

TREATMENT FOR CASE OF DEFAULT OF LIFE INSURANCE UNDER CAPITALIZATION REGIME IN THE BRAZILIAN MARKET USING THE ANALYTIC HIERARCHY PROCESS

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ABSTRACT

The Brazilian insurance market is growing, even if it is still incipient compared to many international markets. Although economic issues end up partially inhibiting this activity, insurance in general and particularly life insurance can be considered a financial investment for the general population. However, insurance default in the Brazilian market is a serious problem and, as such, requires analysis and action. This article aims to use the Analytic Hierarchy Process (AHP) to select an alternative that best meets the needs of an independent insurer to deal with cases of default on life insurance under a capitalization regime and, at the same time, remain within legal standards and deliver the best service to its customers. The fundamental concepts, methodology, results and analysis are presented in this article.

Keywords: life insurance; insurance default; AHP

1. Introduction

Insurance companies play an important role in the economy of countries because by protecting life and property they reduce uncertainties and the impact of large losses, which, therefore, can encourage investments, innovation and stimulate competition. In this sense, according to Arena (2008), the activity of the insurance market can contribute to the economic growth of a nation, both as a financial intermediary and as a provider of transfer and indemnification of risks, by allowing a more efficient management of different risks and by mobilizing internal savings.

Insurance market activities in Brazil have existed for a long time, dating from the beginning of the nineteenth century with the opening of Brazilian ports to international trade and the consequent need for marine insurance (Silva et al., 2015). Certainly, at the time, this market did not use current techniques, nor was it subject to the same regulations, but it had the same concern and objective, which is to neutralize the effects of a possible harmful event by payment of an amount by the insured.

In recent decades, the Brazilian insurance market has shown growth due to changes made by governments, which involve more freedom in setting prices and in products offers. In fact, the market has promoted several recent changes, such as the regulation of the insurance activity in MERCOSUR, the liberalization of tariffs, the extension of the sector's revenue, the greater ease of entry of foreign capital and the breaking of the monopoly of the reinsurance market.

According to the National Confederation of Insurers (CNseg, 2023), the Brazilian insurance market grew by about 10.4% in 2023, representing a turnover of BRL 663 billion (around USD 138 billion in 2023), and the expectation is that it should grow by about 11% in 2024. Therefore, the insurance sector should represent 6.2% of the GDP (Gross Domestic Product) in the same year, which in addition to showing a growth trend, also shows the consolidation of this market, which deserves attention and care, since with growth and consolidation there is a need to manage and calculate risks such as the solvency of companies (the ability of a company to meet all its future obligations) and the default of policyholders.

Life insurance, in addition to long-term investments, is the main activity chosen to ensure financial security for Brazilians, both for the contract holder and for the related beneficiaries (Ikeda & Carvalho, 2022). In May 2024, the life insurance product in Brazil grew by 16.1% compared to the same period of the previous year, raising BRL13.64 billion (SUSEP, 2024a). This type of insurance intends to guarantee financial protection in the case of the covered events, through mutualistic bases and risk sharing. However, the issue of default in particular afflicts both insurers and policyholders because it has a great impact on the revenue and solvency of insurance operators, as well as on the failure to meet the contract's expectations.

This article aims to apply a multicriteria decision support methodology, specifically the Analytic Hierarchy Process (AHP) developed by Thomas Saaty (1977, 1980), to assist decision-making in the selection of an alternative that best meets the needs of an independent insurer. This alternative should be within the legal norms and deliver the best service to its customers, with regard to the definition of the most appropriate way to deal with cases of life insurance default under the capitalization regime, thus avoiding losses to the insurer such as financial insolvency (due to lack of planned collection), legal questions (by the insured), and poor positioning in the market (due to complaints about procedures).

The choice to use the AHP as a specific methodology to carry out this process is due to some interesting aspects of the AHP. This method is a widely used multi-criteria methodology (Emrouznejad & Marra, 2017) with a large number of scientific publications (Petrillo et al., 2023), is easy to use (not requiring data processing), allows group decision-making, can evaluate coherence of judgments, and permits subjective judgments to be dealt with (Leite & Freitas. 2012).

2. Life insurance and insurance default

Insurers are entities constituted in the form of corporations that specialize in entering into a contract where they assume the obligation to pay the contractor (insured) or whoever

the latter assigns an indemnity if the indicated and feared risk occurs, while receiving the established premium (Silva, 2022). Insurers in Brazil need government approval to operate, as well as specific approval from SUSEP (Superintendence of Private Insurance) for each of their products.

