Anis Derradji. Tax optimization vs. Institutional oversight: discretionary provisioning among Algerian non-life insurers using logistic regression. *Інститут бухгалтерського обліку, контроль та аналіз в умовах глобалізації*. 2026. Випуск 2. С. 21-30.
DOI: https://doi.org/10.35774/ibo2026.02.021

JEL Classification : G22, H25, G38

Anis Derradji
PhD in Finance, Lecturer
Abderrahmane Mira University-Bejaia, Algeria
E-mail: anis.derradji@univ-bejaia.dz
ORCID : 0000-0002-6484-1189

TAX OPTIMIZATION VS. INSTITUTIONAL OVERSIGHT: DISCRETIONARY PROVISIONING AMONG ALGERIAN NON-LIFE INSURERS USING LOGISTIC REGRESSION

Abstract

This study investigates the impact of taxation on discretionary provisioning among Algerian non-life insurers using a panel dataset of nine companies (four public and five private) over 2014–2022. Logistic regression analysis reveals contrasting behaviors between ownership structures: while private insurers respond to higher tax burdens by inflating regulated provisions for tax optimization (beta = +4.87, p = 0.015), public insurers reverse this trend (beta = -483.79, p = 0.045) due to state oversight and dividend targets. Marginal effects indicate a 2.9% tax threshold beyond which public sector discretion is strictly curtailed. Operational constraints specifically loss ratio (beta = -24.50, p = 0.000) and firm size (beta = -17.91, p = 0.003) significantly reduce accounting discretion, supporting the political cost theory. Conversely, control variables like premium growth and ROE show no effect, proving that opportunistic reserve management is driven by fiscal, statutory, and institutional pressure rather than routine performance metrics.

Keywords: *Tax; Non-Life Insurers Using Logistic Regression; Institutional Oversight*

Introduction

Technical reserves are funds that insurance companies must establish and maintain to cover liabilities arising from insurance and reinsurance contracts, thereby ensuring they can fulfill their obligations to policyholders at any time (Armeanu et al., 2012; Gláserová, 2014; Nagy & Cotleț, 2011)

.In this capacity, technical reserves serve a dual function: they eliminate the negative financial consequences of claims while simultaneously enabling the insurer's investment activities through the funds set aside (Hudakova et al., 2017).

From an accounting perspective, these reserves represent a practical application of the prudence principle, the accrual concept, and the fair presentation of financial reality (Gláserová, 2014). Specifically, they reflect the insurer's liabilities arising from events that occurred within the scope and duration of the insurance contract, evaluated as of a specific reporting date(Reid, 1978).

© Anis Derradji, 2026

Structurally, technical provisions are broadly categorized into two temporal groups: premium reserves, which cover expected future events, and claims reserves, which pertain to past events(Carvalho & Carvalho, 2019).

Within risk-based insurance frameworks, these mandatory reserves primarily comprise unearned premium reserves and loss reserves (Kompaniets & Kysilyova, 2021).

Consequently, in general insurance businesses, technical provisions consist specifically of unearned premium provisions and claims provisions (Ogungbenle & Phulara, 2023).

In contrast, technical reserves in life insurance differ in structure and are calculated using both prospective and retrospective methods as conditional expected values (Norberg, 1991; Selimović, 2010).

Ultimately, technical reserves function as the core financial mechanism linking an insurer's underwriting obligations directly to its solvency position. Accurate reserve estimation is therefore essential for both regulatory compliance and long-term operational viability (Armeanu et al., 2012; Selimović, 2010). Indeed, miscalculating these reserves carries significant trade-offs: overestimating reserves artificially reduces apparent solvency, whereas underestimating reserves inflates reported profits and escalates insolvency risk (Carvalho & Carvalho, 2019; Vintilă & Armeanu, 2009) .

Complementing these liability-side mechanisms, regulatory capital requirements act as a secondary protective layer. These mandates require insurers to hold sufficient capital beyond their technical provisions to maintain liquidity and overall solvency relative to their total risk exposure(Bhutto et al., 2021). As a result of these obligations, the capital structure of insurance firms differs fundamentally from that of non-insurance corporations, consisting primarily of equity and technical provisions such as accruals, outstanding claims, and dedicated insurance funds rather than traditional financial debt(Akpan et al., 2017; Bhutto et al., 2021).

