28%	2,87%	-1,41 pp
23	4,41%	4,20%	-0,21 pp
24	4,76%	3,16%	-1,60 pp
25	3,93%	3,34%	-0,59 pp
26	5,02%	3,80%	-1,22 pp
27	4,98%	5,88%	0,90 pp
28	1,51%	2,76%	1,25 pp
29	0,62%	1,27%	0,65 pp

Table 5. Policy cancellation rates by product version in 2023 and 2024
Source: CA Vida

As mentioned above, versions 22, 23, 24, 25, 26, 27, 28 and 29 are identical to versions 2, 3, 4, 5, 6, 7, 8 and 9, respectively, but apply to policies with two insured persons. It should be noted that versions 9 and 29 correspond to policies issued for employees of the company. Although these versions are currently active, no premium adjustment will be proposed, due to their internal and exceptional nature, but they are included in the analysis of this chapter for study purposes. As can be seen in Table 5, the analysis does not include cancellation rates for version 4, as there were no policies in force associated with this version during the analysed period. In addition, the cancellation rates in 2023 and 2024 for the different versions of the Mortgage Protection product remained

relatively stable, but versions 7, 8, 27 and 28 stand out as there was a slight increase in the cancellation rate from 2023 to 2024. Although this difference is minimal, it may reflect changes in market conditions. After calculating the cancellation rates for this risk product at *CA Vida* in 2023 and 2024, an attempt was made to understand when these cancellations occur over the life of the contracts. To this end, the duration of the policies cancelled between 2016 and 2024 was assessed and then the average duration of these contracts was calculated. Although the analysis initially focused on cancellations in 2023 and 2024, it was later extended to include contracts issued from 2016 onwards. This was because more cancellations had occurred in older versions of the product, and it was important to assess whether the pattern of early cancellation identified in recent years was consistent with that seen in previous periods.

As can be seen in the following table (Table 6), to analyse whether cancellations are happening too early, the average duration that these cancelled contracts would have if they remained in force until the end was calculated for comparison.

Year	Average Duration of Cancelled Contracts (in years)	Expected Contractual Duration (in years)
2016	5,27	28,61
2017	5,52	28,99
2018	5,32	30,39
2019	5,65	30,45
2020	6,18	30,75
2021	6,52	31,02
2022	6,63	30,62
2023	6,74	31,81
2024	6,41	31,68

Table 6. Average Duration of Cancelled Contracts vs. Expected Contractual Duration
Source: CA Vida

Table 6 shows that there is a significant difference between the actual and expected contractual durations of cancelled contracts in the respective years. Extending the analysis over a longer period revealed that this difference remained consistently high, indicating a trend towards early cancellations. Nevertheless, since 2018, the average duration has increased slightly, except from 2023 to 2024, where there was a slight decrease.

To ensure consistency in the analysis only cancellations motivated by specific causes were considered, such as non-payment of the premium, a request by the insured or a transfer to another company. Those due to claims or contract maturity were excluded, as these do not reflect the policyholder's decision to cancel their insurance policy.

The results shown in this section have provided relevant information on the behaviour of the Mortgage Protection product portfolio, which will be important for the analysis

of the new premiums in Chapter 5. The next section will present the cash flow projection in an IFRS 17 context, which will serve as a basis for measuring the impact of the premium adjustments carried out in the following chapter.

4.2 Analysis of Projected Cash Flows under IFRS 17

This section outlines the results of the cash flow projection made for the contracts in force on 31 December 2024 for version 8 of the risk product under analysis. This projection was carried out until the end of the contracts, since after the premium adjustments made in Chapter 5 these results will serve as a basis for comparing the long-term impacts of the different scenarios presented. The table below (Table 8), shows the aggregated results derived from the projection described above. Following the description in Chapter 2 the calculations are performed in a IFRS17 framework.

Group of contracts	PV inflows	PV outflows	RA	CSM	LC
No possibility of becoming onerous	1.131.940	377.156	160.183	594.601	0
Onerous	23.262.811	12.761.288	5.419.894	5.081.629	0
Remaining	1.034.960	470.461	199.811	364.689	0
Total	25.429.712	13.608.905	5.779.889	6.040.918	0

Table 7. Contractual Projections Overview – base scenario
Source: CA Vida

As shown in Table 7, the cash inflows exceed the cash outflows in the three groups of contracts presented above. This results in a CSM of approximately 6 million euros. This value represents the contracts' expected profit for the company and will be recognised in the Profit and Loss account (P&L) as services are provided. Additionally, the CSM takes into account the RA of 5.779.889 euros, reflecting the amount that the company requires as compensation for the non-financial uncertainty associated with providing the insurance service. No LC was reported since this projection was made until the end of the contracts, as mentioned above. These results indicate that the version 8 contracts show an expectation of long-term profitability, which will be essential for comparative purposes in Chapter 5 when considering the different scenarios of premium adjustments.

The information gathered throughout this chapter, together with the comparative study carried out in Chapter 3, was fundamental to analyse the portfolio associated with this product in greater detail and its position in the market. This analysis aimed to identify the main problems that intensified the need for a review of the currently charged premiums. The next chapter presents various premium adjustment scenarios based on the actual behaviour patterns of *CA Vida* policyholders. There the technical approach will be detailed and its impact analysed based on results obtained in this chapter.

Chapter 5 - Premium adjustments

The previous discussion presented analyses that reinforced the need for a premium adjustment of *CA Vida's* Mortgage Protection product, namely through the market study carried out in Chapter 3 and the analysis of the portfolio of the product in Chapter 4.

Although results in Chapter 3 did not point out a particular cause for the premiums charged by *CA Vida* to be much higher than the ones charged by their competitors, it was suggested by the company that maybe the mortality model in use (a percentage of the GKM80 life table) is not the most adequate regarding the real mortality experience of the portfolio. Additionally, it was suggested to adjust, as an alternative, a parametric mortality model, known as Heligman and Pollard (Heligman & Pollard,1980), to the historical data of the company, including the total number of exposed people and the number of deaths/number of disabled people of different ages from 2005 to 2024. In the next subsections we show how this adjustment was made.

5.1 The Heligman-Pollard Model

Heligman and Pollard Model (Heligman & Pollard, 1980; Carriere (1992)) is a parametric mortality model that aims to represent the pattern of mortality for the whole human life span and has a biological interpretation. The model is given by

$$\frac{q_x}{1-q_x} = A^{(x+B)^C} + De^{-E\left(log\frac{x}{F}\right)^2} + GH^x \quad (2)$$

where q_x is the probability that a life aged x dies within a year and A, B, C, D, E, G and H are the parameters to be estimated. The Heligman-Pollard is an eight-parameter model containing three terms, each representing a distinct component of mortality.

