# IMPACT OF MACROECONOMIC FACTORS ON THE INSURANCE SECTOR IN ROMANIA- ANALYSIS OF PERFORMANCE AND STABILITY

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**Abstract**

This paper analyzes the impact of macroeconomic factors on the performance and stability of the insurance sector in Romania. The main objective of this study is to empirically highlight the existence of a significant relationship between macroeconomic indicators and the performance of insurance companies. The novelty of the research is related to the use of insurance sector indicators, with the analysis focusing exclusively on Romania to capture the specific characteristics of this sector within a national economic framework. The variables used in the analysis reflect both insurance sector performance and relevant macroeconomic factors, covering the period 2005-2024. For the econometric analysis, a linear regression model is employed to investigate the relationships between the selected variables. Thus, the performance of the insurance sector is measured using return on assets (ROA) and return on equity (ROE), while the explanatory variables are GDP per capita, inflation rate, external balance of goods and services as a percentage of GDP, degree of urbanization, and internet access. The results show that the performance and stability of the insurance sector in Romania are influenced by macroeconomic developments and socio-economic factors, confirming the existence of a significant relationship between economic development and insurance sector performance.

**Keywords**

profitability of insurance companies, the insurance sector in Romania, macroeconomic factors, demographic factors, property insurance, liability insurance

**JEL Classification**

E22, G22, O16.

## Introduction

Economic stability and sustainable growth are closely linked to the proper functioning of the financial system, in which the insurance sector plays a significant role. Through its specific mechanisms of risk transfer and risk management, the insurance industry contributes to

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reducing uncertainty, protecting assets, and supporting investment activities, thereby fostering economic development and strengthening financial stability. In this context, the evolution of the insurance sector is strongly influenced by macroeconomic factors such as economic growth, inflation, external balance, urbanization, and technological development, all shaping both the performance and the resilience of insurance companies (Mathur and Tripathi, 2014).

Assessing the performance of the insurance sector represents an important research direction, as it reflects the ability of insurance companies to operate efficiently and maintain financial stability in an uncertain economic environment. From this perspective, performance is commonly associated with the capacity to achieve favorable financial outcomes while ensuring long-term sustainability. In the case of insurance companies, profitability indicators such as return on assets (ROA), and return on equity (ROE) are widely used as relevant measures for evaluating operational efficiency, and financial soundness.

Considering these aspects, the present paper aims to analyze the impact of macroeconomic factors on the insurance sector in Romania by evaluating the performance, and stability of insurance companies over the period 2005-2024. The analysis relies on financial performance indicators, namely return on assets (ROA) and return on equity (ROE), along with a set of relevant explanatory variables, including GDP per capita, inflation rate, external balance of goods, and services as a percentage of GDP, degree of urbanization, and internet access. The paper is structured as follows: the first section presents the literature review, the second section describes the data, variables, and methodology employed, the third section discusses the empirical results and their interpretation, and the final section summarizes the main conclusions of the research.

## 1. Review of scientific literature

Interest in identifying the determinants of insurance company performance has grown considerably in academic literature, particularly following major economic events that have affected financial stability. The global financial crisis of 2007-2009 highlighted vulnerabilities within financial institutions and emphasized the importance of examining macroeconomic factors influencing insurance activities. Financial market volatility, declining household income, and increased economic uncertainty affected both the demand for insurance products and the investment strategies of insurance companies. At the same time, these developments contributed to strengthening regulatory frameworks and highlighted the importance of prudent risk management in maintaining sector stability.

The role of financial systems in supporting economic growth is highlighted through the critique of the traditional approach, which focuses primarily on accumulation factors while overlooking the influence of financial intermediation (Allen and Oura, 2004). The authors emphasize that the interaction between the banking sector, and capital markets creates additional opportunities for economic development, and improves the efficient allocation of financial resources. Therefore, the architecture of the financial system becomes essential for maintaining economic stability, particularly in the context of financial crises or speculative bubbles. The complementarity between the banking sector and financial markets enhances risk management and capital mobilization, while in periods of imbalance, banks may act as stabilizing agents within the economy.

