

ORIGINAL RESEARCH ARTICLE

Economic viability and sustainability of the
Catalan medical professional liability insurance
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Abstract

In Catalonia, Spain, a singular and unique model of medical professional liability insurance has been developed. This model is regarded as highly beneficial, providing substantial benefits to professionals, the government, citizens, society, and patients. Its main feature is the delegation of the management of claims to the medical association by the insurer. In view of the difficulties in obtaining insurance coverage worldwide, the Council of Medical Colleges of Catalonia (CMCC) model has been examined. This analysis evaluates and contrasts the viability and economic sustainability of the model. A retrospective analysis was conducted on 4,832 medical malpractice claims and their compensation costs between 2002 and 2017, evaluating these against the premiums paid to the insurer. The technical return reached 6.39% (€7.78 million), with an estimated additional financial yield ranging between 3.61% and 33.39% depending on the investment scenario, confirming the overall economic viability and sustainability of the model. It is concluded that the delegation of claims management by the CMCC insurer to the CMCC enables the analysis of claims information, thereby facilitating the implementation of clinical safety initiatives that have a double positive impact. Firstly, these initiatives contribute to the viability and economic sustainability of the model by reducing the number and cost of claims. Secondly, they promote clinical safety through the knowledge and use of data, the modification of medical actions, the minimization of the risk of adverse events, the anticipation of claims, the improvement of clinical safety, and contribution to medical training.

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1. Introduction

It is evident that there are significant challenges in Spain's autonomous communities regarding coverage for medical professional liability insurance (MPLI). These challenges have recurred cyclically over the past 25 years, both at the national and the international

levels. In the United States of America, this phenomenon has been documented by Mello *et al.* (2003). In his research, Cohen concludes that there is a growing trend in the severity of medical malpractice verdicts (Cohen, 2026). In Europe, this issue is highlighted by the European Insurance and Reinsurance Federation, which represents UE insurers and reinsurers, and the Standing Committee of the Hospitals of the European Union (Standing Committee of the Hospitals of the European Union, 2004; The European Insurance and Reinsurance Federation, 2009). Apart from international differences among healthcare models (Martínez López, 2005), it is relevant and necessary to analyze the distinctive characteristics of the MPLI model developed by the Council of Medical Colleges of Catalonia (CMCC) in our context. This analysis aims to verify the viability and sustainability of the model since its creation in 1993, and whether it is truly a unique and successful model in the field of MPLI.

The public health system is forced to pay increasingly high premiums for its professionals' insurance, which is intended to cover compensation claims arising from unintentional errors and/or negligence. Spain's 16 regional health systems (excluding that of the Canary Islands) are facing difficulties in the renewal of their policies with major insurance companies. This is due to the rising costs of civil liability coverage for healthcare staff. As a result, public procurement processes in some regions have failed to attract any bidders (Martín-Arroyo, 2019). In this regard, the 2017 Mapfre Annual Insurance Report notes that:

“On the other hand, the reduced number of insurance companies that underwrite civil liability policies in public health are reconsidering the renewal of this insurance because of problems of profitability, and in some cases refusing to continue underwriting this kind of business. This has rekindled the pressure to produce a specific threshold (...)” (Servicio de Estudios Fundación Mapfre, 2018, p. 58).

According to industry sources, the total cost of insuring the healthcare sector amounts to approximately 65 million euros, with an average increase of 27% over the three years following the most recent policy renewals. According to Valle's article, Insurance companies have estimated that there are 75 million euros in the market for insuring the autonomous communities and another 75 million euros for the rest (Valle, 2019). It has been determined that the estimated expenditure for the insurance of Spain's public healthcare systems is projected to reach €138 million in the year 2026. This estimate is derived from data obtained from public information regarding tenders. This indicates an 84% increase in cost between 2026 and 2019.

The following factors have been identified as contributing to this phenomenon:

- The 2015 traffic accident compensation scale, serving as the benchmark to assess medical malpractice damages, has led to higher compensation amounts (Senado, 2017). The annual updates result in a 24.05% increase between 2020 and 2026 in the compensation amounts set out in the damages scale.
- The alleged increase in legal proceedings (Pandey & Sharma, 2023), which escalates defense and administrative costs (Martín-Román *et al.*, 2025).
- Inherent insurance underwriting market cycles (Baker, 2004) and sector consolidation, with a 30% reduction in active insurance entities (Servicio de estudios Fundación Mapfre, 2019).
- Standardized underwriting criteria that often fail to reflect the specific risk profiles of healthcare providers (EIOPA, 2018a; OECD, 2006; Torre-Enciso, 2014).
- Declining financial yields on investment portfolios, reducing insurers' capacity to offset technical underwriting margins (EIOPA, 2018b; INESE, 2018; MacMinn & Ren, 2011).

In contrast to the United States, where the causes of the medical malpractice crisis are well documented (Danzon, 1984), there is no indication of initiatives aimed at improving or mitigating insurers' reluctance to offer medical malpractice liability coverage. One exception is the well-known initiative to establish a cap on damages in the healthcare sector (Nelson III, 2007), which is currently on hold (Mello *et al.*, 2014).

Therefore, this research topic is highly relevant, given the well-known and evident problems that exist and are likely to continue in the future regarding the underwriting of risks by MPLI companies in the traditional manner. The literature on this subject is limited, as research in this area is hindered by the fact that insurance policyholders typically do not handle claims, and insurance companies do not disclose this information for commercial reasons and to protect their trade secrets. We believe that managing medical practice liability (MPL) within the medical profession allows them to address MPLI from a humanistic perspective focused on clinical safety.

Our previous research focused on the analysis of specific elements of risk from a medical perspective (Morales-Ferrero *et al.*, 2026), and our current work aims to address a financial and actuarial analysis of the medical malpractice problem.