SUSEP is a federal agency linked to the Ministry of Economy that regulates and supervises the insurance, reinsurance, open supplementary pension and capitalization markets. It is responsible for analyzing requests for authorization for the creation, operation, reorganization and transfer of corporate control. It also establishes the general parameters of the policies, special coverages, and methods of operation that must be used and approves their operational limits (SUSEP, 2022a).

Currently, life insurance as a fundamental factor to ensure the safety of activities of human life is a product in constant growth. Life insurance is not only a necessity for the development of the insurance market, but also a particularly attractive business, both for this market and for the insured (Toshmurzaevich, 2020). Life insurance uses the duration of human life as the basis for calculating the premium due to the insurer, so that the insurer undertakes to pay the beneficiary of the insurance, a capital or a determined income, upon the death of the insured or if the latter survives an agreed period (the benefit can be paid in one lump sum, or in the form of income) (Souza, 2017). In 2023, according to data from SUSEP (2024b), the life insurance market in Brazil reached the accumulated amount of BRL 30.37 billion, a figure that represents a growth of 12.4% compared to the previous year.

There are two ways to classify the financial mechanisms of insurance, a simple pay-as-you-go system and a capitalization system. In simple insurance, the contributions made in a given year are used to cover claims that occurred in that same year. Therefore, there is no reserve fund. In capitalization insurance, the contribution amounts are calculated in such a way that the future expectation of payments at the time of contracting is equivalent to the future expectation of claims. Therefore, there is a reserve fund (Souza, 2017; Araújo, 2021). According to SUSEP (2022b), capitalized life insurance is a type of insurance that combines characteristics of life insurance with a savings option. When purchasing insurance on a capitalization basis, the person pays premiums (a premium is the amount corresponding to each of the payments intended to fund the insurance) over a period of time and, in return, receives life insurance coverage and a savings option.

According to Coe et al. (2016), individuals, in general, understand the need to take out life insurance for their protection and that of their family, but they encounter many behavioral economic barriers to obtaining adequate coverage, including personal accounting, monetary illusion and, mainly, a strong role of default, that is, non-compliance with premium payments for financial reasons.

Daros and Pinto (2017) considered that delinquency occurs because consumers suffer constant financial impacts on their income and these determine their limits and budget restrictions, causing them to lose economic control of their assets and duties. This fact is particularly prevalent in countries whose economies undergo constant transformations in order to find the much-desired monetary and fiscal stabilization.

Shamsuddin, Ismail and Roslan (2022) studied the reasons that lead the insured to decide to default on life insurance, through a bibliometric analysis, carried out from 1971 to 2021, focusing on publication trends, co-authorship networks between countries, authors and scientific journals, and the evolution of the field. They tried to determine the aspects of default in life insurance. They suggest the study of the behavior of the insured through predictive techniques and show a recent growth in research on the subject.

In fact, some recent articles specifically address the issue of life insurance defaults from various aspects, trying to understand its causes, risks, and harmful consequences through analysis and hypotheses (Lin, Li & Huang 2018; Barucci et al., 2020). They also presented possibilities to try to equate and minimize these damages, both for the insured and for the insurers. They approach issues involving choice factors linked to individual and age values (Fang & Kung, 2021), personal cognitive scope (Mulholland & Finke, 2023), legal certainty (Nugroho & Marzuki, 2024), institutional guarantees (Braun, Fischer & Schmeiser, 2019), planning and management errors (Santri et al., 2022) and the risk of insolvency analysis of companies and their consequences (Cheng & Li, 2018). Univariate and multivariate analysis methods (Hu et al., 2021) and demographic analysis (Yu, Cheng, & Lin, 2019) were also used to try to explain default rates and trust in companies.

Default, particularly in Brazil, according to Barbosa et al. (2023), can be influenced by two major groups of factors: microeconomic, which characterize the individual behavior of each institution or person; and macroeconomic, which interfere with the economy in general, such as unemployment, the Selic rate (basic interest tax defined by Brazilian government), credit concession and minimum wage.

For example, default in Brazil, considering all possible situations, in April 2024 increased 0.72% from the previous month, which corresponds to an increase of 524,000 delinquent consumers. In all, there are 73.42 million Brazilians in default according to data from Serasa Experian (2024), which means that approximately 35% of the country's population is in this situation, and of course this is reflected in the case of individual insurance contracts, and specifically in the case of life insurance.

SUSEP Circular No. 667 (SUSEP, 2022c) discusses, among other topics, the payment of premiums and default. Article 40 specifies that the coverage structured in the capitalization financial regime is treated differently than it would be in the simple distribution regime in case of suspension of the payment of premiums.