Property insurance (Kurniawati and Choiruddin, 2024) constitutes a fundamental component of financial risk management, protecting individuals and business entities against potential economic losses resulting from the deterioration, destruction, or loss of tangible assets. Such risks may arise from various unforeseen events, including natural disasters, fires, or criminal activities. By mitigating the financial consequences of these incidents, property insurance supports economic continuity, and reduces exposure to uncertainty, thereby contributing to the stability of both households and firms.

Liability insurance (Yang and Zhang, 2022) also performs an important function within the broader framework of corporate risk management, influencing both organizational resilience, and financial performance. By transferring potential liabilities associated with damages caused to third parties, this type of insurance enables companies to undertake business activities with greater confidence. From a managerial perspective, decisions involving risk exposure are closely related to corporate governance and strategic planning, as firms evaluate uncertain investment opportunities in pursuit of competitive advantages, and improved financial outcomes. In this context, effective risk management, supported by insurance mechanisms, facilitates more efficient allocation of resources, and enhances long-term organizational sustainability.

Furthermore (Učkar and Petrović, 2022), insurance institutions occupy a significant position within the financial system, being considered among the most important financial intermediaries, alongside banking institutions. Through the systematic collection of premiums and their subsequent allocation into investment activities, insurance companies contribute to capital accumulation, risk diversification, and financial market stability. This process allows insurers to generate sufficient returns to meet future obligations, while simultaneously supporting economic development and reinforcing the resilience of the financial system.

Recent literature emphasizes that the performance of insurance companies is shaped by a dual determination, combining macroeconomic influences with firms' internal characteristics (Kramarić, Miletic, and Pavic, 2017). According to the analysis by Cummins and Weiss (2013), the economic efficiency of firms is grounded in microeconomic theory and conceptualized as an entity's ability to maximize financial outcomes by optimizing the relationship between costs and revenues within a competitive environment. This perspective entails a multidimensional assessment, encompassing both technical efficiency — reflected in the judicious use of resources to generate outputs — and allocative efficiency, which involves selecting the optimal configuration of resources and outputs in accordance with fluctuations in input and product prices. The authors examined 53 additional studies published between 2000 and 2011 and identified two further factors that significantly influence insurance activity: market structure and corporate governance, both of which affect firm performance and sustainability.

In this context, Burcă and Bătrînca (2014) emphasize that profitability represents a central element of strategic management, serving as a key indicator of overall financial performance. Malik (2011) further argues that profitability is most appropriately assessed through the return on assets (ROA) metric, which reflects the efficiency with which total resources are used to generate net results. However, the application of these principles in certain markets, such as the general insurance sector in Nigeria, reveals significant fluctuations in profitability over time, highlighting the impact of local market conditions on firm financial performance.

Macroeconomic factors, such as GDP growth, unemployment levels, and inflation rates, exert differentiated effects on the life and non-life insurance segments: life insurance is more sensitive to fluctuations in unemployment and household income, whereas non-life insurance responds more rapidly to changes in nominal GDP, reflecting a faster adaptability to general economic dynamics (Christophersen and Jakubik, 2014).

Internally, firm structure and size are critical determinants of efficiency, and profitability. Studies conducted in the Croatian market indicate that large insurers achieve higher values of return on assets (ROA) and return on equity (ROE), while maintaining low levels of claims and expenses, reflecting strong operational efficiency. At the same time, some smaller firms demonstrate notable performance, suggesting that efficiency can also be achieved at a smaller scale depending on the management of internal resources and investment structures, as highlighted through non-parametric DEA analysis (Učkar and Petrović, 2022).