The remainder of this manuscript is structured as follows: **Section 1.1** provides a comprehensive overview of the Catalan MPLI model. **Section 2** focuses on the methodological framework. In **Section 3**, the technical

and financial results are presented for a variety of financial scenarios. **Section 4** discusses the broader implications of these findings. The debate is based on documents and reports from the Macprudential Authority and Financial Stability Council (AMCESFI) and the European Insurance and Occupational Pensions Authority (EIOPA). AMCESFI is the Spanish authority tasked with identifying, preventing, and mitigating the development of systemic risk, and ensuring a sustainable contribution of the financial system to economic growth. EIOPA is the supervisory authority for insurance and occupational pensions in the EU. Its objective is to foster financial stability and confidence in the insurance and pensions markets. EIOPA is an independent advisory body to the European Commission, the European Parliament and the Council of the European Union. Finally, **Section 5** concludes this study. This structure has been adopted to logically guide the reader from the theoretical background to the empirical evidence and, ultimately, to the practical implications of the study.

1.1. Description of the Catalan medical professional liability insurance model

Catalonia is a Spanish region, established as an autonomous community, and its capital is Barcelona. Catalonia is organized into four provinces: Barcelona, Tarragona, Girona, and Lleida. Catalonia has a population of 7,770,203 inhabitants, according to the 2020 census.

The CMCC is a public-law corporation that integrates and groups the four medical colleges of Catalonia (Barcelona, Tarragona, Girona, and Lleida) and is tasked with representing and defending the medical profession within its territorial scope before the public administration and society. It is, therefore, the representative and coordinating body of this professional collective (Council of Medical Colleges of Catalonia, 2026). In 2017, 24,575 out of 41,407 licensed physicians were actively practicing; as of recent census data, the total number of licensed physicians in Catalonia has reached 51,578 (Statistical Institute of Catalonia, 2026a; 2026b). CMCC manages the MPLI policy.

The Catalan Health Service (CatSalut), also officially known as the Servei Català de la Salut, has been Catalonia's public health service since 1990. The Catalan healthcare system was formally created to integrate all healthcare resources with a variety of providers and management formulas into a single public network (CatSalut, 2026). CatSalut is responsible for providing public health services. Catalonia has a unique MPI model, which is considered highly beneficial for all stakeholders: physicians, the healthcare administration, and patients. This integrated model consists of a joint, voluntary insurance policy

for physicians affiliated with the CMCC, as well as for CatSalut. The CMCC policy is the leading private MPL insurance policy in Catalonia and covers more than 90% of its doctors, representing approximately 27,000 doctors. Claims management is coordinated in both the public and private sectors, but on an individualized and independent basis.

The MPLI contract is awarded to an insurer through a public tender process. This process involves the formalization of explicit and comprehensive technical insurance contracts. This ensures that the terms and conditions of the contracts are established with transparency and legal certainty. The call for tenders is published in the Official Journal of the European Union in compliance with public procurement regulations (EU Tenders, 2026).

The distinctive feature of the Catalan model of MPLI is that the management, administrative procedures, and legal defense in the event of a claim are delegated by the model's insurer to the policyholders. CatSalut and CMCC are two such policyholders. This practice stands out in the insurance sector, where claims management is one of the activities included in the “core business” of insurance companies. The delegation is carried out through coordination, management, and governance mechanisms described by Arimany-Manso *et al.* (2013; 2026).

The model establishes a governance system (Figure 1) involving the policyholders and the insurer. This system comprises technical committees for each policyholder, a joint monitoring committee, and a tripartite committee. Notably, the insurer is included in all of these committees.

The technical committee is responsible for the oversight of claims under the policyholders' respective policies. This committee is comprised of legal professionals, including attorneys, experts, and medical examiners, among others. The committee's mandate is to establish criteria for the settlement or defense of ongoing claims, which are subsequently submitted to the monitoring committee for approval and ratification. The monitoring committee convenes in a joint session with policyholders, thereby ensuring their involvement in the decision-making process.

The Tripartite committee will also be established to oversee the technical provisions established for the allocation of claims to either insurance policy. This committee will also be responsible for negotiating and proposing a financial settlement for the purpose of renewing the policies.

The Catalan model of professional health insurance is characterized by the following features:

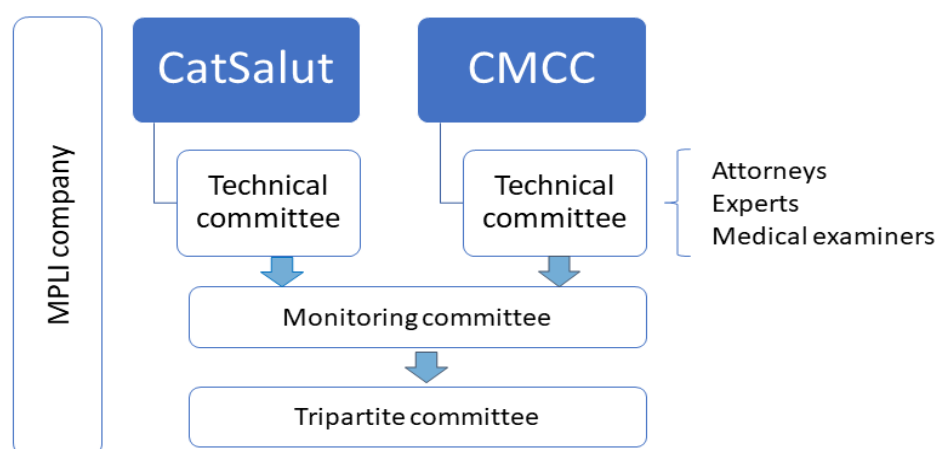


Figure 1. Governance system of the Catalan MPLI model

Abbreviations: CatSalut: Catalan Health Service; CMCC: Council of Medical Colleges of Catalonia; MPLI: Medical professional liability insurance.