In the case of Algeria, the year 1995 was marked by the enactment of Ordinance No. 95-07, which constituted a major structural shift in the insurance sector, establishing the benchmark regulatory framework for national insurance law. Specifically, this decree effectively abolished the state monopoly over the sector and reintegrated insurance intermediaries, while simultaneously opening the market to domestic private actors and permitting foreign institutions to enter the market.

Furthermore, in order to strengthen the solvency of insurance companies, the legislature mandated insurers to record regulated commitments on the liability side of their balance sheets. These commitments comprise technical provisions which are non-deductible for tax purposes and regulated provisions, which are tax-deductible.(décret exécutif n° 95-343, 2013) Within this framework, it becomes pertinent to examine whether taxation acts as a determining factor in the discretionary behavior of non-life insurers, and whether this influence varies between public and private insurance companies. Accordingly, this study aims to address the following central research question: To what extent does taxation influence the discretionary behavior of non-life insurers in Algeria regarding regulated provisions, and does this effect differ between public and private companies?

Accordingly, this study aims to assess the impact of taxation on the discretionary behavior of non-life insurers in Algeria. The empirical analysis relies on a panel sample of nine insurance companies (comprising four public and five private firms) covering the period 2014–2022. To address the research question, a Logistic regression approach was employed, specifically suited for binary dependent variables.

Literature review

The literature on insurance accounting extensively documents that insurers manage technical reserves specifically loss reserves and unearned premium reserves to smooth reported earnings, reduce tax liabilities, and mitigate regulatory oversight. Earlier foundational research in developed markets, notably by (Beaver et al., 2003; Gaver & Paterson, 1999) in the United States, established that property-casualty insurers adjust their discretionary accruals based on financial performance and regulatory thresholds. Specifically, highly profitable firms tend to overstate loss reserves to build hidden buffers and lower current tax exposure, whereas financially weak or marginally profitable insurers understate liabilities

to avoid loss reporting or prevent the violation of regulatory monitoring bounds such as the Insurance Regulatory Information System (IRIS) ratios. However, (Grace & Leverty, 2012) introduced important methodological caveats to this narrative, demonstrating that while financial weakness and tax incentives consistently drive reserve adjustments, the empirical conclusions regarding regulatory evasion often depend heavily on how reserve errors are specified.

(Beaver et al., 2003) establishes that insurers systematically manipulate loss reserve accruals across the entire earnings distribution to avoid reporting small losses a practice particularly prevalent among public and mutual insurers, as well as both financially healthy and distressed firms. Expanding this behavioral paradigm to multi-line operational settings, (Goh et al., 2025) demonstrate that managerial incentives extend beyond aggregate discretionary accounting to strategic cross-sectional allocations; specifically, insurers exploit variations in tax discount factors and Risk-Based Capital (RBC) industry worst-case factors across lines of business and accident years to minimize tax liabilities and optimize regulatory capital ratios. To mitigate such opportunistic reserving, corporate transparency and board governance characterized by smaller board sizes, frequent meetings, and independent directorshipact as crucial constraining mechanisms that enforce greater conservatism in reserve estimation, particularly during macroeconomic crises (Han et al., 2018). Furthermore, examining emerging insurance markets.

Expanding this paradigm to an international scale (Gaganis et al., 2016), provided multi-country evidence confirming that income smoothing via technical reserves is a global phenomenon, though its magnitude is significantly constrained by institutional quality, such as legal origin, economic freedom, and supervisory powers. Subsequent empirical investigations across various regional markets further illustrate how local institutional frameworks and market dynamics shape reserve behavior. For instance, (Alhassan, 2018) highlighted how Mauritius insurers utilize technical reserves, which account for nearly half of total assets, to navigate underwriting risk and market concentration alongside tax considerations. In Latin America (Curvello et al., 2018), observed that top-performing Brazilian insurers systematically over-reserve to keep declared earnings at levels that avoid attracting regulatory scrutiny. Similarly, recent empirical studies in emerging North African contexts, such as those by (Oubira et al., 2024; Zergoune et al., 2024) in Algeria, indicate that insurers leverage negative discretionary receivables and technical provisions primarily to mitigate earnings volatility inherent in multi-year contractual commitments, showing that smoothing behavior is often driven by structural operational risks rather than purely tax-minimization motives.

Beyond traditional regulatory and tax drivers, recent scholarship has examined how evolving accounting standards, capital structure choices, and market mechanisms interact with discretionary provisioning. Analyzing European insurers around the implementation of IFRS 17 (Nichilo, 2022), revealed that earnings management remains more pronounced in primary insurance than in reinsurance, with high-quality external auditing acting as a moderating factor. Concurrently (Hepfer et al., 2020), demonstrated that cross-border institutional arrangements, such as shadow insurance, allow multinational groups to combine regulatory capital relief with offshore tax optimization.