Article 40. For coverage structured in the capitalization financial regime, the contractual conditions must provide for the offer to the insured of at least one of the following options when the non-payment of the premium is configured...

I - cancellation of coverage, with the full refund of the balance of the Mathematical Provision of Benefits to Be Granted (PMBaC);

II - reduction of the amount of the insured capital in proportion to the premium paid with maintenance of the term of validity (settlement); or

III - reduction of the term of validity with maintenance of the value of the insured capital (extended insurance) (SUSEP, 2022c).

Thus, it is understood that it is essential for the insurer to define a clear, coherent and effective way to act in the event of non-payment of premiums by the insured (default) in

order to safeguard its credibility as a company and its financial solvency, and thus continue to operate normally in the Brazilian market.

3. Analytic Hierarchy Process

The Analytic Hierarchy Process (AHP) proposed by Saaty (1977; 1980) is a multi-criteria decision support tool widely used for dealing with problems in business (Sooksaksun & Chanta, 2023), industry (Dweiri et al., 2016), services (Raišienė & Raišys, 2022), energy planning (Romero-Ramos et al., 2023), environment (Petrillo et al., 2023), logistics (Moslem et al., 2023), construction (Darko et al., 2018), and health (Konomura et al., 2023), among others (Emrouznejad & Marra, 2017), in various and multiple contexts, by governments and organizations.

Table 1 presents a selection of recent articles published on the use of the AHP, or methods that interact with the AHP, or are derived from the AHP that address life insurance, either for the analysis of factors related to the choice or operation of insurance companies that work with the life insurance product, or for the choice of life insurance plans, or even for investments including life insurance. However, no article (recent or not) was found that related the use of the AHP in the treatment of cases of default in life insurance. (Databases consulted: Scopus, Google Scholar and Web of Science).

Table 1
Articles on the use of AHP in life insurance

Title	Author(s)
Performance ranking of Turkish life insurance companies using AHP and TOPSIS.	Akhisar & Tunay (2015)
Analysis of insurance customer factors to renewal using hybrid AHP-FTOPSIS	Andawaningtias, Artiani & Kahim (2022)
Determinants' hierarchy of decision for life insurance on digital platform: an Analytical Hierarchy Process approach	Dawar, Singh, & Uppal (2022)
Implementation of the Analytical Hierarchy Process method and Multi Objective Optimization on the basis of ratio analysis in the selection of insurance products	Haviluddin, Budiman, & Ramadhan (2022)
An intuitionistic fuzzy AHP based multi criteria recommender system for life insurance products	Hinduja & Pandey (2018)
Analysis of the factors influencing sustainable development in the insurance industry	Ho, Huang, & Me (2018)
Financial decision making among young adults: an AHP approach	Kaftandzieva & Cvetkoska (2021)
Choice of life insurance companies by using analytic hierarchy process: Experience of the Republic of Serbia.	Mimović, Jakšić & Todorović (2017)

Title	Author(s)
A SERVQUAL model approach integrated with fuzzy AHP and fuzzy TOPSIS methodologies to rank life insurance firms	Saeedpoor et al. (2015)
Decision making methods for evaluation of efficiency of general insurance companies in Malaysia: A comparative study.	Wang et al. (2019)

The AHP aims at the selection, choice or prioritization of alternatives, in a process that considers different evaluation criteria, which can be both quantitative and qualitative, taking into account the subjectivity involved in the decisions. The three fundamental principles of the AHP are as follows: construction of hierarchies; definition of priorities and logical consistency (Saaty, 2001).

- Construction of hierarchies: The problem must be structured into hierarchical levels, as a way of seeking better understanding and evaluation. The key elements for decision making are identified, and grouped into related sets, which are allocated in specific layers. Figure 1 shows a generic hierarchical model of the use of the method. Depending on the decision situation, more than one layer of criteria can be used - when there is difficulty in judging the performance of the alternatives in the light of a given criterion.
- Definition of priorities: The adjustment of priorities in the AHP is based on the ability to perceive the relationship between objects and observed situations, comparing pairs in the light of a given focus, criterion or sub-criterion (parity judgments). Those responsible for these comparisons are called experts.