- (i) The delegation of management, administrative processes, and legal defense in the event of an incident from the insurer to the policyholder is a critical component of the insurance agreement.
- (ii) The concept of joint and coordinated contracting between the public healthcare sector and medical professionals is a subject of significant interest.
- (iii) The implementation of a collective insurance policy with voluntary enrollment.
- (iv) The solidarity among professionals, resulting in a flat-rate insurance policy for all professionals, regardless of their medical specialty.
- (v) Stable premiums over time.
- (vi) The implementation of public tenders guarantees transparency and legal certainty through explicit, comprehensive technical contracts awarded via competitive bidding.
- (vii) The utilization of long-term contracts fosters a sense of commitment, which ensures stability to the model.
- (viii) Contracts with solvent insurance companies (solvency).
- (ix) Close involvement in claims management adds value to a process that is inherently distressing for professionals. Gómez-Durán *et al.* (2018) reported that 80.8% of them report a significant emotional reaction following an incident, with symptoms of anxiety, and the experience frequently affects their personal, family, and social lives, as well as their professional conduct.
- (x) The promotion of out-of-court settlement of cases is a strategy employed to expedite the resolution of legal cases.

2. Data and methods

2.1. Sources of information

The total cost of the MPLI policies purchased by the CMCC is the amount indicated in the selected proposals for the respective plans, which are collectively contracted by CatSalut and the CMCC with the insurer during the analysis period. Information on claims rates was obtained from the claims database managed by the CMCC and is available in its claims database for the 2002–2017 period.

Information on interest rates and bonds was obtained from the Spanish Treasury (Tables 1 and 2), whose primary objectives include the management of public debt, the regulation of the financial sector and international financial relations. The financial results for the non-life insurance sector (Table 3) were obtained from the Spanish insurance regulator, Dirección General de Seguros y Fondos de Pensiones (DGSFP).

The database under analysis does not include any personally identifiable information regarding the physicians or patients involved in the claim. This is in accordance with current personal data protection legislation.

2.2. Methodology

For the economic analysis of the model during the reference period, the theoretical premiums of the respective contract awards were considered the most conservative working hypothesis. This was due to the fact that the premiums actually paid were significantly higher and, therefore, that criteria improve the results of the economic study conducted in this research. According to the terms

of the insurance contract, two items are subtracted from the total premiums according to the award: The Insurance Premium Tax (IPT) and the broker's commission for obtaining the inventory insurance premium. It is the premium received by the insurer for risk coverage plus internal administrative expenses.

Theoretically, the outcome of comparing the technical result obtained by comparing premiums with the cost of claims (i.e., claims payments plus reserves for pending claims) indicates that the insurance company would generate a financial profit from the premiums collected. Moreover, a time lag exists between the collection of premiums and the payment of claims, which represents additional revenue directly attributable to the MPLI model. In the absence of knowledge regarding the precise financial amounts obtained by the insurer from the model, the subsequent step was to estimate a series of financial profit scenarios. The first two tables (Tables 1 and Table 2) present the interest rates on short-term risk-free assets for the model's reference period, which serve as potential investments for the model's liquid resources (Tesoro Público, 2020a; 2020b).

Table 1. Interest rate on outstanding debt issue (IRR) at the end of each period

Year	Interest rate on bonds
2002	3.526%
2003	2.438%
2004	2.259%
2005	2.263%
2006	3.158%
2007	4.027%
2008	3.510%
2009	0.880%
2010	1.689%
2011	3.093%
2012	2.664%
2013	1.225%
2014	0.358%

In addition, as an alternative scenario, the financial results of non-life insurance companies (Table 3) published in the annual reports of the Spanish Insurance regulator (DGSFP) will be employed as a benchmark (Dirección General de Seguros y Fondos de Pensiones, 2007; 2009; 2011; 2014; 2018).

Table 2. Effective interest rates for new issues

Year	Bonds up to three months	Bonds at 12 months
2002	3.370%	3.411%
2003	2.130%	2.253%
2004	2.027%	2.151%
2005	2.063%	2.192%
2006	n/a	3.250%
2007	n/a	4.113%
2008	2.603%	3.680%
2009	0.654%	1.031%
2010	0.919%	1.663%
2011	2.003%	3.158%
2012	1.251%	2.809%
2013	0.420%	1.225%
2014	0.176%	0.421%
2015	-0.069%	0.080%
2016	-0.341%	-0.143%
2017	-0.603%	-0.373%

Note: n/a: No data available.

Table 3. Financial results for the non-life branch

Year	Financial results non-life branch	Source
2002	5.89%	No data available; data assumed from the 2005 financial year
2003	5.89%	
2004	5.89%	
2005	5.89%	Insurance annual report 2007
2006	5.80%	
2007	5.52%	Insurance annual report 2009
2008	3.24%	
2009	4.90%	Insurance annual report 2011
2010	4.70%	
2011	4.10%	
2012	3.00%	Insurance annual report 2014
2013	4.00%	
2014	4.81%	Insurance annual report 2018
2015	4.26%	
2016	4.00%	
2017	3.53%	
2018	3.15%	

The estimation of the potential financial return can be made on the basis of the data provided by the Spanish Treasury and the DGSFP.

3. Results

3.1. Technical result:

The total theoretical premiums for the respective models and their extensions amount to €144,856,912.40 for the period 2002–2017 (through June 30, 2017). The total premiums and the IPT are deducted, along with the expenses corresponding to each fiscal year, to obtain the corresponding net premiums. [Table 4](#) illustrates the IPT for the specified period, considering the temporal variability of this tax. The broker commission ([Table 5](#)) for each year is deducted from the net premiums for each financial year.