From a market discipline perspective (Pimentel, 2022), showed that equity markets exhibit asymmetric sensitivity to bad news, reacting more sharply to earnings declines than increases, which further intensifies managerial incentives to smooth reported results. Finally, addressing the statistical limitations of traditional linear regressions in detecting reserve manipulation,(Song & Heo, 2022) demonstrated that advanced machine learning frameworks combining unsupervised hierarchical clustering with supervised boosting and neural networks outperform conventional econometric estimations in capturing non-linear interactions and predicting reserve errors, offering a more robust approach to evaluating discretionary accounting practices in the insurance industry (Abdul Wahab Hassoon Al-Sabti et al., 2024), confirm that discretionary accounting strategies significantly interact with specific technical components, such as unearned premium reserves, investment revenue, and reinsurance configurations, underscoring the universal reliance on technical accounts for earnings discretion under varying institutional and regulatory frameworks.

Purpose

While existing literature has extensively examined the discretionary management of technical provisions, empirical research addressing this issue within the Algerian context remains scarce. Furthermore, the few studies available have predominantly relied on the Modified Jones Model (M.dechow et al., 1995) ,which focuses on total operational accruals. This methodological framework fails to capture the unique structural characteristics of the insurance industry a sector fundamentally reliant on statutory commitments, namely technical and regulated provisions. Given that technical provisions are non-deductible for tax purposes (thereby implying tax neutrality), For this reason, management discretion for fiscal optimization is primarily exercised through regulated provisions.

This study adopts the approach of (Beaver et al., 2003), which enables the detection of discretionary loss reserves while accounting for the specific characteristics of the insurance industry.

Methodology

The empirical analysis relies on a panel sample of nine non-life insurers in Algeria (comprising four public and five private companies) covering the period 2014–2022 Based on reports from the Algerian Union of Insurance and Reinsurance Companies.

Following the approach of (Beaver et al., 2003), we capture discretionary reserves as the difference between actual and expected reserves. To model expected reserves, we incorporate key insurance-specific explanatory variables: company size, Δpremiums, the loss ratio, and theoretical tax liability. The dependent variable is measured by the required regulated provisions.

Table 1. The study variables

Variable	Symbol	Explanation
company size	SIZE	Logarithm of gross written premiums (Premiums were selected as a proxy due to the unavailability of total assets data).
Change in Premiums	Δpremiums	Change in collected premiums from the previous period
Loss ratio	LR	Claims paid divided by collected premiums
Theoretical Tax	TAX	Accounting income multiplied by the statutory corporate income tax rate (Pre-tax income * 26%)
Change in regulated Loss Reserves	Δ regulated Loss	Change in regulated Loss Reserves from the previous period
Slovency margin	Margin	expressed in millions of Algerian dinars
Reinsurance cession	Reinsurance cession	expressed in millions of Algerian dinars
Return on equity	ROE	Net income/ shareholder's Equity

Source: prepared by the author

Table 2. Descriptives analysis

Variable	Obs	Mean	Std .dev	Min	Max
Δ regulated Loss	81	055.556	643.8167	300.0000	2700.000
SIZE	81	13127.98	8222.831	2100.000	30500.00
Δpremiums	81	3.903704	4.821386	-11.51000	23.00000
LR	81	42.34864	13.50764	12.59000	67.39000
TAX	81	241.595	220.3982	-5.04000	862.7580
Margin	81	6961.051	6515.646	1150.200	27540.80
ROE	81	13.7136	4.345025	-1.590000	22.55000
Reinsurance cession	81	3281.994	2055.708	525.0000	7625.000