The first part $A^{(x+B)^C}$ represents the child mortality pattern, where A reflects the infant mortality rate, B represents the mortality rate of a 1-year-old children and C reflects the rate of mortality decline up to early adult life. All these three parameters take values between 0 and 1. The second part $De^{-E\left(log\frac{x}{F}\right)^2}$ models the hump at age 23 that is found in many mortality tables, where D measures the severity of the hump and takes values between 0 and 1, E indicates the spread and takes positive values and F indicates the location of the mortality hump on the age axis. The last part GH^x reflects the exponential pattern of mortality at the adult ages, where G indicates the base level of adult mortality and takes values between 0 and 1 and H represents the rate increase of adult mortality and takes positive values.

Therefore, in the Heligman-Pollard Model, q_x is constructed by adding three sub models to capture specific features of child, early adult and adult mortality.

5.2 Mortality Data Analysis and Model Estimation

To estimate the observed mortality rates, q_x, throughout this chapter, the ratio between the number of observed deaths at a specific age or ages and the number of people exposed to risk observed at a specific age or ages was calculated, i.e., the following formula was used

$$q_x = \frac{d_x}{l_x} \tag{3}$$

where d_x represents the number of lives who die between age x and $x+1$ and l_x represents the number of lives alive at age x.

Before applying the model to mortality data, it was considered essential to perform an exploratory analysis of the data to get a better view of how mortality has evolved over the years. To this end, graphs representing the evolution of mortality for different ages were constructed to decide the most appropriate time interval to consider when estimating the model to guarantee results that are appropriate to the current reality, bearing in mind that it is necessary to consider a sufficiently large number of data for the model to be more accurate.

The graphs below, Figures 3,4 and 5, correspond to mortality by age groups (≤39, 40-59 and ≥60) in the different years, using data on the number of exposed people and the number of deaths from 2005 to 2024.

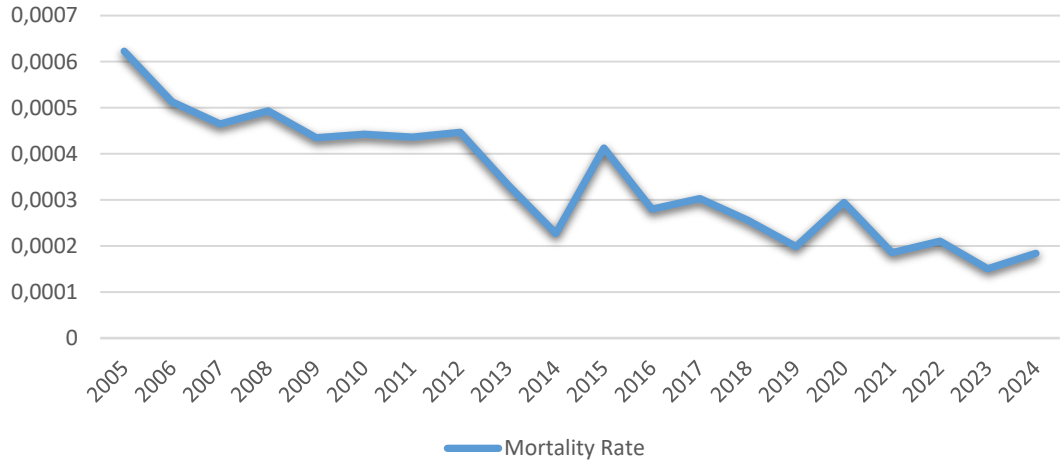

Figure 3. Mortality rate trends for ages ≤39, 2005-2024
Source: CA Vida

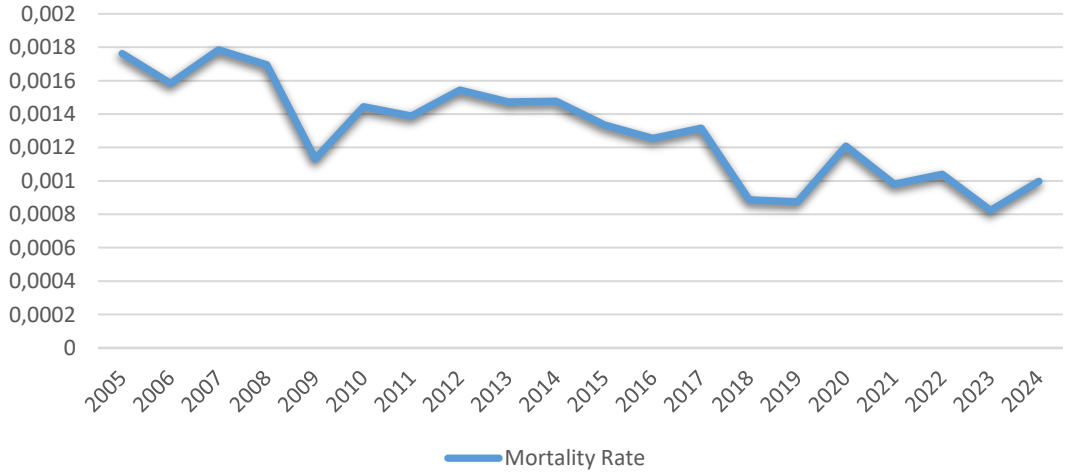

Figure 4 Mortality rate trends for ages 40-59, 2005-2024
Source: CA Vida

Figure 5. Mortality rate trends for ages ≥60, 2005-2024
Source: CA Vida

After analysing the evolution of the mortality rates between 2005 and 2024, it was observed that, for most ages, mortality rates were much higher in the early years than in more recent periods. This proves the need for this analysis, as overestimating mortality would increase premiums.

It should also be noted that, although in the ages ≥60 the rates are very volatile, from 2016 onwards they tend to stabilize. Therefore, to guarantee a sufficiently large sample, the 2016-2024 time interval was considered when estimating the model.