Table 4. Insurance premium tax (IPT) by year

Year	% IPT and charges
2002–2009	6.30%
2010–2017	6.15%

Table 5. Broker commission for the model (2002–2017)

Year	% Commission
2002–June 2012	10.00%
July 2012–2017	12.00%

After the necessary deductions are made—including IPT, expenses, and broker’s commission—the inventory premium amounts to 121,854,237.08 euros ([Appendix](#)

[1](#)). The claims cost is €114,071,553.03 (payments of €101,123,913.35 plus claims reserves of €12,947,639.68), and the technical result is 6.39% (1 minus the cost of claims divided by portfolio premiums, $1 - [€114,071,553.03 / €121,854,237.08]$). This results in a total of €7,782,684.05. [Appendix 1](#) provides a detailed breakdown of these calculations.

3.2. Financial result:

As illustrated in [Table 6](#), the findings of the economic analysis of the model for the 2002–2017 period are presented with a detailed breakdown according to various interest rate or yield scenarios ([Tables 1–3](#)).

In the insurance business, premiums are collected before claims occur and are paid out, generating funds available for investment. Claims involve a long-term horizon (“tail risk”), as medical claims can take years to resolve through the courts. For this reason, investment returns are a factor that must be considered. Therefore, the financial result should be incorporated into the technical result ([Table 7](#))—which is derived by comparing inventory premiums against the cost of claims (i.e., claim payments plus provisions for outstanding claims).

Given the impossibility of knowing the actual amounts obtained by the insurer from the model, the next step was to estimate a series of financial profit scenarios. In the treasury bond yield database, a financial return of between 361 basis points (bp) and 945 bp on portfolio premiums, and 33.39% when considering the financial results published by the DGSFP for non-life insurance companies. [Appendices 2–5](#) provide a visual representation of the calculation.

To avoid ambiguity, four distinct and independent investment scenarios are presented in [Tables 6](#) and [7](#): (i) average yields on outstanding public debt (interest rate on the outstanding debt issue; IRR); (ii) highly conservative

Table 6. Estimation of financial performance (2002–2018)

Interest rate scenario	Financial performance (€)	% (Financial performance [€]/inventory premium)	Detail
Interest rate on the outstanding debt issue (IRR) at the end of each period	11,519,459.20	9.45%	Appendix 2
Effective interest rates on new issues. 3-month bonds.	4,404,493.87	3.61%	Appendix 3
Effective interest rates on new issues. 12-month bonds.	11,382,054.06	9.34%	Appendix 4
Financial results for non-life insurers according to DGSFP data	40,685,095.16	33.39%	Appendix 5

Note: Each row represents an independent, mutually exclusive investment assumption applied to the model’s cash flows (detailed in [Appendices 2–5](#)). Abbreviation: DGSFP: Dirección General de Seguros y Fondos de Pensiones.

3-month Treasury bill yields; (iii) 12-month Treasury bill yields; and (iv) the empirical non-life insurance sector yields published by the DGSFP.

The estimated financial return must be added to the 639 basis points corresponding to the technical return, based on the preliminary estimate of the technical result (6.39% = 100% – 93.61%, where 93.61% corresponds to the [claims cost of €114,071,553.03/€121,854,237.08 in premiums]). For a more comprehensive overview of the subject, please refer to the [Appendices 1–5](#).

[Table 8](#) presents the technical and financial performance associated with inventory premiums under four alternative investment assumptions.

4. Discussion

4.1. Strengths and limitations

The dataset includes claims from CMCC-insured physicians, representing approximately 90% of registered doctors in Catalonia (>27,000 insured). However, it also incorporates claims filed with the judicial authority and cases handled out of court, i.e., without the filing of a lawsuit—an increasingly common method. Claims may be addressed to one or more physicians, regardless of whether

a public or private health institution is ultimately involved.

Although 12% of the claims remain open and under processing (604 out of 4,832 claims from the 2002–2017 period), the sample is actuarially mature. To account for potential financial liabilities arising from these unresolved cases, the total claims cost of €114.07 million explicitly incorporates €12.95 million in technical reserves for pending claims. While final judicial resolutions or court settlements could introduce minor adjustments, the active provision of these reserves by the insurer, under the supervision of joint technical committees, ensures that potential future liability costs are properly capitalized and do not compromise the overall conclusions regarding profitability and sustainability.

The data on payments and reserves for the claims considered were provided by the insurer of the CMCC model in June 2019, at the company's discretion, and could have varied depending on the favorable or unfavorable processing of the claims.

A main limitation of this study is the lack of comparable empirical datasets from other regional or international healthcare civil liability insurance models. This constraint is largely due to the widespread practice among commercial

Table 7. Scenario of the technical results according to the estimate of financial performance (%)

Interest rate scenario	Technical performance (e)	Financial performance (e)	Technical (e) + financial (e) performance
Interest rate on the outstanding debt issue (IRR) at the end of each period	6.39%	9.45%	15.84%
Effective interest rates on new issues. 3-month bonds.	6.39%	3.61%	10.00%
Effective interest rates on new issues. 12-month bonds.	6.39%	9.34%	12.95%
Financial results for non-life insurers according to DGSFP data	6.39%	33.39%	39.78%

Note: Each row represents an independent, mutually exclusive investment assumption applied to the model's cash flows (detailed in Appendices 2–5). Abbreviation: DGSFP: Dirección General de Seguros y Fondos de Pensiones.