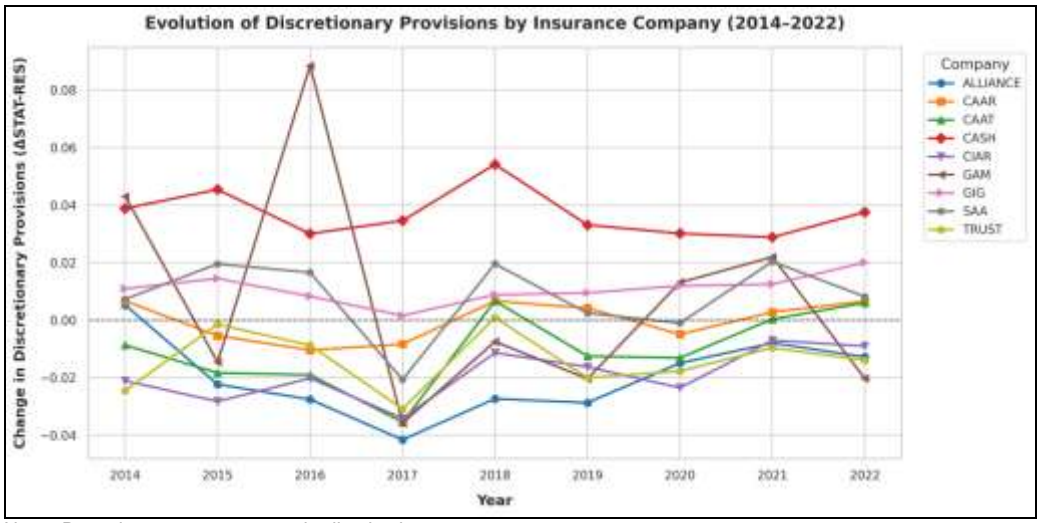
Source: Author calculation Based on repor
ts from the Algerian Union of Insurance and Reinsurance Companies

The table 2 summarizes the descriptive statistics for the 81 observations. The data reveals substantial scale heterogeneity among firms, with SIZE averaging 13,127.98 (ranging from 2,100 to 30,500) and Margin averaging 6,961.05. Underwriting performance shows a moderate loss ratio (LR) averaging 42.35% (spanning 12.59% to 67.39%), accompanied by an average Reinsurance Cession of 3,281.99. regulated reserve changes remain strictly positive (mean of 1,055.56), while premium growth averages 3.90%, fluctuating between -11.51% and 23.00%. Finally, firm performance exhibits a mean ROE of 13.27% and average tax liabilities (TAX) of 241.96, where negative values (minimum -5.30) reflect deferred tax credit recoveries.

We use the following regression equations to capture discretionary Loss reserves :

$$\Delta \text{ regulated Loss}_{it} = \alpha_0 + \beta_1 \text{ Log } (\text{SIZE}_{it}) + \beta_2 \Delta\text{premiums}_{it} + \beta_3 \text{ Loss ratio}_{it} + \beta_4 \text{ TAX}_{it} + \varepsilon_{it}$$

Where : Disreserve = discretionary Loss reserves= (Δ regulated Loss_{actual} - Δ regulated $\text{Loss}_{expected}$)



Note : Data shown represent standardized values

Figure 1. Evolution of discretionary provisions by non-life insurers in Algeria (2014-2022)

Source :prepared by the author using Python

A logistic regression approach was selected due to its suitability for modeling the non-linear nature of discretionary behavior among insurers, while effectively assessing the likelihood of adopting discretionary practices.

The logistic regression model is a widely used classification technique that predicts binary outcomes by estimating the probability of an event occurring. Unlike linear regression, which produces continuous outputs, logistic regression constrains predicted values to the interval between zero and one(Lobna Abid, 2022). It is used where data is dichotomous or binary (0 or 1).

We have chosen **Disreserve** as the dependent variable, which reflects the Discretionary behavior of insurance companies.

The dependent variable is predicted as the probability of high technical provision discretion, bounded between 0 and 1. Specifically, at the company year level, it takes a value of 1 if an insurer exhibits high discretionary behavior regarding regulated provisions in a given financial year (**Disreserve** > = Median) and 0 if the insurer exhibits low discretionary or conservative provisioning behavior in that year (**Disreserve** < Median)

The logistic regression equation is estimated by using the maximum likelihood estimation :

$Y_{it} = \alpha_1 + \alpha_2 \text{Theoretical Taxe}_{it} + \alpha_3 \text{Type}_{it}\,(\text{Public}=1/\text{private}=0)_{it} + \alpha_4\ (\text{Taxe} * \text{Type})_{it} + \alpha_5\ \Delta\text{premiums}_{it} + \alpha_6\ \text{Size}_{it} + \alpha_7 LR_{it} + \alpha_8 ROE_{it} + \alpha_9 \text{Margin}_{it} + \alpha_{10}\ \text{Reinsurance cession} + u_{it}$

Where : (Shahan Ali, Mubeen, Lal, & Hussain, 2018)

Y= log (P/1-p) and 'p' is the probability of the discretionary behavior.