5.2.1 Model Estimation and Calibration

The calibration of the Heligman-Pollard model was implemented in R using the *'MortalityLaws'* [5] package. This package contains a *'MortalityLaw'* function that fits parametric mortality models to observed data (including the HP model), estimating, by default, the eight parameters using the maximum likelihood method. Before calibrating the Heligman-Pollard model, the mortality rate data observed in the time interval discussed above was smoothed to eliminate abrupt fluctuations and make the resulting function more regular. For this purpose, the *'loess'* [6] function available in R was used, which allows a smoothed curve to be fitted to the data through multiple regressions in the local neighbourhood. However, when applying this function to the aggregate mortality rate, q_x – constructed from the sum of the number of exposed people and deaths between 2016 and 2024 – a calibration of a parameter, span, which determines the smoothness of the fitted curve was required. Various span values between 0,2 and 0,9 were attempted. A lower value produces a curve that is more sensitive to local variations in the data and a higher value produces a curve that is less sensitive to point fluctuations. To choose a span that suited the data and objective, the HP model was calibrated for each span value tested and subsequently the standard deviation of the

[5] https://cran.r-project.org/web/packages/MortalityLaws/MortalityLaws.pdf

[6] https://www.rdocumentation.org/packages/stats/versions/3.6.2/topics/loess

difference between the aggregate mortality rate mentioned above and the values estimated by the model was calculated.

Span	Standard Deviation
0,20	0,005375466
0,25	0,005439992
0,30	0,005298144
0,35	0,005221404
0,40	0,005225308
0,45	0,005091551
0,50	0,004836334
0,55	0,004607476
0,60	0,004487345
0,65	0,003940323
0,70	0,003744009
0,75	0,003517568
0,80	0,003156190
0,85	0,003181591
0,90	0,004148642

Table 8. Standard deviation of the difference between observed and estimated mortality rates for different spans values

Based on the results presented in Table 8, the span value of 0,80 was selected, as it yielded the lowest standard deviation. The estimated parameters of the HP model for this selected span value are presented below (Table 9).

Parameter	Estimate
A	$7{,}46 \times 10^{-5}$
B	$4{,}44 \times 10^{-3}$
C	$1{,}69 \times 10^{-10}$
D	$4{,}14 \times 10^{-4}$
E	$1{,}14 \times 10^{1}$
F	$1{,}48 \times 10^{1}$
G	$9{,}67 \times 10^{-7}$
H	$1{,}13 \times 10^{0}$

Table 9. Estimated Parameters of the Heligman-Pollard Model, span 0,8

5.2.2 Comparison with the company's Mortality Assumption

Once the Heligman-Pollard model had been estimated, it was compared with the mortality assumption currently applied by the insurer, to assess which of the approaches

is closer to the observed data. To do this, the standard deviation of the difference between the aggregate mortality rate and the mortality assumption was also calculated.

Approach	Standard Deviation
HP model (span 0,80)	0,003156190
Current Mortality Assumption	0,007748795

Table 10. Standard deviations: model vs company assumption
Source: CA Vida

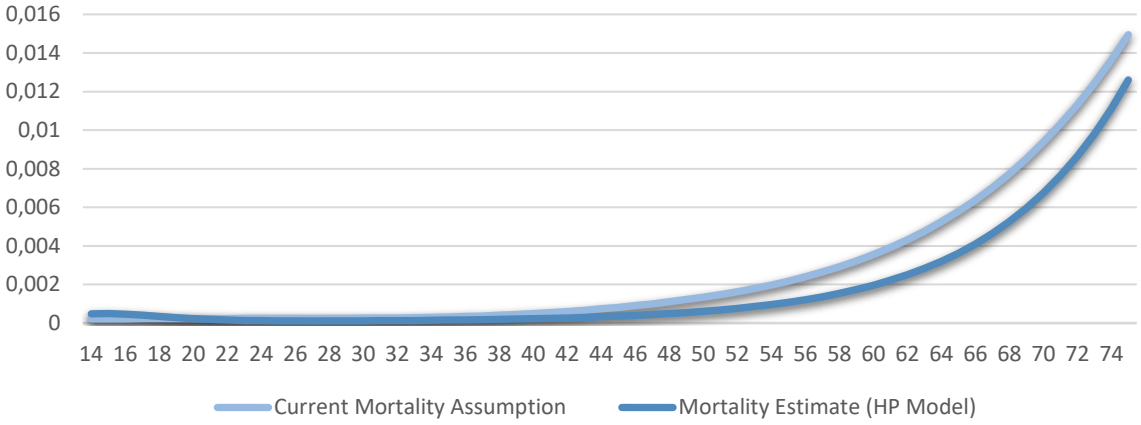

Figure 6. Mortality curves: estimated vs company assumption
Source: CA Vida

From Table 10 above, it can be concluded that the mortality rate estimated by the HP model shows a better fit of the mortality observed in the company when compared to the mortality assumption currently applied. As shown in Figure 6, mortality may therefore be overestimated.

5.3 Disability Data Analysis

CA Vida models the probabilities of absolute and definitive disability and definitive disability for the profession or compatible activity as percentages of the death probabilities, i.e., they apply the same (mortality) model. In this section the same reasoning is followed, i.e., to estimate the definitive disability rate for the profession or compatible activity, based on the data observed by the insurance company, the same model previously used to estimate mortality - the Heligman-Pollard model – was employed, since, while being different occurrences, both rely on looking at probabilities in terms of ages. However, as this is a less frequent event, there is not enough data to include in the model for ages under 21 and over 61.

Nevertheless, it is important to note that there are two types of disability included in the product, namely absolute and definitive disability and definitive disability for the profession or compatible activity, with the pure premium allocated to ADD cover being a percentage of the pure premium allocated to DDPCA cover. In this section, to estimate the observed disability rates, the ratio between the number of people with this type of disability at a specific age or ages and the number of people exposed to the risk observed at a specific age or ages was calculated. Then, the same graphical analysis was carried

out on the company's observed data from 2005 to 2024 to determine the time interval to be used in estimating this disability rate. The graphs below, Figures 7 and 8 correspond to disability rate by age groups (≤39 and ≥40) in the different years.