Table 8. Scenario of the technical results according to the estimate of financial performance (€)

Interest rate scenario	Technical performance (e)	Financial performance (e)	Technical (e) + financial (e) performance
Interest rate on the outstanding debt issue (IRR) at the end of each period	€7,782,684.05	€11,519,459.20	€19,302,143.25
Effective interest rates on new issues. 3-month bonds.	€7,782,684.05	€4,404,493.87	€12,187,177.92
Effective interest rates on new issues. 12-month bonds.	€7,782,684.05	€11,382,054.06	€19,164,738.11
Financial results for non-life insurers according to DGSFP data	€7,782,684.05	€40,685,095.16	€48,467,779.21

Note: Each row represents an independent, mutually exclusive investment assumption applied to the model's cash flows (detailed in Appendices 2–5). Abbreviation: DGSFP: Dirección General de Seguros y Fondos de Pensiones.

insurers of withholding financial and claims data to protect trade secrets and maintain competitive advantages. However, this absence of external benchmarks also constitutes a major catalyst for this research: It underscores the critical need to generate and disseminate transparent, reliable data on medical professional liability. By bringing these figures to light, this study aims to fill an important gap in the literature and encourage the collection and publication of standardized risk management data across health systems.

Finally, a noteworthy conceptual limitation of this study is that its evaluation of economic sustainability relies primarily on the technical margin (net premiums versus claims costs) and estimated investment yields. In real-world insurance dynamics, comprehensive long-term sustainability is contingent upon broader actuarial and systemic factors, including reserve adequacy, compliance with Solvency II capital requirements, claims inflation driven by periodic updates to legal compensation scales, and long-term financial risk management. Although active oversight by joint technical committees in the Catalan model helps mitigate reserve risk and claim inflation through early claims management, future research should integrate these broader solvency and regulatory parameters into the quantitative framework.

Furthermore, this evaluation relies primarily on descriptive actuarial modeling over 16 years rather than dynamic time-series forecasting or stochastic uncertainty estimation. While financial variability was addressed by calculating four distinct investment and interest-rate scenarios (spanning short-term Treasury bonds to broader non-life industry returns), future studies could expand upon these findings by applying longitudinal trend analyses and predictive modeling to assess changing claims severity, inflation dynamics, and market fluctuations over time.

4.2. Interpretation within the context

A financial return estimate was calculated for the portfolio's premiums, considering the account's high volume. The investment criteria prioritized maximum security and liquidity over maximizing financial return. The high volume of premiums was initially projected, as were the "Incurred But Not Reported" and "Incurred But Not Enough Reported" incidents. It is important to note that the claims filing process was taken into account, with an average payment period of 2030 days (754 days for filing a claim and 1,276 days for claim settlement).

In other words, approximately 5.5 years. However, the dynamics of the health liability segment would allow for more sophisticated financial planning and, consequently, a longer investment horizon, which would likely increase

investment returns. This is not the objective of this study and also depends on the insurance company's investment policy, which is sometimes subject to corporate restrictions or guidelines regarding asset allocation and rating. This reveals not only a positive technical return (639 bps), but also an estimated additional financial return of at least 300–900 bps based on Treasury bonds and 3,300 bps according to financial results data published by the DGSFP regarding non-life insurers, which have been affected by the current situation in the public debt markets, particularly in the shorter maturities. It is noteworthy that MPLI company currently holds reserves for outstanding claims amounting to 12 million euros. However, the financial return of the insurance company remains uncertain.

The sample includes 604 pending (open) claims and 4,228 resolved (closed) claims, with a data set sufficiently robust to support analysis and draw conclusions from the study, as only 12% of the claims are pending.

It is important to note that the financial results of the non-life insurers under consideration, as reported in the DGSFP's annual reports, correspond to a specific distribution of investments (Appendices 6–8).

The valuation has been estimated as if it were a single account. Consequently, it has not been positively or negatively affected by the combined return on investment of the insurance company's entire diversified portfolio. The strategy of diversifying investments adds value primarily because it mitigates risk—declines in one asset can be offset by the strong performance of others in your portfolio; optimizes returns—it allows you to capture growth opportunities across different industries or global markets over time; and reduces dependency—it prevents the success of your savings from relying exclusively on a single company or sector (Markowitz, 1952).

The prolonged period of low interest rates exerts a significant impact on non-life insurance companies, as they are particularly vulnerable to these conditions. In response, these companies may implement modifications to their asset and liability management strategies or pricing models, given the short-term nature of these operations (González & Márques, 2013).

It should also be noted that insurers' investment policies are subject to the regulatory framework of Solvency II, specifically the aspect of market risk, which constitutes one of the four risk categories: Market risk, Risk of underwriting, Counterparty risk (credit), and Operational risk, that must be considered in the calculation of the Solvency Capital Requirement (SCR). It should also be noted that insurers' investment policies and capital allocations are bound by the regulatory framework of Solvency II,

which establishes the SCR across market, underwriting, counterparty, and operational risks (Kozarevic *et al.*, 2014; Vilardebó Miró, 2013). Under Solvency II, non-life lines such as medical professional liability are subject to stringent capital surcharges for technical underwriting and reserve volatility. Consequently, insurers operating under this framework must continuously balance risk-adjusted investment returns against the capital consumption mandated by regulatory requirements.

Cummins *et al.* (1998) analyzed how publicly traded insurers—driven by market pressure and shareholder control mechanisms—tend to manage their portfolios with much tighter control over underwriting risk exposure and a greater aversion to unforeseen catastrophic losses compared to mutual insurers, which operate with greater flexibility in the face of long-term volatility.