Prior to estimating the model, we normalized the explanatory variables (Taxe, Margin, and Reinsurance cession) as ratios relative to total premiums. This approach allows us to control for and neutralize heterogeneity, thereby obtaining unbiased estimators.

To verify the absence of severe multicollinearity among the explanatory variables, Variance Inflation Factor (VIF) statistics were calculated. As shown in the results, individual VIF values range from 1.150 for to 4.863. Since all values remain comfortably below the widely accepted threshold of 5 (Marquardt, 1970), we conclude that multicollinearity does not pose a threat to the validity or stability of our regression estimates.

Table 3. Variance Inflation Factor Test

Variables	VIF
Taxe	3.791
Δpremiums	1.150
Size	4.863
Loss Ratio	2.447
ROE	2.894
Margin	4.444
Reinsurance cession	2.330

Source: Author calculation

Table 4. Logistic regression results

Variable	Coefficient	Std.Error	z-statistic	p-value
Constant	80.9571	26.54	3.045	**0.002**
Δpremiums	2.5988	7.382	0.352	0.725
Size	-17.9141	5.985	-2.993	**0.003**
Loss ratio	-24.4975	6.760	-3.624	**0.000**
ROE	23.4277	21.220	1.104	0.270
Margin	5.7115	6.177	0.925	0.355
Reinsurance cession	-4.8768	5.138	-0.949	0.343
Interaction (Taxe * Type)	-483.7901	276.003	-2.753	**0.045**
(Public/private) type	14.0405	6.032	2.327	**0.020**
Theoretical Taxe	4.8687	2.006	2.427	**0.015**
Model diagnostics & Fit statistics				
Observations (N)	**81**			
Pseudo R-squa	**0.4665**			
Log-likelihood	**-29.952**			
LR statistic (x^2)	**52.374 (p-value <0.001)**			
Accuracy	**86.42%**			
Sensitivity	**90.00%**			
Specificity	**82.93%**			
Precision	**83.72%**			
F1-score	**0.8675**			
AUC-ROC	**0.9250**			

Source: Author calculation

The empirical evaluation of the overall logistic model performance (Table 4) confirms its high goodness-of-fit and strong classification ability. Regarding predictive accuracy, the model achieves an overall accuracy of 86.42%, supported by a sensitivity of 90.00% and a specificity of 82.93%, ensuring a

balanced detection rate across both positive and negative outcomes. The F1-score stands at 0.8675. The area under the ROC curve (AUC-ROC = 0.9250) demonstrates outstanding discriminatory power according to standard academic benchmarks (Hosmer et al., 2013).Furthermore, McFadden's Pseudo exceeds the conventional threshold range (McFadden, 1974), indicating a highly satisfactory model fit. confirming the precise calibration of the predicted probabilities.

Discussion and conclusion

Overall, our empirical findings demonstrate that:in the private sector, the effect of tax on discretionary provisioning is positive (beta = +4.87 \ p = 0.015), indicating that private companies respond to higher tax burdens through tax optimization, artificially inflating regulated provisions to reduce taxable income. Conversely, in the public sector, a strong negative interaction (beta = -483.79 \ p = 0.045) completely reverses this dynamic to a net negative effect, as state oversight and dividend targets push public insurers to restrict discretion and stick strictly to regulatory minimums rather than maximize tax avoidance. Regarding operating constraints, the loss ratio exhibits a significant negative impact (beta = -24.50 \ p = 0.000), demonstrating that deteriorating claims drain financial margins and eliminate the cushion required to build discretionary reserves, thereby forcing accounting numbers to reflect operational reality. Finally, company size negatively affects discretionary provisioning (beta = -17.91 \ p = 0.003), which aligns with the political cost theory (Watts & Zimmerman, 1978); larger insurers face heightened scrutiny from auditors, rating agencies, and regulators, ultimately limiting their ability to manipulate technical provisions, Moreover, the major Algerian non-life insurers by size are public-owned companies.