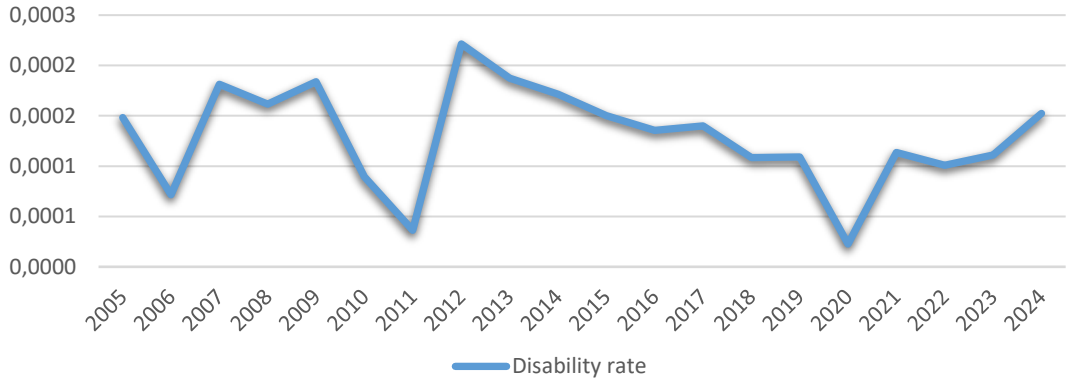

Figure 7. Disability rate trends for ages ≤39, 2005-2024
Source: CA Vida

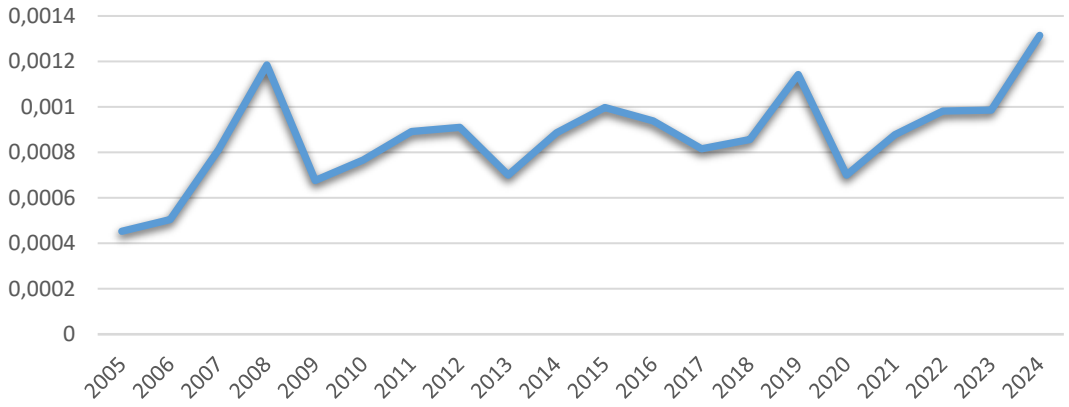

Figure 8. Disability rate trends for ages ≥40
Source: CA Vida

An analysis of the figures above shows that the disability rate is more volatile over the years, with no visible stabilization period. Even so, aligned with what was done previously and to guarantee a sufficiently large sample of data, it was decided to calibrate the model based on the same time interval, 2016-2024.

5.3.1 Model Calibration

Similarly to the mortality estimation process, we first smoothed the aggregate disability rate, constructed from the sum of the number of exposed people and the number of disabled people, observed in the aforementioned time interval using the *'loess'* function available in R.

Span	Standard Deviation
0,20	0,000268883
0,25	0,000263974
0,30	0,000209575
0,35	0,000213277
0,40	0,000187321
0,45	0,000181838
0,50	0,000189207
0,55	0,000193473
0,60	0,000202514
0,65	0,000354517
0,70	0,000394853
0,75	0,000316351
0,80	0,000275254
0,85	0,000266846
0,90	0,000275069

Table 11. Standard deviation of the difference between observed and estimated disability rates for different spans values

Based on the results presented in Table 11, the span value of 0,45 was selected, as it yielded the lowest standard deviation. The estimated parameters of the HP model for this selected span value are presented below (Table 12).

Parameter	Estimate
A	$2{,}09 \times 10^{-3}$
B	$4{,}00 \times 10^{-3}$
C	$5{,}44 \times 10^{-1}$
D	$3{,}06 \times 10^{-2}$
E	$5{,}72 \times 10^{1}$
F	$7{,}79 \times 10^{0}$
G	$8{,}43\times 10^{-7}$
H	$1{,}15 \times 10^{0}$

Table 12. Estimated Paramaters of the Heligman-Pollard Model, span 0,45

5.3.2 Comparison with the company's Disability Assumption

After estimating the Heligman-Pollard model for the disability rate, it was also compared with the disability assumption currently used by the company, to assess which approach is closer to the observed data.

Approach	Standard Deviation
HP model (span 0,45)	0,000181838
Current Disability Assumption	0,000340763

Table 13. Standard deviations: model vs company assumption
Source: CA Vida

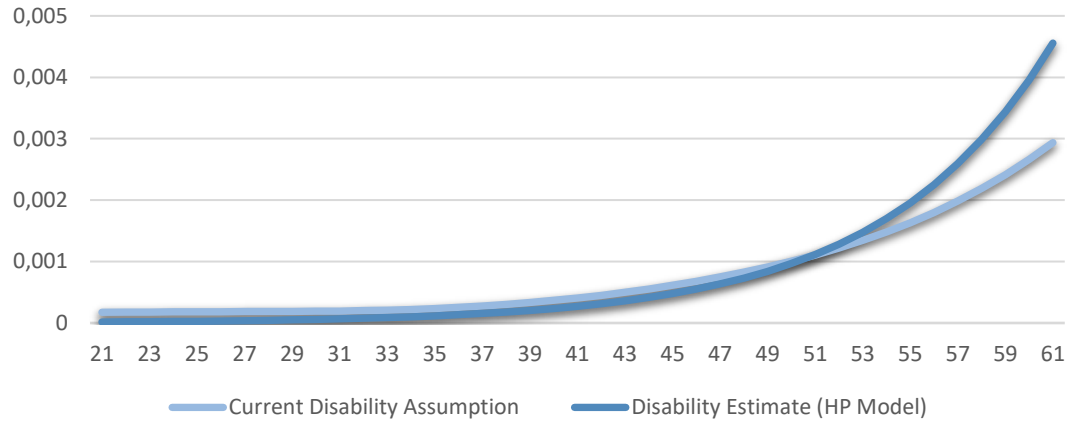

Figure 9. Disability curves: estimated vs company assumption
Source: CA Vida

According to Table 13, it can be concluded that the HP model used to estimate disability rates better fit the disability observed in the company when compared to the disability assumption currently applied. It should also be noted, from Figure 9, that the disability rate may be overestimated at younger ages and underestimated at older ages.