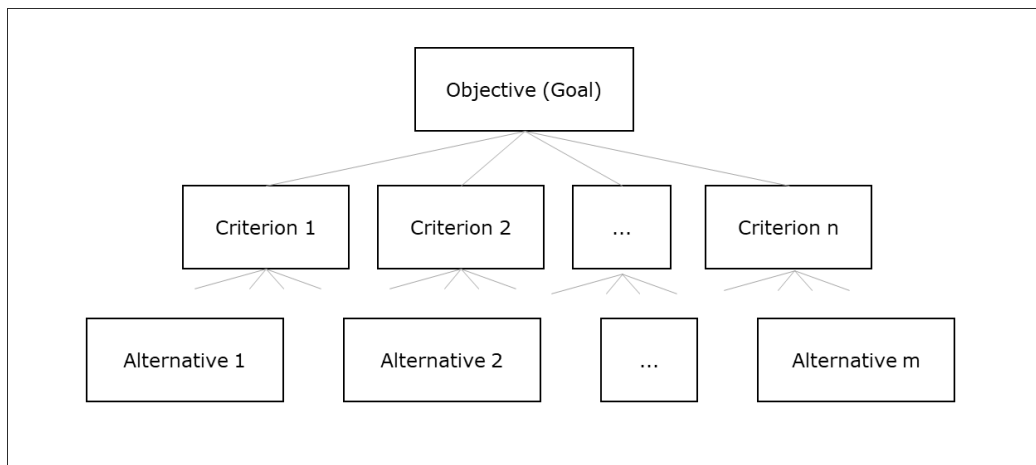


Figure 1 AHP hierarchy model

Figure 2 illustrates a simplification of the AHP matrix of judgments, where A is a matrix of order n, non-negative, where the a_{ij} reflects the importance of element A_i over element A_j (so the diagonal must be unitary) and where the properties of reciprocity and transitivity must exist (Saaty, 1977).

$$\begin{bmatrix} 1 & a_{12} & \dots & a_{1n} \\ a_{21} & 1 & \dots & a_{2n} \\ \vdots & \vdots & \dots & \vdots \\ a_{n1} & a_{n2} & \dots & 1 \end{bmatrix}$$

Figure 2 AHP matrix

Table 2 illustrates the fundamental scale proposed by Saaty (1980), which allows the specialist to make judgments in a very simplified way, using natural language.

Table 2
Saaty scale for pairwise comparison (Saaty, 1980)

Definition	Numerical value
Equal importance	1
Weak importance	3
Strong importance	5
Demonstrated importance	7
Absolute importance	9
Intermediate values	2, 4, 6, 8

The local weights of the elements compared in the judging matrix can be obtained through matrix operations, calculating the matrix eigenvector and then normalizing it. Global weights are obtained by combining the local weights relative to alternatives and criteria (and sub-criteria, when they exist). The elements of the global weights store the performances of the alternatives in light of the main focus (Saaty, 1980).

- Logical consistency: In the AHP (Saaty, 1980), it is possible to evaluate the prioritization model built in terms of its consistency. A consistency analysis is an important step when using the method, as it ensures that judgments are coherent and respect the principles of the method. One way to measure the degree of inconsistency in a parity matrix is to evaluate how far the maximum eigenvalue of this matrix (λ_{max}) deviates from the order of the matrix (n), calculating the so-called consistency index, according to Equation 1:

$$CI = |\lambda_{max} - n| / (n-1) \tag{1}$$

Also, according to Saaty (1980), the severity of the inconsistency should be reduced as the order of the matrix increases, according to Equation 2:

$$CR = CI/RI \tag{2}$$

Where, RI is the random index obtained for a reciprocal, non-negative matrix. Table 3 shows the RI values.

Table 3
Random indices (Saaty, 1980)

n	2	3	4	5	6	7	8	9	10
RI	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49

A recommended matrix consistency value occurs if the calculated consistency ratio is less than or equal to 0.10, according to Vargas (1982) and Saaty (2001).

More recent discussions on consistency analysis in the AHP can be found in works such as Cavallo et al. (2012) that uses algebraic structure analysis to overcome the main consistency problems; Cavallo et al. (2019) that analyzes different types of paired comparisons to find the most coherent one; Serra Costa (2011), that uses genetic algorithms to deal with and propose matrix inconsistencies; Amirabadi (2011) that uses a fuzzy approach to conduct consistency and Pant et al (2022), which carries out a broad review on the topic of consistency.

A recommended caution in the use of the AHP is the issue of order inversion (rank reversal); however, some authors such as Wang and Triantaphyllouda (2008), Wang and Luo (2009), and García-Cascales and Lamata (2012) show in their works that order inversion does not occur only in the AHP, but also in other multicriteria methods. Schoner and Wedley (1989) argue that the issue of inversion of order is not the result of the introduction or withdrawal of an alternative, but rather of the introduction or withdrawal of an alternative without adequate reassessment of the values attributed to the elements of the higher hierarchical level.