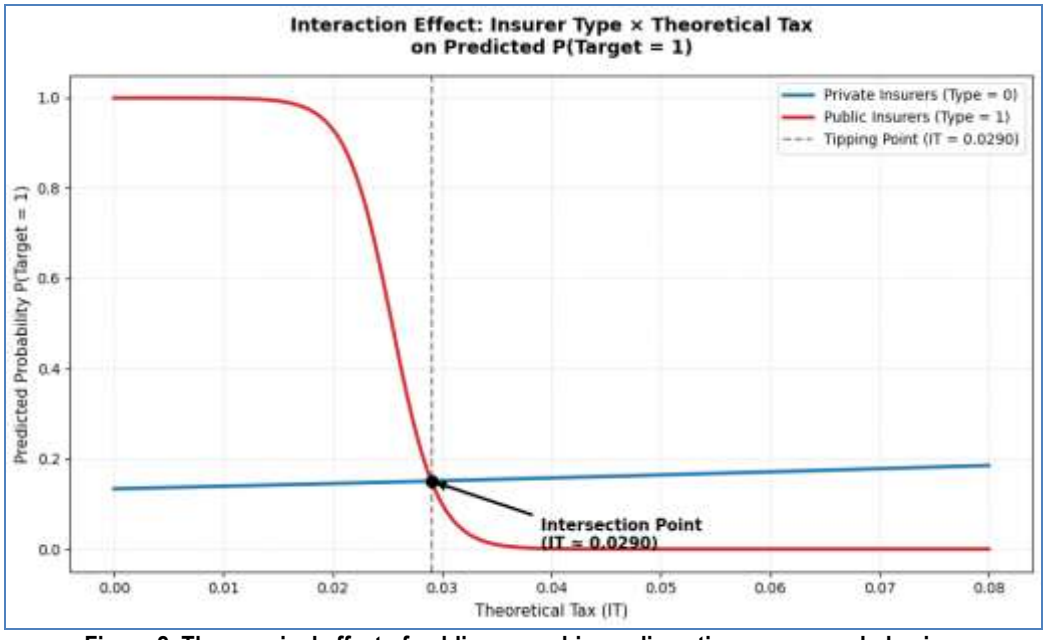


Figure 2. The marginal effect of public ownership on discretionary reserve behavior
Source :prepared by the author using Python

The statistical non-significance of several control variables, provides key insights into the boundaries of discretionary reserve behavior. Premium growth, financial margin, reinsurance cession rate, and return on equity exhibit no statistically demonstrable relationship with the likelihood of technical reserve manipulation.This absence of effect suggests that decision-makers do not systematically rely on reserve discretion to smooth market expansion. Similarly, overall corporate profitability (ROE, marge) and

risk-transfer strategies (reinsurance cession rate) appear secondary to institutional constraints,size, and direct loss experience ,Consequently, management's opportunistic room for maneuver is primarily constrained by statutory, fiscal, and regulatory pressures rather than routine performance metrics or structural underwriting adjustments.

Where Type (Public=1/Private=0) represents the critical threshold beyond which an insurer's public status radically alters its propensity to exercise accounting discretion, we adopted the approach of (Ai & Norton, 2003) to calculate this critical threshold :

$$\text{Critical threshold} = \frac{\beta\ \text{type}}{\beta\ interaction} = \frac{-14.0405}{-483.7901} = 0{,}029$$

The marginal effect of public ownership on discretionary reserve behavior is conditional on the level of theoretical tax burden. There is a tipping point of 2.9%, beyond which the incentive for accounting discretion reverses: below this threshold, public companies exhibit a higher propensity for discretion than their private counterparts, whereas above it, strict regulatory oversight and state supervision inhibit discretionary adjustment behaviors in response to rising tax burdens.

As the theoretical tax burden increases, the public sector drastically curtails this practice, in stark contrast to the private sector, which exhibits the opposite pattern: discretionary practices remain moderate at lower tax levels but rise steadily as the tax burden escalates, thereby serving to reduce taxable income

This can be explained by the mechanism of administrative constraint and scrutiny. When the theoretical tax liability is high, state-owned companies are subject to heightened tax and administrative control by state authorities. This regulatory pressure deters companies from exercising discretionary reserve behavior in order to avoid penalties or audit adjustments. Conversely, when the tax burden is negligible, the tax stake is low and regulatory oversight is less stringent, affording public sector companies greater discretion to engage in earnings smoothing without triggering regulatory scrutiny.

The results of this study are consistent with previous findings :(Gaver & Paterson, 1999) , (Beaver et al., 2003), (Alhassan, 2018), (Grace & Leverty, 2012).

However, these results contrast with the findings of (Zergoune et al., 2024),(Oubira et al., 2024) showing that in the Algerian insurance sector, discretionary reserve behavior is often driven by structural operational risks rather than purely tax-minimization motives.