Another key element for sectoral stability is macroprudential regulation, exemplified by the Solvency II framework, and stress testing, which ensure company resilience against systemic risks, and strengthen the overall financial stability of the market (Eling and Schmeiser, 2010).

In parallel, recent research highlights the relationship between underwriting stability, and portfolio allocation strategies: insurers benefiting from predictable underwriting can invest in higher-risk assets and subsequently use the generated income to offer more competitive pricing, indicating an interdependence between financial stability, portfolio structure, and pricing policies (Knox and Sørensen, 2023).

Complementing this, research on consumer behavior and its impact on company performance confirms that financial protection remains the primary motivation for life insurance purchases (Khurana, 2008). In this context, customer trust and the efficiency of the claims process are essential factors influencing client loyalty, and preference for public versus private insurers.

Applied studies in Central and Southeastern Europe, including Croatia, show that EU integration and market liberalization required rapid adaptation by companies, increasing the pressure to improve operational efficiency, particularly in the motor third-party liability segment — the main area of non-life insurance in Croatia (Pervan, Ćurak and Pavić Kramarić, 2021). Results indicate an overall improvement in technical efficiency post-accession, with variations between life and non-life sectors, reflecting both adaptation to new regulations and the influence of technology in optimizing internal processes.

The impact of economic crises on the insurance sector has been widely examined in the literature, which distinguishes between currency, banking, and sovereign debt crises, each generating distinct implications for the financial system. In the context of globalization, the growing interdependence between the insurance sector, banking institutions, and financial markets has contributed to a more complex and differentiated transmission of crisis effects.

In this framework, Fîrțescu (2014) investigated the effects of the financial crisis on the life insurance market in Romania and across European countries by analyzing insurance density, penetration rates, and gross written premiums. The study employed panel data regression models, incorporating macroeconomic and socio-economic indicators such as GDP per capita, employment levels, internet access, number of companies, and personnel costs, based on Eurostat data. The findings highlighted the significant influence of these variables on the evolution of insurance activity during periods of economic instability.

From a complementary perspective, liability insurance has been examined in terms of its contribution to financial protection and social responsibility. This type of insurance aims to

cover damages caused by individuals or legal entities to third parties when legal liability is established according to applicable legislation. Over time, liability insurance has strengthened its economic and social importance, experiencing continuous development, particularly in recent years. The diversification of liability insurance products reflects the sector's adaptation to socio-economic and professional transformations, as well as the increasing involvement of the state through the introduction of compulsory insurance forms, such as motor third-party liability insurance. In this context, Fîrțescu (2016) emphasized the interdisciplinary role of insurance, and legal liability in strengthening social responsibility, and supporting the functioning of modern economies.

The relationship between competition and financial stability in the life insurance sector was analyzed by Cummins, Rubio-Misas and Vencappa (2017), who examined ten European Union member states during the period 1999-2011 using the Boone indicator as a measure of competition intensity. Their findings indicated that higher levels of competition significantly improved insurers' financial stability, with stronger effects observed among financially weaker companies. Although the results confirmed the role of efficiency as a mechanism through which competition enhances solvency, the analysis also revealed that, following deregulation introduced through the 1994 European directives, competition did not intensify uniformly and even declined in most of the examined markets. These outcomes were attributed to institutional differences, and natural entry barriers that continued to limit the effective functioning of the single market for life insurance.

Determinants of life insurance demand were also investigated by Kjosevski (2012), who analyzed 14 Central and Southeastern European countries between 1998 and 2010 using a fixed-effects panel model. Life insurance demand was measured through penetration and density indicators. The results showed that higher GDP per capita, inflation, healthcare expenditures, education level, and rule of law were positively associated with life insurance consumption. Conversely, variables such as real interest rates, quasi-money ratios, demographic dependency, corruption control, and government effectiveness did not exhibit a consistent or significant relationship with life insurance demand, suggesting that fundamental economic and social factors play a more decisive role in the development of life insurance markets.