4. Application

As previously explained, for the proper application of the AHP, it is necessary to define its elements: main focus, criteria and alternatives. In addition to this, it is also necessary to define who the experts are that will be responsible for issuing the judgments (parity comparisons).

4.1 Objective (main focus)

Establishing the main focus of the decision-making problem in a clear, objective and detailed way is a fundamental activity in the use of AHP. An ill-defined focus poorly explained and not reflecting the reality of the problem may lead to errors in the attribution of judgments by experts.

For this, a brainstorm was carried out with analysts from the insurance company's business area taking into account that the insurer is subject to inspections by the Superintendence of Private Insurance (SUSEP). Thus, it was concluded that, in the case of life insurance under a capitalization regime, the main focus should be to select the best alternative for an independent insurer to deal with cases of default in compliance with SUSEP's regulatory standards, making sure the insurer delivers a good service to its customers and remains well-positioned in the market, thus avoiding the issue of default in life insurance, which can cause problems in the operators' solvency.

4.2 Alternatives

Alternatives must meet the requirements presented in the main focus so that the problem is well structured. Thus, the company's team of analysts defined the possibilities of solving the issue that can meet SUSEP's premises (SUSEP, 2023) as viable alternatives. In the process of defining the alternatives, the team sought the ways in which the competitors position themselves on this topic through market research with the main Brazilian insurance companies. The most cited alternatives were:

- Alternative 1 (A1): Maintenance of current rules – In case of default, the insured will have his insurance paid off if it has a term of more than 24 months and the reserve is sufficient to compose a minimum capital of BRL 30,000. If the reserve is not sufficient for this capital, the insurance is canceled, and the customer is entitled to redeem a percentage of the reserve. If the cancellation happens before the 24-month period, the insurance is canceled, and the customer does not receive any redemption amount.
- Alternative 2 (A2): Settle all delinquent certificates – Change to a paid capital, regardless of the term and without minimum capital after the grace period (60 days).
- Alternative 3 (A3): Inclusion of the extended benefit – The insured may change the original insurance to insurance with extended benefit, interrupting the payment of premiums due, provided that the minimum period of validity stipulated by the insurer is respected.
- Alternative 4 (A4): Inclusion of suspension period – In the absence of payment of premiums and after the expiration of the grace period, the policy will be suspended for a period of time, starting from the day immediately following the last day of the grace period.
- Alternative 5 (A5): Temporary suspension of the certificate and inclusion of the extended benefit – In the absence of payment of premiums and after the expiration of the grace period, the policy will be suspended for a limited period, starting from the day immediately following the last day of the grace period. Once the suspension period ends, the extended benefit for that policy will be applied.

4.3 Criteria

The criteria were defined in a brainstorm by analysts from the insurance company's business area based on factors such as governance, good relationships with customers and brokers, performance and positioning in the market, operationalization of processes (Castro, 2004; Lyons & Demaster, 2015; Rodrigues, 2019) that can meet SUSEP's premises (SUSEP, 2023). Thus, the most relevant criteria were:

- Legal Exposure (LE): This criterion aims to be in accordance with SUSEP Circular No. 667, which provides for the complementary rules of operation and the criteria for the operation of personal insurance risk coverage.
- Complexity (CP): It is necessary to take into account the degree of difficulty that will be faced to start operationalizing the chosen alternative. This is because it is not useful to promise a service that cannot be delivered to the end customer.

- Customer Satisfaction (CS): Customers will be directly affected in this process, so it is necessary to be cautious when defining the alternative to be followed, so that they are not dissatisfied and file complaints with the insurance company.
- Broker Satisfaction (BS): Brokers are the biggest partners of the insurance company; one cannot run the risk of losing them, as they are responsible for selling the insurance.
- Market Positioning (MP): It is always good to have a differential in relation to competitors, but it is even more important that the service is better than that offered by ones counterparts.

4.4 Experts

The experts selected for the decision-making process must have complete mastery of the problem addressed in the main focus (Malhotra et al., 2007), as the effectiveness of the outcome of the process is directly associated with the competence of the experts in issuing value judgments.

The opinions of a group of experts, analysts from the insurance company being studied, who answered electronic questionnaires with information about alternatives and criteria independently and exclusively, were considered. All of them work in the insurance area and have at least 15 years of experience in the insurance market. Each expert individually answered a multiple-choice digital form containing two sections: one comparing each pair of alternatives in the light of each criterion and the other comparing each pair of criteria in the light of the objective. In both cases, the comparison was made using Saaty's Fundamental Scale (1980).