References

1. Abdul Wahab Hassoon Al-Sabti, A., Abdullah Al-Tamimi, S., & Hadi Yasir, M. (2024). The Role of Technical Reserves and Investments in Income Smoothing Operations : Empirical Evidence in Insurance Companies Operating in the Gulf Cooperation Council Countries. *Cuadernos de Economía*, *47(133),* 185-194. https://doi.org/10.32826/cude.v47i133.1318

2. Akpan, S., Mahat, F., Noordin, B. A. A., & Nassir, A. (2017). *Another look at risk-based capital regime, capital structure, insurer's risk profile and performance : A conceptual paper*. https://econ.upm.edu.my/content/another_look_at_risk_based_capital_regime_capital_structure_insurers_risk_profile_and_performance_a_conceptual_paper-32949

3. Alhassan, A. L. (2018). Loss reserving behaviour in insurance markets : Evidence from Mauritius. *Managerial and Decision Economics*, *39*(7), 805-813. https://doi.org/10.1002/mde.2963

4. Armeanu, D., Burca, A.-M., & Cioaca, S. (2012). Methods to Fund Technical Reserves in General Insurances. *Romanian Statistical Review Supplement*, *60*(2), 424-430.

5. Beaver, W. H., McNichols, M. F., & Nelson, K. K. (2003). Management of the loss reserve accrual and the distribution of earnings in the property-casualty insurance industry. *Journal of Accounting and Economics*, *35*(3), 347-376. https://doi.org/10.1016/S0165-4101(03)00037-5

6. Bhutto, S., Ghumro, I., Rajper, Z. A., & Shaikh, S. (2021). Conceptual review of capital structure under risk-based capital regime, risk profile of insurer's and performance. *Sukkur IBA Journal of Management and Business*. https://doi.org/10.30537/sijmb.v8i1.462

7. Carvalho, B. D. R. de, & Carvalho, J. V. de F. (2019). A stochastic approach for measuring the

uncertainty of claims reserves. *Revista Contabilidade & Finanças*, *30*, 409-424. https://doi.org/10.1590/1808-057x201907860

8. Curvello, R. da S. S., Rodrigues, A., & Macedo, M. A. da S. (2018). Loss Reserve Error in the Brazilian Insurance Market : Empirical evidence of the response to economic and tax regulations. *Revista Brasileira de Gestão de Negócios*, *20*, 550-572. https://doi.org/10.7819/rbgn.v0i0.2942

9. décret exécutif n° 95-343. (2013). Correspondant au 31 mars 2013. *JORADP*.

10. Gaganis, C., Hasan, I., & Pasiouras, F. (2016). Regulations, institutions and income smoothing by managing technical reserves : International evidence from the insurance industry. *Omega, Business Analytics*, *59*, 113-129. https://doi.org/10.1016/j.omega.2015.05.010

11. Gaver, J. J., & Paterson, J. S. (1999). Managing Insurance Company Financial Statements to Meet Regulatory and Tax Reporting Goals. *Contemporary Accounting Research*, *16*(2), 207-241. https://doi.org/10.1111/j.1911-3846.1999.tb00579.x

12. Gláserová, J. (2014). Specifics of the Unearned Premium Reserve in the Accounting of Commercial Insurance Companies. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, *62*(6), 1271-1277.

13. Goh, J. R., Kamiya, S., & Lou, P. (2025). How do insurance companies manage reserves? Evidence from reserve errors across lines of business and accident years. *Risk Sciences*, *1*, 100014. https://doi.org/10.1016/j.risk.2025.100014

14. Grace, M. F., & Leverty, J. T. (2012). Property–Liability Insurer Reserve Error : Motive, Manipulation, or Mistake. *Journal of Risk and Insurance*, *79*(2), 351-380. https://doi.org/10.1111/j.1539-6975.2011.01434.x

15. Han, S., Lai, G. C., & Ho, C.-L. (2018). Corporate transparency and reserve management : Evidence from US property-liability insurance companies. *Journal of Banking & Finance*, *96*, 379-392. https://doi.org/10.1016/j.jbankfin.2018.07.017

16. Hepfer, B. F., Wilde, J. H., & Wilson, R. J. (2020). Tax and Nontax Incentives in Income Shifting : Evidence from Shadow Insurers. *The Accounting Review*, *95*(4), 219-262. https://doi.org/10.2308/accr-52657

17. Hosmer, D. W., Lemeshow, S., & Sturdivant, R. X. (2013). *Applied Logistic Regression* (1re éd.). Wiley. https://doi.org/10.1002/9781118548387