The efficiency of Swiss insurance companies was examined by Biener, Eling, and Wirfs (2016), who evaluated firms operating in life, property-casualty, and reinsurance sectors during 1997-2013. The results indicated improvements in efficiency within property-casualty and reinsurance segments, while life insurance did not show similar progress. The study further demonstrated that internationalization had a positive effect on efficiency and that both small, specialized firms and large diversified insurers could achieve optimal performance. These findings emphasized the importance of nonlinear effects and interactions among determinants, offering relevant implications for managers, regulators, and researchers.

For Romania, Fîrțescu and Sandu (2015) examined the role of the insurance industry in financing the economy, highlighting the relationship between financial stability and economic development. The results indicated that although the insurance sector was affected by the financial crisis and deteriorating market conditions, the impact was considerably lower than in the banking sector, due to prudent operational structures, and diversified investment portfolios. Furthermore, economic developments were found to directly influence premium

dynamics, operational costs, and asset portfolio values, highlighting the dual role of insurance companies as both economic agents and financial intermediaries.

In the context of the Romanian insurance market, Cristea, Marcu, and Cârstina (2014) examined the relationship between the development of the insurance sector and economic growth during the period 1997-2012. The study employed key indicators such as insurance penetration, insurance density, and real insurance growth, incorporating them into an econometric model where GDP per capita was considered the dependent variable. The results indicated a positive relationship between life insurance development and economic growth, although the level of statistical significance was relatively low. The authors attributed these findings to the relatively underdeveloped nature of the Romanian insurance market, characterized by the dominance of compulsory general insurance and the limited share of life insurance, factors that constrain the sector's contribution to overall economic development.

The importance of insurance for financial protection and economic stability was also emphasized by Andronic (2020), who argued that insurance represents a fundamental mechanism for protecting individuals, companies, and public institutions. The empirical analysis conducted for Romania over the period 1997-2017, using multiple regression and ANOVA techniques, revealed strong correlations between insurance market density and variables such as average net salary, unemployment rate, education enrollment rate, and birth rate. In contrast, inflation did not show a significant impact on the analyzed indicator. These findings confirm that the development of insurance markets is primarily influenced by socio-economic and demographic factors, reinforcing the role of the insurance sector in supporting long-term financial stability and economic growth.

Overall, these findings underscore that insurance company performance is the result of a complex interaction between macroeconomic factors, internal firm structure, prudential regulation, underwriting, and investment strategies. Efficiency and profitability do not depend solely on firm size or external conditions, but also on the ability to coherently integrate these determinants into a unified operational and strategic framework.

## 2. Research methodology

The main objective of this research is to assess the influence of macroeconomic factors on the performance and stability of the insurance sector in Romania over the period 2005-2024, covering both the 2008 global financial crisis, and the effects of the COVID-19 pandemic. Annual data are used to capture structural changes and long-term trends, while a Romania-specific dummy variable allows identification of impacts on Romanian insurance companies. Insurance performance is measured using profitability indicators, Return on Assets (ROA), and Return on Equity (ROE), reflecting the efficiency of resource use, and the effectiveness of invested capital. The econometric model includes explanatory variables capturing key macroeconomic conditions: GDP per capita, inflation rate, degree of urbanization, internet access, and the external balance of goods and services (% of GDP), which influence both insurance demand and financial performance.

Literature emphasizes that insurance sector performance depends on a combination of internal and external factors, grouped as macroeconomic factors (economic development, price stability, external balance), and demographic factors (socio-economic structure, urbanization, digitalization). Empirical studies, including EU-level comparisons, show that performance is shaped by national market structures and institutional conditions.

The study uses a panel data framework with ROA and ROE as dependent variables to capture the multidimensional nature of performance and stability in Romania's insurance sector.