4.5 Hierarchy model

Figure 3 shows the problem hierarchy with the main focus, criteria, and alternatives.

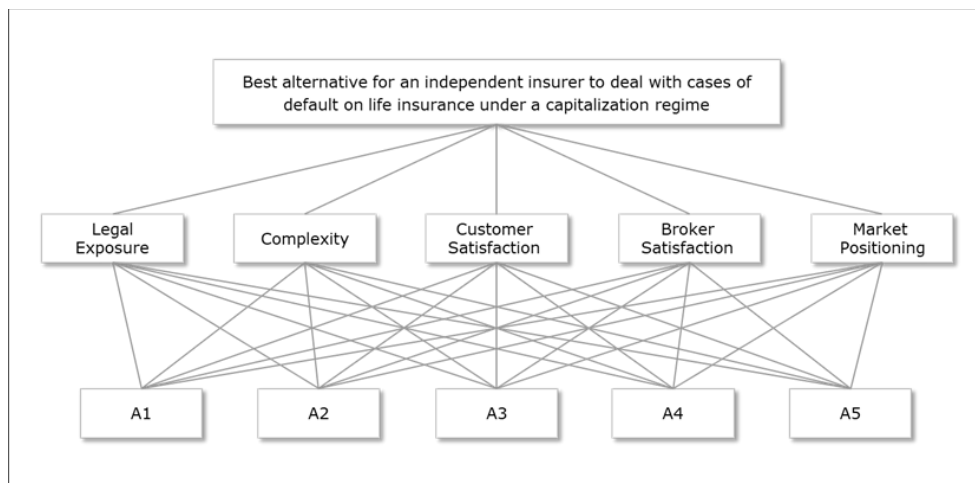


Figure 3 Hierarchy model

5. Results and discussion

After collecting the information through the questionnaires completed by the experts, the matrices of individual judgments were constructed using the fundamental scale (Saaty, 1980). Then, to aggregate the judgments, the aggregation of individual judgments (AIJ) technique (Forman & Peniwati, 1998) was used, which is appropriate when individuals from a decision-making group desire above all the good of the organization they represent, despite their own preferences, values and objectives. The calculations for the application of the AHP and the sensitivity analysis were performed using Microsoft Excel® software, making it easier to visualize the results at each stage of the process. Figure 4 shows the matrices after applying the aggregation of individual judgements AIJ.

LE	A1	A2	A3	A4	A5	CP	A1	A2	A3	A4	A5
A1	1	0.17	0.17	0.18	0.16	A1	1.00	1.65	4.16	4.76	6.00
A2	5.85	1	1	1.26	0.44	A2	0.61	1.00	2.88	3.63	4.93
A3	5.85	1	1	0.79	0.44	A3	0.24	0.35	1.00	1.59	4.48
A4	5.43	0.79	1.26	1	0.44	A4	0.21	0.28	0.63	1.00	3.63
A5	6.21	2.29	2.29	2.29	1	A5	0.17	0.20	0.22	0.28	1.00
CS	A1	A2	A3	A4	A5	BS	A1	A2	A3	A4	A5
A1	1.00	0.41	0.28	0.63	0.29	A1	1.00	0.46	0.32	0.41	0.20
A2	2.41	1.00	0.58	0.82	0.26	A2	2.15	1.00	0.69	0.78	0.26
A3	3.56	1.71	1.00	1.59	0.44	A3	3.11	1.44	1.00	0.75	0.23
A4	1.59	1.22	0.63	1.00	0.22	A4	2.47	1.29	1.34	1.00	0.23
A5	3.42	3.91	2.27	4.58	1.00	A5	4.93	3.91	4.38	4.38	1.00
MP	A1	A2	A3	A4	A5	MF	LE	CP	CS	BS	MP
A1	1.00	0.32	0.24	0.48	0.18	LE	1.00	0.48	0.55	0.63	1.47
A2	3.11	1.00	0.63	0.94	0.26	CP	2.08	1.00	0.87	2.29	3.11
A3	4.16	1.59	1.00	1.88	0.55	CS	1.82	1.14	1.00	3.48	5.28
A4	2.08	1.06	0.53	1.00	0.22	BS	1.59	0.44	0.29	1.00	2.54
A5	5.43	3.91	1.82	4.58	1.00	MP	0.68	0.32	0.19	0.39	1.00

Figure 4 Criteria and main focus judgment matrices

Table 4 presents the local weights related to the criteria, where alternative A₅ prevails over the others in the criteria Legal Exposure (LE), Customer Satisfaction (CS), Broker Satisfaction (BS) and Market Positioning (MP); obtaining weak performance only in the Complexity criterion (CP).