5.4 Adjustment for Absolute and Definitive Disability

In this project it was not possible to model the absolute and definitive disability rates with the HP model due to insufficient data, which could compromise the model's accuracy. However, since the pure premium of absolute and definitive disability corresponds to a fixed percentage of the pure premium of definitive disability for the profession or compatible activity, it was decided to follow this reasoning in its estimation. For this purpose, different percentages of the disability rate for the profession or compatible activity were tested. To see which was the best fit for the absolute and definitive disability rate, the standard deviation of the difference between the observed and estimated absolute and definitive disability rates was calculated and the percentage chosen was the one that minimised this standard deviation, representing the best compromise between simplicity and fitting the available data. Based on this criterion, the percentage chosen was 50%, so this will be the percentage used to estimate the absolute and definitive disability rate from the disability rate for the profession or compatible activity. Similarly, in this section, to estimate the observed disability rates, the ratio between the number of people with this type of disability at a specific age and the number of people exposed to the risk observed at a specific age was calculated.

5.4.1 Comparison with the company's Absolute and Definitive Disability Assumption

To investigate if these new disability rates produce better results than the assumption applied by the company, a comparison was made of the aforementioned standard deviation calculated for the estimated disability rates and the assumed disability rates. In Figure 10 we can also analyse the curves for this type of disability in both approaches.

Approach	Standard Deviation
Estimated using selected percentage (50%)	0,000626677
Current Absolute and Definitive Disability Assumption	0,000758206

Table 14. Standard deviations: model vs company assumption
Source: CA Vida

According to the standard deviation metric shown in Table 14, it can be concluded that the approach used to estimate disability rates better fits the observed disability when compared to the disability assumption currently applied.

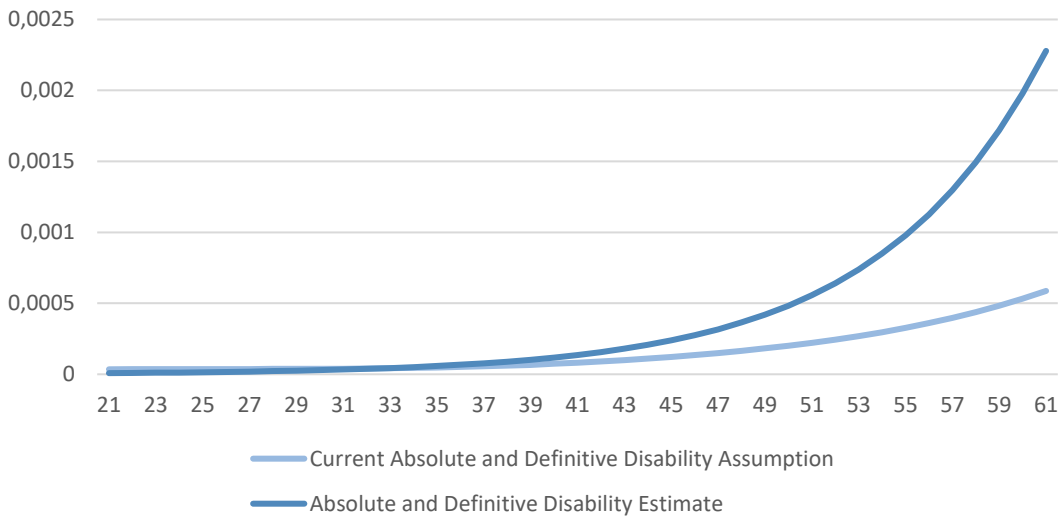

Figure 10. Absolute and Definitive Disability curves: estimated vs company assumption
Source: CA Vida

5.5 Sensibility Analysis on the Pure Premium

This section will test a new pure premium for the Mortgage Protection risk product, which has been designed to accurately reflect the observed data. Through sensibility analysis, discussed in the following sections, different multiplicative factors will be applied to the previously estimated mortality and disability rates, to determine the pure premium associated with these risk product covers at different ages. The impact of these changes on the company's results and the contractual service margin (CSM) or loss component (LC) of the contracts will then be tested.

Four adjustment factors were attempted for this analysis, namely 1,9; 2,0; 2,1 and 2,2. These figures have been chosen after a preliminary analysis, since they imply that the company takes a more conservative position, without jeopardising too much the sustainability.

5.5.1 Scenario 1 – Adjustment Factor: 1,9

In this first scenario, an adjustment factor of 1,9 was applied to the previously estimated mortality and disability rates. This initial choice aims to reduce the impact on the aforementioned metrics, ensuring that the final premiums for this risk product are aligned with the market. Lower values were tested, but by projecting the cash flows until the end of the contracts in the version 8 portfolio that was in force in December 2024, assuming the respective new pure premium, this resulted in a set of contracts with a loss component, which in this context is not appropriate. Before considering the impact of this change on the metrics presented above, Table 15 and Table 16 show the premiums achieved in this scenario under the conditions described in Chapter 3, for both basic and complementary cover. To facilitate comparison with current premiums, these will be presented along with the absolute difference.

Age	Scenario 1	Current Scenario	Absolute Difference
20	60,12	59,64	0,48
30	37,32	66,00	-28,68
40	87,12	126,96	-39,84
50	277,08	347,16	-70,08
60	1.000,68	1.201,56	-200,88

Table 15. Annual Premium, in euros, for basic coverages: Scenario 1 vs Current Scenario
Source: CA Vida

The annual premiums currently charged by the company for this product's basic cover are higher than the premiums achieved in scenario 1, except at 20 years. This scenario also results in significantly lower premiums for most ages, particularly from age 30 onwards, which could increase the product's competitiveness.

Age	Scenario 1	Current Scenario	Absolute Difference
20	61,92	83,04	-21,12
30	44,64	91,92	-47,28
40	117,36	176,64	-59,28
50	400,92	483,00	-82,08
60	1.507,32	1.561,20	-53,88

Table 16. Annual Premium, in euros, for complementary coverages: Scenario 1 vs Current Scenario
Source: CA Vida

The annual premiums currently charged by the company for complementary cover are higher than those of scenario 1 for all ages evaluated. These lower premiums may

contribute to improved alignment with market prices. In general, scenario 1 offers a more competitive premium structure than that currently practiced. However, assessing whether this greater competitiveness could result in a loss of profitability or financial balance is important.

The impact on the different metrics mentioned above is now shown below (Table 17 and Table 18), assuming the revised pure premium corresponding to the adjustment factor of 1,9.