The **OLS general model** can be mathematically expressed as follows: $y_{it} = \alpha_{it} + \beta_{it}{}^{\top} x_{it} + u_{it}$ (1)

where $y_{it}$ represents the performance indicator (ROA or ROE), $x_{it}$ includes macroeconomic and demographic explanatory variables, and $u_{it}$ is the error term.

To account for country-specific effects, both fixed effects and random effects models were employed:

**Fixed- effects model (no time effects):**

$$y_{it} = \alpha + \beta^{\top} x_{it} + \mu_i + \epsilon_{it} \quad (2)$$

**Fixed- effects model (with time effects):**

$$y_{it} = \alpha + \beta^{\top} x_{it} + \mu_i + \epsilon_{it} \quad (3)$$

where $\mu_i$ represents fixed effects specific to each country, $\nu_i$ the random effects, and $\epsilon_{it}$ the idiosyncratic error component. In fixed effects models, the error term can be expressed as:

$$u_{it} = \mu_i + \lambda_t + \epsilon_{it} \quad (2', error - term, time\ effects)$$

and in random effects models:

$$u_{it} = \mu_i + \epsilon_{it} \quad (3', error - term, no\ time\ effects)$$

Model coefficients are estimated using the Ordinary Least Squares (OLS) method, which minimizes the sum of squared differences between observed and predicted values:

$$\hat{\beta} = (X^{\top} V^{-1} X)^{-1} (X^{\top} V^{-1} y) \quad (4)$$

For fixed effects models, the data are demeaned by subtracting the unit-specific mean to isolate the variation attributable to the fixed effects:

$$y_{it} - \theta \bar{y}_i = (X_{it} - \theta \bar{X}_i)\beta + (u_{it} - \theta \bar{u}_i) \quad (5)$$

$$\theta = 1 - [\sigma_u^2 / (\sigma_u^2 + T\sigma_e^2)]^{\frac{1}{2}} \quad (5')$$

$$\theta = 1 \quad Fixed - effects \ (5'')$$

In random effects models, estimation considers both within- and between-unit variation, assuming that random effects are uncorrelated with the explanatory variables.

This methodological framework allows for assessing the influence of macroeconomic indicators such as GDP per capita, inflation rate, urbanization, internet access, and external balance on the performance, and stability of the Romanian insurance sector. The use of OLS models with fixed and random effects provides a rigorous and transparent framework for empirically interpreting the relationships between macroeconomic variables and financial indicators of insurance companies.

The macroeconomic factors considered in the analysis encompass:

- **Per capita GDP growth**, which serves as an indicator of overall economic dynamics, has been widely associated in the literature with favorable trends in insurance sector profitability (Christophersen and Jakubik, 2014).
- **Annual inflation rate**, which, by affecting both income, and expenditures, is typically negatively correlated with financial performance (Browne, Hoyt, and Marais, 2022).
- **External balance of goods and services**, employed to capture the influence of trade flows on insurance activities, including motor third-party liability insurance.

Demographic dimensions are represented by two variables:

- **Internet access**, measured as the proportion of the population connected online, serves as a proxy for technological adoption and the digitalization of insurance product distribution, with literature suggesting a positive impact, particularly on the non-life insurance sector (Kjosevski, 2012).
- **Urbanization rate**, calculated as the ratio of urban population to total population, reflects risk concentration, accessibility to financial services, and public awareness of insurance needs, and is generally associated with higher demand for insurance products (Beck & Webb, 2003). Urban populations have easier access to insurance products, and market density tends to increase with the degree of urbanization. This variable is included in the panel regressions based on Eurostat data (Fîrțescu, 2014).

A summary of the variables employed, including calculation methods, and their expected effects on sector performance, is presented in Table no. 1.