Table 4
Local weights for the criteria

Alternatives	Criteria				
	LE	CP	CS	BS	MP
A1	0.04	0.42	0.08	0.07	0.06
A2	0.20	0.29	0.13	0.12	0.14
A3	0.19	0.14	0.22	0.15	0.23
A4	0.19	0.10	0.13	0.15	0.12
A5	0.38	0.05	0.44	0.51	0.45

Table 5 presents the local weights related to the main focus, where it can be observed that the criterion with the highest weight (0.36) in relation to the main focus is Customer Satisfaction (CS).

Table 5
Local weights relative to the main focus

Criteria	Local weights
Legal Exhibition (LE)	0.13
Complexity (CP)	0.28
Customer Satisfaction (CS)	0.36
Broker Satisfaction (BS)	0.15
Market Positioning (MP)	0.08

Table 6 shows the values obtained in the model for the global weights. Alternative A5 obtained the greatest weight in the opinion of the experts (0.33), while the other alternatives presented values very close to each other.

Table 6
Global weights

Alternatives	Global weights
A1	0.17
A2	0.18
A3	0.18
A4	0.13
A5	0.33

Table 7 presents the values found in the calculation of the Consistency Analysis, where all the consistency ratios (CR) obtained for the criteria matrices and the main focus are below the threshold value of 0.10 (Vargas, 1982; Saaty, 2001), thus ensuring the consistency of the judgments issued by the experts.

Table 7
Consistency analysis

Criteria/Main Focus	λ_{max}	CI	RI	CR
Legal Exposure	5.09	0.021	1.12	0.019
Complexity	5.20	0.049	1.12	0.044
Customer Satisfaction	5.12	0.031	1.12	0.028
Broker Satisfaction	5.12	0.029	1.12	0.026
Market Positioning	5.06	0.016	1.12	0.014
Main Focus	5.12	0.030	1.12	0.027

It is always important to check the robustness of the solution. Thus, performing a sensitivity analysis (Dogan, 2021) is essential for making decisions based on accurate data and information. Figure 5 shows the result of the sensitivity analysis performed for each evaluation criterion, an important operation when one wants to ensure the robustness of the model in terms of the judgments issued by the experts.