Vilardebó Miró (2013) argued that the insurance sector has a strong connection with the financial market, since an indirect part of the business involves investing insurance technical provisions. As a result, all companies have professionals specialized in this field to decide which strategies and products are best suited to their needs. He indicates that the non-life line of business is much more demanding in terms of SCRs than the life line of business, and the main reason for this is that, under the new Solvency II regulations, regarding market risk, government debt is not subject to any mandatory capital requirement for spread risk or concentration risk, and life insurance companies have concentrated their investments in government debt. Market risk arises from price fluctuations (volatility) in the financial assets that comprise the insurance company's investment portfolio. The rules ultimately determine insurers' investment policies based on the type of business they conduct ("life" or "non-life") and the type of investments they make. Insurers must strike the best balance between risk-adjusted returns and the capital consumption resulting from the Solvency II rules (Vilardebó Miró, 2013).

It is worth noting that persistently low interest rates pose a significant challenge to the insurance sector. Historically, the insurance sector has offset technical deficits in certain accounts and products. It has become one of the precursors to the professional liability insurance crisis in the United States and Europe. This risk has been highlighted by regulators in reports from both the AMCESFI and the EIOPA. The AMCESFI acknowledges the intense competitive nature of the insurance sector, which has prompted companies to concentrate their management efforts on achieving enhanced efficiency and rationalization of loss ratios. Additionally, these companies have directed their attention toward the costs that contribute to the

technical result (Autoridad Macropudencial Consejo de Estabilidad Financiera, 2020).

European Insurance and Occupational Pensions Authority has expressed concerns that the persistent low-interest-rate environment is affecting insurance companies' investment policies, profitability, and solvency, leading insurers to adjust their investment strategies to achieve higher returns. This phenomenon consequently engenders a modification in the asset allocation of their investment portfolios, which affects their risk profile and solvency (EIOPA, 2020).

While this study evaluates economic sustainability primarily through the technical margin (premiums vs. claims costs) and investment yield, long-term insurance sustainability encompasses broader actuarial and systemic factors. In practice, model viability is also contingent upon reserve adequacy, compliance with Solvency II capital requirements, claims inflation driven by periodic updates to legal compensation scales, and long-term financial risk management. Within the Catalan model, the active oversight by joint technical committees helps mitigate reserve risk and claim inflation through early claims management, while statutory Solvency II frameworks ensure that underwriting and market risks remain properly capitalized.

A comprehensive review of the existing literature revealed no studies that addressed the specific issue of this research's manuscript. Aljaffary (2026) cautioned that a lack of awareness among healthcare professionals, regulatory fragmentation, and economically regressive insurance models continue to shape the behavior of healthcare professionals, which could indirectly affect patient safety and access to healthcare. The extant literature is deficient in robust empirical evaluations that quantify how specific reforms in the area of civil liability translate into improved patient outcomes. The analysis of economic viability and sustainability is limited to the cost of litigation, without establishing a relationship between that cost and insurance premiums.

5. Conclusion

The technical result of the Catalan MPL model was positive, and the financial performance enhances the credibility of the model, indicating that the Catalan MPLI insurance model was sustainable and economically viable during the 2002–2017 period.

The delegation of claims management empowers insurance professionals to manage a particularly sensitive aspect of their work: risk management. The result of this process is a series of benefits for all stakeholders,

demonstrating that direct management enables the adoption of proactive measures, such as data analysis, risk identification, and guidelines to foster clinical safety (e.g., clinical practice guidelines, quality programs). While these qualitative outcomes fall outside the quantitative scope of this financial analysis, direct management from experience and professionalism provides a valuable framework to support medical care, risk reduction, and continuous learning from errors.

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Conflict of interest

The authors declare they have no competing interests.

Author contributions

Conceptualization: Juan Ignacio Morales-Ferrero

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Methodology: All authors

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Consent for publication

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Availability of data

Data are available from the corresponding author upon reasonable request. A signed data access agreement is also needed for data requesters.

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Appendix

Appendix 1. Total premiums, inventory premiums and technical result

Year	Total premium (€)	Extension (€)	% IPT	Net premium (€)	% commission	Inventory premium (€)	Cost (€)
2002	7,041,928.84	0.00	6.30%	6,624,580.28	10%	5,962,122.25	18,526.10
2003	8,176,756.71	0.00	6.30%	7,692,151.19	10%	6,922,936.07	1,605,757.33
2004	8,896,706.22	0.00	6.30%	8,369,432.00	10%	7,532,488.80	3,599,366.87
2005	9,245,000.00	0.00	6.30%	8,697,083.73	10%	7,827,375.35	7,451,050.64
2006	9,245,000.00	0.00	6.30%	8,697,083.73	10%	7,827,375.35	6,809,916.71
2007	9,245,000.00	0.00	6.30%	8,697,083.73	10%	7,827,375.35	9,746,020.31
2008	11,302,488.89	4,622,500.00	6.30%	14,981,174.87	10%	13,483,057.39	8,165,649.09
2009	11,620,000.00	0.00	6.30%	10,931,326.43	10%	9,838,193.79	7,770,805.98
2010	7,150,000.00	0.00	6.15%	6,735,751.30	10%	6,062,176.17	7,362,064.14
2011	2,550,000.00	4,827,838.23	6.15%	6,950,389.29	10%	6,255,350.36	7,067,906.91
2012	11,238,752.76	4,827,838.23	6.15%	15,135,742.81	10% / 12%	13,410,416.24	9,427,233.74
2013	16,600,978.82	0.00	6.15%	15,639,169.87	12%	13,762,469.49	9,143,107.17
2014	5,866,116.82	0.00	6.15%	5,526,252.30	12%	4,863,102.03	8,756,877.05
2015	2,362,769.82	0.00	6.15%	2,225,878.30	12%	1,958,772.91	7,378,138.90
2016	816,066.00	4,610,585.53	6.15%	5,112,248.26	12%	4,498,778.47	8,606,817.23
2017	0.00	4,610,585.53	6.15%	4,343,462.58	12%	3,822,247.07	6,440,897.10
2018	–	–	6.15%	0.00	–	0.00	4,721,417.76
	121,357,564.88	23,499,347.52	–	136,358,810.67	–	121,854,237.08	114,071,553.03
Total	144,856,912.40	–	–			Technical result:	7,782,684.05
				% Costs/inventory premiums:		93.61%	

Abbreviation: IPT: Insurance premium tax.