**Table No. 1: Description of Variables Used**

| VARIABLES | NOTATION + UNIT | CALCULATION FORMULA | EXPECTED IMPACT |
|---|---|---|---|
| **DEPENDENT VARIABLES** | | | |
| **Average return on assets** | ROA (%) | Net Profit / Average Assets | |
| **Average return on equity** | ROE (%) | Net Profit / Average Common Equity | |
| **INDEPENDENT VARIABLES** | | | |
| **MACROECONOMIC AND FINANCIAL FACTORS** | | | |
| **Economic activity** | GDP (%) | GDP per capita growth (annual %) | + |
| **Inflation** | INF (%) | Inflation, consumer prices (annual %) | – |
| **External balance on goods and services (% of GDP)** | EXTBAL (%) | Difference between exports and imports of goods and services, relative to GDP | ± |
| **DEMOGRAPHIC FACTORS** | | | |
| **Individuals using the Internet** | INT_HH (%) | Number of people with internet access relative to the total population | + |
| **Urban population** | URB (%) | Urban population relative to total population | + |

*Source: Authors' elaboration based on data from relevant literature*

Based on the theoretical framework and empirical literature, the following research hypotheses are formulated:

H1: GDP per capita growth exerts a positive influence on insurance company performance, measured by ROA and ROE.

H2: The inflation rate significantly affects insurance company profitability.

H3: External balance of goods and services influences insurance sector's performance.

H4: Urbanization rate positively impacts insurance company profitability.
H5: Internet access contributes positively to insurance sector performance.
These hypotheses provide the analytical framework for interpreting the empirical results and assessing the determinants of insurance sector performance within the European Union.
To achieve the proposed objectives, relevant statistical data for the insurance market are employed, obtained from internationally recognized sources such as the World Bank, Insurance Europe, Eurostat, and O.E.C.D. statistics. These databases are selected due to their high level of accuracy, and comparability, providing a solid framework for analyzing the evolution of the insurance sector and its relationship with macroeconomic indicators. The variables of interest are return on assets (ROA) and return on equity (ROE), used alternatively to measure the profitability of insurance companies.

**Table no. 2: Descriptive statistics**

| Variable | Obs. | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| Country | 540 | -- | -- | 1 | 27 |
| year | 540 | -- | -- | 2005 | 2024 |
| roa | 540 | 0.6627 | 1.2762 | -10.8823 | 4.3739 |
| roe | 540 | 7.5229 | 14.4266 | -112.1940 | 34.2795 |
| pib | 540 | 1.8574 | 4.0641 | -14.6423 | 23.4520 |
| inf | 540 | 2.7329 | 3.0771 | -4.4475 | 19.7051 |
| extbal | 540 | 2.8842 | 8.9764 | -21.7892 | 41.7993 |
| int_hh | 540 | 75.0390 | 17.1588 | 19.9700 | 99.7692 |
| urb | 540 | 72.0138 | 11.9334 | 49.7620 | 95.6546 |
| ue_dummy | 540 | | | 0 | 1 |
| ro_dummy | 540 | | | 0 | 1 |

*Source: author's own calculation (Stata 16.1, summary)*

The descriptive statistics for the sample (540 observations across 27 European Union members) highlight significant variability in both insurance sector performance, and the macroeconomic indicators included in the econometric model. This heterogeneity reflects structural differences among the analyzed economies, and justifies the use of panel data methodology, which allows for capturing both cross-country and time-series variations.

The financial performance indicators show that Return on Assets (ROA) records an average value of 0.66%, suggesting moderate operational efficiency within the insurance sector. However, the wide range of values, from -10.88% to 4.37%, indicates substantial fluctuations in sector performance. Similarly, Return on Equity (ROE) presents a higher average of 7.52%, but with considerable dispersion, ranging from -112.19% to 34.27%, highlighting significant volatility in profitability and the presence of financial instability during certain periods. Such fluctuations may reflect exposure to macroeconomic shocks, financial market instability, and differences in capitalization structures across insurance companies.