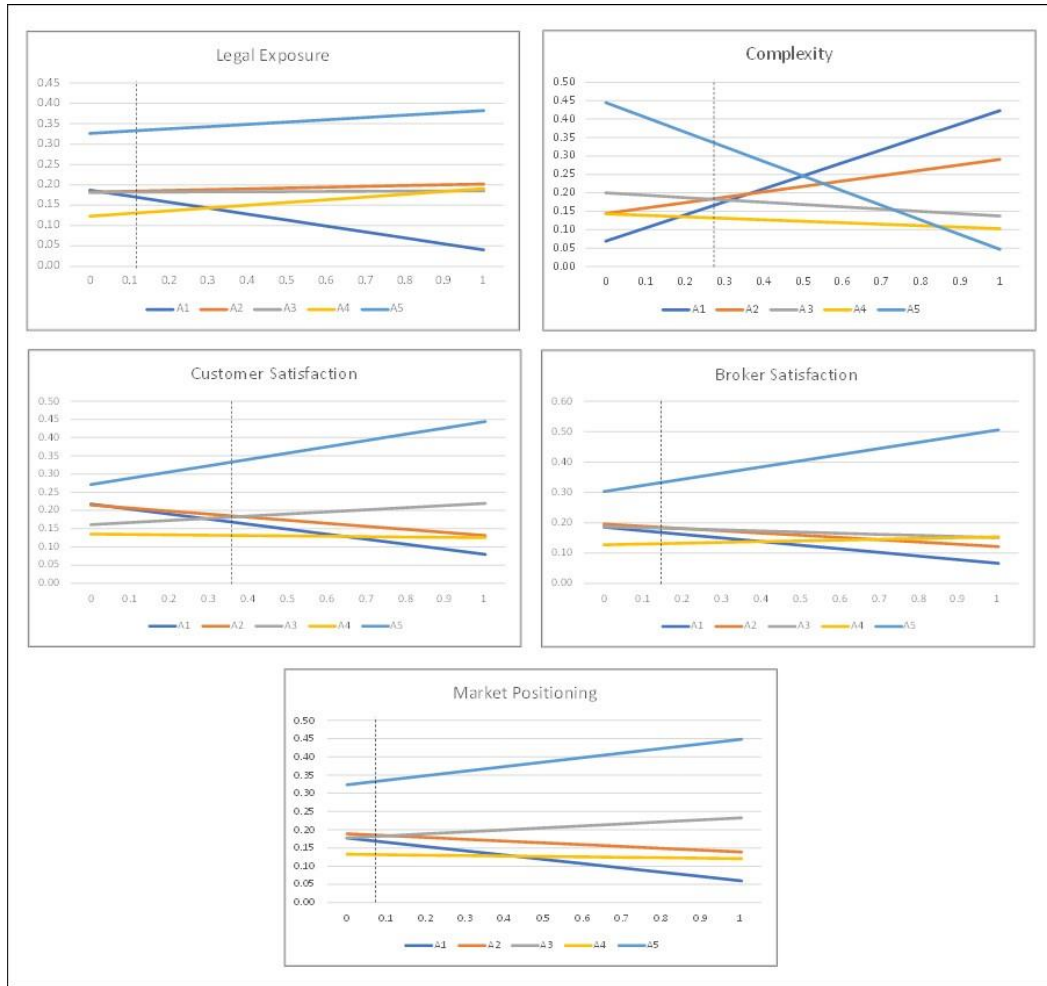


Figure 5 Sensitivity analysis

According to Nabavi et al. (2023), a sensitivity analysis is a procedure that should be adopted when it is desired to determine whether the solution obtained using the AHP can be modified by making small changes in the values of each criterion. In the analysis of the graphs, considering the positioning of the alternatives in relation to the dotted vertical line, the robustness presented by the model is demonstrated, since in only one criterion (Complexity) would it be possible to reverse the result and, even so, only if the variation in the judgments was extremely large, which would be very unlikely in the case of specialists trained to work in the area of the process with extensive experience in the subject.

6. Conclusion

Insurance delinquency is a problem that affects both insurers and users, and the economy of countries in general, since there is a need to carry out very precise calculations of the inflow and outflow of funds to make the operation viable. Thus, when monthly payments become delinquent, the insurer needs to use a larger portion of its reserves to meet its

obligations. In the specific case of insurance under the capitalization regime, which is the subject of this article, reserve funds are used, which may in certain cases lead to the insurer's insolvency.

This article aimed to use the Analytic Hierarchy Process (AHP) to help decide the most appropriate choice in the treatment of default for an alternative that best meets the needs of an independent insurer to be compliant with the legal norms and deliver the best service to its customers, minimizing risks.

The result of the application of the method pointed to alternative A5 – “Temporary suspension of the certificate and inclusion of the extended benefit, in the absence of payment of premiums and after the expiration of the grace period, the policy will be suspended for a limited period, starting from the day immediately following the last day of the grace period. Once the suspension period ended, the extended benefit for that policy would be applied.” This alternative had a much higher value than the other alternatives (0.33), as demonstrated in Table 6.

It is interesting to note that alternative A5 is predominant with a significant difference over the others in four out of the five criteria used (Table 4), only losing in the complexity criterion. From a practical point of view, it is likely that alternative A5 will be considered the most appropriate solution for the case of default, as it meets both the insurer's expectation (preventing the company from forcing itself to have the reserve fund for a long time, which could result in insolvency) and the insured's expectations, who has a grace period to pay off the debt.

The consistency analysis showed that the judgments issued by the experts of the model developed here were quite consistent (all the Consistency Ratio values found were less than 0.10), thus validating the result indicated as a solution (Table 7).

Even though the specialists involved in the model were appointed by the insurance company itself and considered extremely experienced in the field, and all of them answered the questionnaires without making any comment that evidenced doubts, a sensitivity analysis was performed (Figure 5) that pointed to the robustness of the results.

It should be taken into account that the case study was carried out specifically in relation to an insurance company, and therefore should not be considered as necessarily applicable to the entire insurance market. Although it uses alternatives and criteria that are common to the entire Brazilian insurance market, as it meets the requirements of the regulatory agency (SUSEP), the experts involved in the process are analysts of the company under study.

At a time when there is an attempt to stimulate the contracting of life insurance, which can even act as a long-term financial investment for consumers, the issue of default in insurance and, particularly in life insurance, needs to be discussed. This debate should be expanded to the scientific community, especially taking into account the high general rates of default in Brazil. Another issue to highlight is that, when asked about it, the experts did not show any difficulty in understanding the method, nor in answering the questionnaires.

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