Appendix 2. Calculation of financial performance estimated according to the scenario of interest rates on the outstanding debt issue (IRR) at the end of each period

Year	Inventory premium (€)	Cost at close date (€)	Interest	Financial performance (€)	End of year total (€)
2002	5,962,122.25	1,511.44	3,526%	78,834.16	6,040,956.42
2003	6,922,936.07	3,181.96	2,438%	210,557.64	13,172,938.69
2004	7,532,488.80	281,468.45	2,259%	361,359.33	21,063,604.86
2005	7,827,375.35	737,547.23	2,263%	540,705.83	29,150,217.59
2006	7,827,375.35	1,537,617.30	3,158%	1,004,525.16	37,244,570.88
2007	7,827,375.35	3,275,430.61	4,027%	1,594,822.08	45,129,151.01
2008	13,483,057.39	10,875,973.13	3,510%	1,718,391.09	57,055,168.87
2009	9,838,193.79	7,771,720.56	0,880%	498,660.81	56,516,050.34
2010	6,062,176.17	4,432,676.07	1,689%	943,728.26	55,750,234.21
2011	6,255,350.36	5,742,765.86	3,093%	1,745,495.49	59,318,403.99
2012	13,410,416.24	4,468,439.22	2,664%	1,656,842.11	68,642,896.47
2013	13,762,469.49	5,019,581.58	1,225%	883,569.93	78,820,496.67

(Cont'd...)

Appendix 2. (Continued)

Year	Inventory premium (€)	Cost at close date (€)	Interest	Financial performance (€)	End of year total (€)
2014	4,863,102.03	6,476,671.46	0,358%	281,967.30	78,945,984.43
2015	1,958,772.91	12,971,788.30	0,000%	0.00	74,428,085.88
2016	4,498,778.47	4,757,446.36	0,000%	0.00	65,955,076.04
2017	3,822,247.07	21,733,948.01	0,000%	0.00	65,019,876.76
2018	0.00	10,919,382.67	0,000%	0.00	43,285,928.75
2019	–	116,763.15	0,000%	0.00	32,366,546.08
2020	–	1,511.44	0,000%	0.00	32,249,782.93
Total	121,854,237.08	101,123,913.35	–	11,519,459.20	–
Financial performance / Inventory premiums:				9.45%	–

Appendix 3. Calculation of financial performance according to the scenario of effective interest rates for new issues (bonds at 3 months)

Year	Inventory premium (€)	Cost at close date (€)	Interest	Financial performance (€)	End of year total (€)
2002	5,962,122.25	1,511.44	3.37%	75,346.32	6,037,468.57
2003	6,922,936.07	3,181.96	2.13%	183,882.96	13,142,776.16
2004	7,532,488.80	281,468.45	2.03%	323,636.22	20,995,719.23
2005	7,827,375.35	737,547.23	2.06%	491,518.71	29,033,144.84
2006	7,827,375.35	1,537,617.30	0.00%	0.00	36,122,972.96
2007	7,827,375.35	3,275,430.61	0.00%	0.00	42,412,731.01
2008	13,483,057.39	10,875,973.13	2.60%	1,203,642.59	53,824,000.37
2009	9,838,193.79	7,771,720.56	0.65%	349,463.81	53,135,684.84
2010	6,062,176.17	4,432,676.07	0.92%	482,425.43	51,908,565.88
2011	6,255,350.36	5,742,765.86	2.00%	1,053,419.14	54,784,659.30
2012	13,410,416.24	4,468,439.22	1.25%	721,326.95	63,173,636.63
2013	13,762,469.49	5,019,581.58	0.42%	279,967.37	72,747,634.27
2014	4,863,102.03	6,476,671.46	0.18%	127,932.56	72,719,087.28
2015	1,958,772.91	12,971,788.30	–0.07%	–49,007.16	68,152,181.56
2016	4,498,778.47	4,757,446.36	–0.34%	–221,564.08	59,457,607.65
2017	3,822,247.07	21,733,948.01	–0.60%	–356,414.65	58,165,993.71
2018	0.00	10,919,382.67	–0.52%	–261,082.28	36,170,963.42
2019	–	116,763.15	0.00%	0.00	25,251,580.75
2020	–	1,511.44	0.00%	0.00	25,134,817.60
Total	121,854,237.08	101,123,913.35	–	4,404,493.87	–
Financial performance/ inventory premiums:				3.61%	–

Appendix 4. Calculation of financial performance according to the scenario of effective interest rates for new issues (bonds at 12 months)