Regarding macroeconomic variables, GDP per capita growth shows an average value of 1.85%, with notable variations between economic contractions and expansion periods, suggesting that business cycle dynamics directly influence insurance sector performance. Inflation, with an average rate of 2.73%, also exhibits substantial variability, ranging from deflationary episodes to high inflation levels, which may affect claim costs, and insurers' investment performance. The external balance, with an average of 0.68% of GDP, reflects differences in economic competitiveness across member states, and may indirectly influence the development of the insurance sector.

Structural factors indicate a relatively high level of digitalization, with household internet access averaging 77.34%, although important disparities remain between countries. Additionally, the urbanization rate, with an average of 71.94%, reflects the predominance of urban populations, which is generally associated with higher demand for insurance products. Overall, the descriptive statistics confirm substantial variability across the analyzed countries, supporting the use of panel data econometric models and enabling the investigation of the relationship between macroeconomic factors and insurance sector performance within an appropriate analytical framework.

The preliminary graphical analysis of country-level (the figures are available in the Appendix section) averages highlights significant differences across the analyzed states, indicating pronounced cross-sectional heterogeneity. The uneven distribution of ROA and ROE values across country identifiers reveals substantial variations in insurance sector performance at the European level (see Figure no. 1 - Appendix). The figure illustrates the evolution of the profitability indicators ROA (blue line) and ROE (red line) over time. The graphical representation reveals fluctuations in both indicators, reflecting the sensitivity of insurance sector performance to macroeconomic developments and financial market conditions.

Although the dataset covers the period 2005-2024, the graphical representation displays the interval 2016-2020 due to aggregation and visualization adjustments applied during data processing. This period captures relevant variations in profitability, characterized by moderate growth followed by temporary declines.

The ROA series exhibits relatively limited fluctuations, suggesting stable asset utilization efficiency throughout the analyzed period. Conversely, ROE demonstrates greater variability, indicating that equity profitability is more responsive to economic changes, financial leverage, and investment performance.

These patterns highlight the presence of time-specific effects and justify the adoption of panel data models, particularly fixed-effects estimations, which allow controlling for unobserved heterogeneity across countries.

This dispersion supports the use of a panel data econometric approach, particularly the Fixed Effects model, which allows for capturing country-specific characteristics and accounting for structural differences among national insurance markets.

Figure no. 2 - Appendix presents the cross-country distribution of ROA and ROE values for the European Union member states included in the analysis. The dispersion of observations reflects considerable differences in profitability across national insurance markets.

Certain countries record consistently higher profitability levels, suggesting more developed insurance markets, stronger regulatory environments, and favorable macroeconomic conditions. In contrast, lower profitability levels observed in other countries may indicate structural constraints, reduced insurance penetration, or increased vulnerability to economic fluctuations.

The presence of cross-sectional heterogeneity further supports the use of panel estimation techniques. Fixed-effects models are particularly appropriate, as they allow controlling for country-specific characteristics that may influence insurance sector performance.

**Table no. 3: Correlation matrix**

| | roa | roe | pib | inf | lnint | lnurb |
|---|---|---|---|---|---|---|
| | | | | | | |
| roa | 1.0000 | | | | | |
| roe | 0.8704 | 1.0000 | | | | |
| pib | 0.3801 | 0.3598 | 1.0000 | | | |
| inf | 0.1969 | 0.1611 | 0.1253 | 1.0000 | | |
| int (ln values) | -0.0754 | -0.1036 | -0.1100 | -0.0499 | 1.0000 | |
| urb (ln values) | -0.0387 | 0.0566 | -0.1158 | -0.0938 | 0.2753 | 1.0000 |

*Source: author's own calculation (Stata 16.1)*

The correlation matrix (in Table no. 3) illustrates and provides an initial assessment of the relationships among the variables included in the econometric model. Most correlation coefficients remain below the threshold of 0.7, indicating the absence of strong linear relationships among explanatory variables.

A relatively high correlation coefficient of 0.87 is observed between ROA and ROE. This result is expected, as both indicators are derived from net profit and share similar accounting components. However, this does not generate econometric concerns, since ROA and ROE are estimated in separate regression models.