18. Hudakova, M., Adamko, J., & School of Economics and Management in Public Administration in Bratislava. (2017). Technical reserves in insurance and Slovak insurance market. *Economic Annals-XXI*, *162*(11-12), 98-103. https://doi.org/10.21003/ea.V162-20

19. Kompaniets, M., & Kysilyova, I. (2021). FEATURES OF THE FORMATION AND VALUATION OF INSURANCE RESERVES. *Pryazovskyi Economic Herald*. https://doi.org/10.32840/2522-4263/2021-3-21

20. Lobna Abid. (2022). A Logistic Regression Model for Credit Risk of Companies in the Service Sector. *International Research in Economics and Finance*, p1. https://doi.org/10.20849/iref.v6i2.1179

21. Marquardt, D. W. (1970). Generalized Inverses, Ridge Regression, Biased Linear Estimation, and Nonlinear Estimation. *Technometrics*, *12*(3), 591-612. https://doi.org/10.1080/00401706.1970.10488699

22. McFadden, D. (1974). The measurement of urban travel demand. *Journal of Public Economics*, *3*(4), 303-328. https://doi.org/10.1016/0047-2727(74)90003-6

23. M.dechow, P., G.sloan, R., & P.seweeny, A. (1995). Detecting earnings management. *The Accounting Review*, *70*(2), 193-225.

24. Nagy, C. M., & Cotleț, D. (2011). Specific Aspects of the Technical Reserves of Insurance Accounting. *Annals of the University of Petrosani, Economics*, *11*(1), 171-178.

25. Nichilo, S. de. (2022). Detecting Earnings Management Practices in European Insurance Sector : Purpose and Application of Accrual Modelling and Distribution of Earnings. *European Journal of Management Issues*, *30*(3), 164-176. https://doi.org/10.15421/192215

26. Norberg, R. (1991). Reserves in Life and Pension Insurance. *Scandinavian Actuarial Journal*, *1991*, 3-24. https://doi.org/10.1080/03461238.1991.10557357

27. Ogungbenle, G. M., & Phulara, K. R. (2023). An Actuarial Comparison of General Business Insurance Loss Reserving : Evidence from Classical Chain Ladder and Cape-Cod Technical Provisions Numerical Techniques. *Nepal Journal of Mathematical Sciences*, *4(1),* 33-46. https://doi.org/10.3126/njmathsci.v4i1.53155

28. Oubira, mohamedsaid, hadjadj, M., & Zergoune, mohamed. (2024). The Effect of Earnings Management Practices through Discretionary Accruals on the Taxable Profit of Algerian Insurance Companies : An Empirical Study of a Sample of Insurance Sector Companies in Algeria (2016–2020). *Journal of Quantitative Economic Studies*, *10*(*1*), 199-209.

29. Pimentel, R. C. (2022). Earnings Persistence and Market Reaction to Earnings in the International Insurance Industry. *Revista de Administração Contemporânea*, *26*, e200404. https://doi.org/10.1590/1982-

7849rac2022200404.en

30. Reid, D. H. (1978). Claim reserves in general insurance. *Journal of the Institute of Actuaries*, *105*(3), 211-315. https://doi.org/10.1017/S0020268100018631

31. Selimović, J. (2010). ACTUARIAL ESTIMATION OF TECHNICAL PROVISIONS' ADEQUACY IN LIFE INSURANCE COMPANIES. *Interdisciplinary Management Research*, *6*, 523-533.

32. Song, I. J., & Heo, W. (2022). Improving insurers' loss reserve error prediction : Adopting combined unsupervised-supervised machine learning techniques in risk management. *The Journal of Finance and Data Science*, *8*, 233-254. https://doi.org/10.1016/j.jfds.2022.09.003

33. Vintilã, G., & Armeanu, D. (2009). Substantiating the Incurred but not Reported Reserve. *Theoretical and Applied Economics*, *12(541)*(12(541)), 19-24.

34. Watts, R. L., & Zimmerman, J. L. (1978). Towards a Positive Theory of the Determination of Accounting Standards. *Accounting Review*, *53*.

35. Zergoune, omarelfarouk, Oubira, mohamedsaid, & Zergoune, M. (2024). The Impact of Earnings Management Practices on the Taxable Profit of Algerian Insurance Companies : An Empirical Study on a Sample of Insurance Sector Companies in Algeria. *Prospects for Economic Studies*, 9(1), 111-126.

Received: 07.23.2026 / Review 09.07.2026 / Accepted 10.30.2026