Group of contracts	PV inflows	PV outflows	RA	CSM	LC
No possibility of becoming onerous	1.008.790	365.212	155.111	488.466	0
Onerous	20.447.626	12.488.662	5.304.106	2.654.857	0
Remaining	1.096.796	474.272	201.430	421.094	0
Total	22.553.211	13.328.147	5.660.647	3.564.417	0

Table 17. Contractual Projections Overview - scenario 1
Source: CA Vida

When compared with the standard values presented in Section 4.2, scenario 1 resulted in a significant decrease in CSM, corresponding to 2.476.501 euros and the group of contracts remain without a loss component, which is expected, given that this cash flow projection is carried out until the end of the contracts.

In addition to this analysis, the impact of the change in the pure premium can also be measured through the company's accounting result in 2024. Assuming that all contracts associated with this risk product that were in force on 31 December 2024 were subject to the revised pure premium, the company's 'new' accounting result in 2024 was calculated and compared with the observed one. This represents the worst-case scenario in 2024, as it assumes that policyholders cancelled their previous contracts to take out new ones with this change.

Indicator	Pre-Adjustment	Post-Adjustment
2024 Result	32.345.352,15	26.681.046,81

Table 18. Impact of scenario 1 on company results (2024)
Source: CA Vida

As can be seen in Table 18, by making this change to the premium of all the contracts associated with this product, this results in a decrease of 5.664.305,34 euros in the company's accounting results. However, this impact can be overcome if the amount of new business increases.

5.5.2 Scenario 2 – Adjustment Factor: 2,0

Given that scenario 1 still significantly impacted the two metrics above, a new adjustment factor of 2,0 was applied to the previously estimated mortality and disability rates. Following the same reasoning, the tables below (Table 19 and Table 20) show the premiums achieved by applying this scenario, as well as the premiums currently charged for comparison under the conditions described in Chapter 3.

Age	Scenario 2	Current Scenario	Absolute Difference
20	63,24	59,64	3,60
30	39,24	66,00	-26,76
40	91,68	126,96	-35,28
50	291,72	347,16	-55,44
60	1.053,36	1.201,56	-148,20

Table 19. Annual Premium, in euros, for basic coverages: Scenario 2 vs Current Scenario
Source: CA Vida

Age	Scenario 2	Current Scenario	Absolute Difference
20	65,16	83,04	-17,92
30	47,04	91,92	-44,88
40	123,48	176,64	-53,16
50	421,92	483,00	-61,08
60	1.586,64	1.561,20	25,44

Table 20. Annual Premium, in euros, for complementary coverages: Scenario 2 vs Current Scenario
Source: CA Vida

For the basic cover of this product, scenario 2 generally shows lower premiums than the current ones for most of the analysed ages, except for 20-year-olds, for whom there is a slight increase. The largest reductions occur from the age of 40 onwards, which suggests that, in this case, the impact of the adjusted premium is more relevant for older policyholders. For the complementary cover of this product, reductions are seen at all ages except at age 60, where there is a slight increase. Nevertheless, scenario 2 still represents an improvement on the current situation overall, offering less aggressive reductions than scenario 1.

An analysis of the impact of this new scenario is now presented below (Table 21 and Table 22) to assess whether a more acceptable balance for the company is possible.

Group of contracts	PV inflows	PV outflows	RA	CSM	LC
No possibility of becoming onerous	1.061.445	369.828	157.071	534.546	0
Onerous	21.495.115	12.579.990	5.342.894	3.572.231	0
Remaining	1.153.516	479.313	203.571	470.632	0
Total	23.710.076	13.429.130	5.703.536	4.577.409	0

Table 21. Contractual Projections Overview – scenario 2
Source: CA Vida

Compared to scenario 1, scenario 2 results in an increase in CSM of 1.012.992 euros, which is expected since the pure premium applied is higher. However, compared to the standard values presented in Chapter 4, this scenario results in a significant decrease in the CSM, corresponding to 1.463.509 euros. As intended, the group of contracts remain without a loss component.

Next, and in a similar way to the previous scenario, the company's 'new' accounting result in 2024 was calculated, assuming that all contracts in force on 31 December 2024 for this risk product were subject to the new pure premium being tested.

Indicator	Pre-Adjustment	Post-Adjustment
2024 Result	32.345.352,15	27.056.417,08

Table 22. Impact of scenario 2 on company results (2024)
Source: CA Vida

Regarding the company's accounting results, scenario 2 has a slightly less negative impact than scenario 1. This relief in the annual result comes from the application of higher premiums. Even so, the impact compared to the standard scenario is high, corresponding to a decrease in results in 2024 of around 5.288.935,07 euros.

5.5.3 Scenario 3 – Adjustment Factor: 2,1

Although there was a slight improvement in the impact on the sustainability of the risk product and the company of the previous scenario compared to the first, it should be noted that the effects are still significant. Therefore, an adjustment factor of 2,1 will now be tested to assess whether it is possible to mitigate some of these effects.

Again, before analysing the impacts, the following tables (Table 23 and Table 24) are presented to compare the adjusted premiums of this scenario with the current ones, calculated under the conditions described in Chapter 3.

Age	Scenario 3	Current Scenario	Absolute Difference
20	66,48	59,64	6,84
30	41,28	66,00	-24,72
40	96,24	126,96	-30,72
50	306,20	347,16	-40,96
60	1.106,00	1.201,56	-95,56

Table 23. Annual Premium, in euros, for basic coverages: Scenario 3 vs Current Scenario
Source: CA Vida

Age	Scenario 3	Current Scenario	Absolute Difference
20	68,40	83,04	-14,64
30	49,44	91,92	-42,48
40	129,72	176,64	-46,92
50	443,04	483,00	-39,96
60	1.665,96	1.561,20	104,76

Table 24. Annual Premium, in euros, for complementary coverages: Scenario 3 vs Current Scenario
Source: CA Vida

In scenario 3, premiums for both basic and complementary cover remain below those currently charged at most ages. However, an increase of around 6,84 euros for basic

cover and an increase of 104,76 euros for complementary cover can be seen at the age of 20 and 60, respectively. For the remaining ages, the difference between scenario 3 and the premiums currently charged is still significant, but more moderate than in the above scenarios.

The following tables (Tables 25 and 26) show the impact of this premium adjustment on the analysed metrics.