Year	Inventory premium (€)	Cost at close date (€)	Interest	Financial performance (€)	End of year total (€)
2002	5,962,122.25	1,511.44	3.37%	76,263.00	6,038,385.25
2003	6,922,936.07	3,181.96	2.13%	194,522.21	13,154,332.09
2004	7,532,488.80	281,468.45	2.03%	343,682.95	21,027,321.89
2005	7,827,375.35	737,547.23	2.06%	522,946.25	29,096,175.04
2006	7,827,375.35	1,537,617.30	0.00%	1,032,032.97	37,218,036.13
2007	7,827,375.35	3,275,430.61	0.00%	1,627,789.48	45,135,583.67
2008	13,483,057.39	10,875,973.13	2.60%	1,801,854.73	57,145,065.17
2009	9,838,193.79	7,771,720.56	0.65%	585,153.31	56,692,439.14
2010	6,062,176.17	4,432,676.07	0.92%	932,134.12	55,915,028.86
2011	6,255,350.36	5,742,765.86	2.00%	1,787,381.63	59,525,084.78
2012	13,410,416.24	4,468,439.22	1.25%	1,752,828.74	68,945,563.90
2013	13,762,469.49	5,019,581.58	0.42%	887,277.61	79,126,871.77
2014	4,863,102.03	6,476,671.46	0.18%	332,877.09	79,303,269.31
2015	1,958,772.91	12,971,788.30	−0.07%	62,087.25	74,847,458.01
2016	4,498,778.47	4,757,446.36	−0.34%	−102,488.21	66,271,959.96
2017	3,822,247.07	21,733,948.01	−0.60%	−245,886.30	65,090,874.37
2018	0.00	10,919,382.67	−0.52%	−208,402.76	43,148,523.61
2019	–	116,763.15	0.00%	0.00	32,229,140.94
2020	–	1,511.44	0.00%	0.00	32,112,377.79
Total	121,854,237.08	101,123,913.35	–	11,382,054.06	–
Financial performance / Inventory premiums:				9.34%	–

Appendix 5. Calculation of financial performance estimated from the financial results for non-life insurance companies published by the DGSFP

Year	Inventory premium (€)	Cost at close date (€)	Interest	Financial performance (€)	End of year total (€)
2002	5,962,122.25	1,511.44	5.89%	131,688.38	6,093,810.63
2003	6,922,936.07	3,181.96	5.89%	511,802.41	13,527,037.67
2004	7,532,488.80	281,468.45	5.89%	963,046.08	22,019,390.60
2005	7,827,375.35	737,547.23	5.89%	1,463,612.33	31,028,909.83
2006	7,827,375.35	1,537,617.30	5.80%	1,953,880.53	40,072,618.48
2007	7,827,375.35	3,275,430.61	5.52%	2,342,206.53	48,704,583.07
2008	13,483,057.39	10,875,973.13	3.24%	1,702,051.16	60,614,261.00
2009	9,838,193.79	7,771,720.56	4.90%	2,951,029.59	62,527,511.25
2010	6,062,176.17	4,432,676.07	4.70%	2,908,662.31	63,726,629.17
2011	6,255,350.36	5,742,765.86	4.10%	2,640,815.41	68,190,118.87
2012	13,410,416.24	4,468,439.22	3.00%	2,131,964.63	77,989,733.87
2013	13,762,469.49	5,019,581.58	4.00%	3,258,999.81	90,542,763.95

(Cont'd...)

Appendix 5. (Continued)

Year	Inventory premium (€)	Cost at close date (€)	Interest	Financial performance (€)	End of year total (€)
2014	4,863,102.03	6,476,671.46	4.81%	4,352,284.45	94,738,568.85
2015	1,958,772.91	12,971,788.30	4.26%	3,963,689.60	94,184,359.90
2016	4,498,778.47	4,757,446.36	4.00%	3,640,279.25	89,351,629.32
2017	3,822,247.07	21,733,948.01	3.53%	3,141,732.81	91,558,162.85
2018	0.00	10,919,382.67	3.15%	2,627,349.87	72,451,564.71
2019	–	116,763.15	0.00%	0.00	61,532,182.04
2020	–	1,511.44	0.00%	0.00	61,415,418.89
Total	121,854,237.08	101,123,913.35	–	40,685,095.16	–
Financial performance/inventory premiums:				33.39%	–

Abbreviation: DGSFP: Dirección General de Seguros y Fondos de Pensiones.

Appendix 6. Distribution of non-life insurance company investments (2009–2011)

Non-life investments in %	2009	2010	2011
Private fixed income	35.56%	28.82%	29.23%
Public fixed income	17.38%	15.40%	20.88%
Immovable assets	15.89%	12.29%	11.01%
Variable income	8.20%	11.66%	12.48%
Collective investment scheme	7.96%	9.35%	7.99%
Other	15.01%	22.49%	18.42%

Source: Dirección General de Seguros y Fondos de Pensiones.

Appendix 7. Distribution of non-life insurance company investments (2012–2015)

Non-life investments in %	2012	2013	2014	2015
Private fixed income	30.93%	26.35%	24.11%	23.62%
Public fixed income	32.91%	26.93%	29.86%	29.48%
Immovable assets	4.83%	12.08%	11.07%	10.81%
Variable income	5.24%	12.95%	12.93%	13.06%
Collective investment scheme	4.07%	8.39%	10.02%	11.04%
Treasury and deposits	12.62%	10.64%	10.00%	10.09%
Credits	5.49%	1.24%	0.65%	0.58%
Structured credit/debt and derivatives	3.89%	1.43%	1.35%	1.31%

Source: Dirección General de Seguros y Fondos de Pensiones.

Appendix 8. Distribution of non-life insurance company investments (2016–2018)

Non-life investments in %	2016	2017	2018
Public debt	32.13%	29.86%	30.72%
Company debt	24.34%	24.87%	24.72%
Variable income	10.52%	11.26%	11.33%
Collective investment institutions	11.08%	12.40%	12.49%
Structured financial assets	2.74%	1.65%	1.61%
Securitization of assets	0.35%	0.95%	0.85%
Cash and deposits	8.60%	8.97%	8.01%
Mortgages and other credits	1.63%	1.51%	1.68%
Immovable assets	8.73%	8.54%	8.58%
Other investments	0.00%	0.00%	0.00%
Derivatives	−0.12%	0.00%	0.01%

Source: Dirección General de Seguros y Fondos de Pensiones.