Group of contracts	PV inflows	PV outflows	RA	CSM	LC
No possibility of becoming onerous	1.114.100	374.443	159.031	580.625	0
Onerous	22.542.604	12.671.317	5.381.682	4.489.605	0
Remaining	1.210.237	484.354	205.712	520.171	0
Total	24.866.941	13.530.114	5.746.425	5.590.401	0

Table 25. Contractual Projections Overview – scenario 3
Source: CA Vida

Table 25 shows that this scenario resulted in a decrease in CSM compared to the base scenario, of approximately 450.517 euros. Although it doesn't fully recover the values observed, this scenario is more favourable compared to the others analysed above and comes close to a more acceptable impact for the company. Once again, the groups of contracts have no loss component.

Next, the impact of this scenario on the income statement is presented, to assess the sustainability of the product from an accounting perspective as well.

Indicator	Pre-Adjustment	Post-Adjustment
2024 Result	32.345.352,15	27.431.787,35

Table 26. Impact of scenario 3 on company results (2024)
Source: CA Vida

Although the impact of this scenario on the cash flow projection is less significant than the previous ones, this scenario still caused a considerable decrease in the accounting result in 2024 of approximately 4.913.564,80 euros.

5.5.4 Scenario 4 – Adjustment Factor: 2,2

Given the improvement seen in the previous scenario, it was decided to test a new adjustment factor of 2,2 to analyse whether it would be possible to obtain better results. However, as the aim is to align the company's risk product premiums with those practised on the market, this will be the last factor to be tested, as it is not intended to systematically exceed the pure premium currently in force.

Therefore, to evaluate the adjusted premiums resulting from applying this final scenario, the following tables (Tables 27 and 28) present the adjusted annual premiums for basic and complementary coverage, as well as the current premiums charged, for comparison, calculated under the conditions presented in Chapter 3.

Age	Scenario 4	Current Scenario	Absolute Difference
20	69,60	59,64	9,96
30	43,20	66,00	-22,80
40	100,92	126,96	-26,04
50	320,88	347,16	-26,28
60	1.158,72	1.201,56	-42,84

Table 27. Annual Premium, in euros, for basic coverages: Scenario 4 vs Current Scenario
Source: CA Vida

Age	Scenario 4	Current Scenario	Absolute Difference
20	71,76	83,04	-11,28
30	51,72	91,92	-40,20
40	135,84	176,64	-40,80
50	464,16	483,00	-18,84
60	1.745,28	1.561,20	184,08

Table 28. Annual Premium, in euros, for complementary coverages: Scenario 3 vs Current Scenario
Source: CA Vida

In general, the premiums resulting from this scenario for the basic and complementary coverages offered by this product remain lower than those currently charged at most ages, particularly in the ages with the highest number of cancellations and new policy issues. This is favourable for *CA Vida* since the most significant changes affect policyholders in the ages that the company wants to attract and retain.

However, as expected, this scenario has the highest premiums due to the higher adjustment factor applied, so it is important to analyse whether this premium adjustment has a sufficiently significant impact to justify it.

The impact of applying this scenario on the main metrics is presented below (Table 29 and Table 30). As before, the values obtained are compared with those observed during 2024, to assess the evolution and sensitivity of the product to the changes introduced.

Group of contracts	PV inflows	PV outflows	RA	CSM	LC
No possibility of becoming onerous	1.166.755	379.058	160.991	626.705	0
Onerous	23.590.094	12.762.644	5.420.470	5.406.979	0
Remaining	1.266.958	489.395	207.853	569.710	0
Total	26.023.806	13.631.098	5.789.314	6.603.393	0

Table 29. Contractual Projections Overview – scenario 4
Source: CA Vida

When comparing the results obtained in Table 29 with the base scenario presented in Chapter 4, it should be noted that this is the first scenario presented in which there is an increase in CSM of 562.475 euros, reflecting an improvement in expected profitability over time. In addition, the RA is also higher, which translates into greater compensation

for the non-financial risk assumed by the insurer. This reinforcement suggests a more sustainable position for this scenario compared to the previous ones.

Indicator	Pre-Adjustment	Post-Adjustment
2024 Result	32.345.352,15	27.807.157,61

Table 30. Impact of scenario 4 on company results (2024)
Source: CA Vida

Despite the previous improvement compared to the current situation and the scenarios presented above, this scenario caused a decrease of approximately 4.538.194,54 euros in the 2024 accounting result compared to the actual result, as can be seen above in Table 30. This is still a high impact, but it is important to note this new result is calculated assuming that all policyholders with this risk product, regardless of the version applied, have cancelled their policies to take out new ones in which the pure premium applied is the one being tested, i.e. the worst-case scenario is being analysed. This closes the analysis of the last scenario.

Section 5.5 evaluated the impact of applying different adjustment factors to the initially estimated risk rates on the main actuarial and financial metrics. However, as mentioned in Chapter 1, this adjustment aims to align the premiums charged by the company with the premiums practised in the market. Therefore, the next section will compare the premiums resulting from each of the previously analysed scenarios with the premiums charged by competing insurers identified in the market study carried out in Chapter 3. This comparison will allow an assessment of whether the simulated scenarios place *CA Vida* in a more competitive position in the market, analysing if the premiums approach or exceed the levels of commercial attractiveness observed in other insurers. As mentioned before, the analysis focuses on the premiums for basic and complementary cover based on the profiles used in Chapter 3, i.e. the premiums were calculated for an insured capital of 100.000 euros and people aged between 20 and 60.

5.6 Premium Comparison across Insurers

This section compares the premiums obtained in the scenarios tested in Section 5.5 with those charged by the insurers analysed in Chapter 3. To avoid redundancy, rather than reproducing the tables presented previously, the comparison is made directly within Table 31. In addition to the premiums resulting from the simulated scenarios, this table shows the minimum and maximum premiums charged by the considered insurers for each age. These are identified by letters (A to E) to ensure clearer and more direct comparisons. This approach provides a more concise and informative view of the competitiveness of each scenario. The comparison focuses on the Basic Coverage offered by the product, Death and Absolute and Definitive Disability.

Age	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Minimum Premium	Maximum Premium
20	60,12	63,24	66,48	69,60	39,21 (A)	63,19 (C)
30	37,32	39,24	41,28	43,20	35,18 (A)	56,18 (C)
40	87,12	91,68	96,24	100,92	79,34 (A)	103,12 (C)
50	277,08	291,72	306,2	320,88	208,36 (A)	279,24 (E)
60	1.000,68	1.053,36	1.106,00	1.158,72	347,16 (E)	755,32 (B, C)

Table 31. Adjusted Annual Premiums, in euros, by Scenario and Market Range for basic coverages (Death and ADD)
Source: Minimum and maximum premium values based on data from Table 2 (Chapter 3)

As would be expected due to the application of successively higher multipliers, Table 31 shows an increasing progression in the simulated premiums across the different scenarios and all of these now reflect a downward trend between the ages of 20 and 30, a pattern already evident among competing insurers. At 20 years, scenario 1 is the only scenario in which the premium applied is lower than the maximum observed in this market sample. The remaining scenarios present values that exceed, for this age, the maximum premium observed in the sample. At the ages 30 and 40, the premiums achieved in the different scenarios are slightly lower than those of some insurers, bringing them closer to the competition. From the age of 50 onwards, there is a larger difference compared to the market, particularly in scenarios where higher adjustment factors are applied. At the age of 60, the difference between the simulated premiums and those charged by the main competing insurers had increased significantly. However, premiums are still lower than those currently charged by *CA Vida*.

Additionally, it should be noted that the ages identified in Chapter 4 as the ones with the highest incidence of cancellations are the same that benefit from a reduction in premiums or greater proximity to premiums available on the market, with the adjustments now studied. This can contribute positively to portfolio retention.

Next, the annual premiums are analysed for the Complementary Covers, Death and Definitive Disability for the Profession or Compatible Activity. As discussed in Chapter 3, insurers apply different percentages for this disability, namely 60% and 65%. To allow for a clear and objective comparison, Table 32 and Table 33 shows the premiums obtained under each of the simulated scenarios (based on the 66% threshold adopted by CA Vida), along with the minimum and maximum premiums observed among the insurers using the 60% and 65% criterion, respectively. Again, these are identified by letters (A to E).

Age	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Minimum Premium (60%)	Maximum Premium (60%)
20	61,92	65,16	68,40	71,76	74,64 (E)	82,31 (B)
30	44,64	47,04	49,44	51,72	67,12 (D)	76,67 (B)
40	117,36	123,48	129,72	135,84	121,45 (A)	137,52 (E)
50	400,92	421,92	443,04	464,16	319,46 (A)	404,62 (E)
60	1.507,32	1.586,64	1.665,96	1.745,28	840,84 (E)	1.437,79 (B)

Table 32. Adjusted Annual Premiums, in euros, by Scenario and Market Range for complementary coverages (Death and DDPCA - 60%)
Source: Minimum and maximum premium values based on data from Table 3 (Chapter 3)

Age	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Minimum Premium (65%)	Maximum Premium (65%)
20	61,92	65,16	68,40	71,76	70,20 (A)	86,34 (C)
30	44,64	47,04	49,44	51,72	61,84 (A)	81,27 (C)
40	117,36	123,48	129,72	135,84	114,42 (A)	139,61 (C)
50	400,92	421,92	443,04	464,16	300,99 (A)	369,31 (C)
60	1.507,32	1.586,64	1.665,96	1.745,28	822,66 (A)	1.094,29 (C)

Table 33. Adjusted Annual Premiums, in euros, by Scenario and Market Range for complementary coverages (Death and DDPCA - 65%)
Source: Minimum and maximum premium values based on data from Table 4 (Chapter 3)

Once again, the scenarios reflect an increasing structure between the ages of 20 and 30, as is also seen with other companies for this optional cover. Compared to the market range shown in Table 32 and Table 33, the premiums obtained in the different scenarios are generally close to or even below the minimum values observed up to the age of 40. However, from the age of 50 onwards, most scenarios exceed the maximum premiums identified in the sample, particularly in the case of the highest adjustment factors.

This marks the end of this chapter, where the impacts of different adjustments to the premium of *CA Vida's* Mortgage Protection product were proposed and tested, ensuring greater alignment with current market prices. Although each scenario represents a different compromise between competitiveness and profitability, the results achieved provide a solid foundation for deciding on the most suitable pricing strategy, bearing in mind the company's primary concerns. Chapter 6 will present the main conclusions of the work carried out, along with recommendations for future work.

Chapter 6 - Conclusion

This report aimed to study the current downward trend in life insurance premiums associated with home loans and to propose changes to the product currently marketed by *CA Vida*, in terms of the premiums charged to policyholders. Throughout the work, several challenges were identified, with one of the most significant being the lack of publicly available information, especially regarding technical assumptions and actuarial bases used by other insurers. This limitation made it difficult to understand in detail the differences between the premiums charged by the company's competitors and *CA Vida* itself. Nevertheless, using the available information, it was possible to identify and compare some of the factors influencing the premiums charged by different insurers. It should be noted that the premiums considered for competing insurers were obtained through their online simulators and, although indicative, they may not be fully accurate representations of the actual values applied in practice.

An analysis of the portfolio associated with this product allowed us to identify relevant patterns, which reinforced the importance of ensuring that the premiums charged are adequate and competitive, as any misalignment with the behaviour observed could compromise the retention of the portfolio and the long-term sustainability of the product.

In order to align the observed behaviour of *CA Vida* policyholders with the actuarial assumptions, new mortality and disability rates were estimated based on an actuarial model. Premiums for the analysed risk product were adjusted using different adjustment factors on these estimated rates. The choice of adjustment factor depends on the company's strategic objectives, since the higher the factor applied, the more profitable the product will be in the long term (due to higher premiums). However, it is important not to introduce new premiums that considerably exceed those of the market.

Although the report is finished, it is important to emphasise that the analysis of this risk product is not complete, as this work requires constant monitoring and revision for continuous improvement. Throughout the project, several aspects were highlighted that could be revised, such as the mortality and disability assumptions applied, as it was possible to see through the estimation of these rates that they may be overestimated and/or underestimated, necessitating their revision.

Moreover, this report has adopted a specific model to project both mortality and disability, so it is recognised that other actuarial models could be explored, as well as the use of alternative mortality tables that better suit reality. At the same time, it will be essential to monitor the evolution of the portfolio of the most recent version of the product to anticipate the need for further adjustments. In other words, the process of reviewing products and premiums is an ongoing process that must always be aligned with up-to-date data. Market dynamics and changes in the profile of policyholders require constant analysis and adaptability.

Finally, I would like to emphasise that this experience has been both enriching and rewarding. The work I did allowed me to complement the knowledge I acquired during my master's degree and it was satisfying to make a positive contribution to the company.

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