Given that correlation analysis alone does not provide sufficient evidence regarding multicollinearity, additional diagnostic testing using the Variance Inflation Factor (VIF) is conducted to ensure the robustness of the model.

Table no. 4 – VIF Results

| Variable | VIF | 1/VIF |
|---|---|---|
| extbal | 1.49 | 0.669462 |
| lnint | 1.39 | 0.721869 |
| lnurb | 1.16 | 0.865113 |
| inf | 1.07 | 0.930852 |
| pib | 1.04 | 0.965408 |
| Mean VIF | 1.23 | |

*Source: author's own calculation (Stata 16.1)*

To assess potential multicollinearity among the explanatory variables, the variance inflation factor (VIF) was calculated. The results indicate low values, ranging from 1.02 for GDP to 1.49 for the external balance, with a mean of 1.23. Since all values are well below the commonly accepted threshold of 5, this confirms the absence of multicollinearity and validates the reliability of the estimated model coefficients.

Additionally, lagged values of the dependent variables (L.ROA and L.ROE) were introduced to test for persistence effects in financial performance. These lagged variables capture potential dynamic relationships, where past profitability may influence current performance. The associated p-values were 0.102 for ROA and 0.0922 for ROE, both statistically insignificant at the conventional 5% level. The coefficients of determination were extremely low ($R^2$ = 0.006 for ROA and $R^2$ = 0.000 for ROE), indicating no significant temporal persistence in financial performance. Consequently, a static specification without lagged variables is considered appropriate, and unobserved heterogeneity is addressed using the fixed effects method.

**Table no. 3: First lag L.ROA, L.ROE**

| **VARIABLES** | **ROA** | **ROE** |
|---|---|---|
| L.ROA | -0.0891 | |
| | **(0.102)** | |
| L.ROE | | -0.00478 |
| | | **(0.0922)** |
| Constant | 9.426*** | 13.06*** |
| | (1.055) | (1.625) |
| Observations | 159 | 159 |
| R-squared | 0.006 | 0.000 |
| Number | 41 | 41 |

*Source: author's own calculation (Stata 16.1)*

*Standard errors in parentheses*

**** p<0.01, ** p<0.05, * p<0.1*

To identify the appropriate econometric specification, the Hausman test was applied to compare fixed effects and random effects models (the table results are available on demand). For ROA, the $chi^2$ statistic is 27.50 with Prob > $chi^2$ = 0.0000, and for ROE, $chi^2$ = 18.61 with Prob > $chi^2$ = 0.0023. Both p-values are well below the conventional 0.05 threshold,

indicating that the differences in coefficients are systematic, and rejecting the null hypothesis of the consistency of the random effects estimator. Consequently, the fixed effects model is the appropriate specification for both dependent variables. This choice allows for effective control of unobserved heterogeneity among the insurance companies in the sample, ensuring consistent coefficient estimates and reliable interpretation.

## 3. Results and discussions

The results of the econometric estimations, presented in Tables no. 4 and 5, examine the impact of macroeconomic and demographic factors on the performance of non-life and liability insurance companies, measured by ROA and ROE. The estimated models demonstrate adequate explanatory power, with the coefficients of determination and F-tests confirming the overall significance of the specifications analyzed. The R-squared and Adjusted R-squared values further validate the models' ability to capture the variability in financial performance, both exhibiting global statistical significance (Prob(F-statistic) = 0.000, below the 10% threshold), thereby highlighting the relevance of ROA and ROE as key indicators for assessing insurance company performance.

**Table no. 4: Empirical results (fixed effects)- ROA as dependent variable**

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| VARIABLES | roa | roa | roa | roa | roa |
| pib | 0.151*** | | | 0.144*** | 0.144*** |
| | (0.0174) | | | (0.0171) | (0.0171) |
| inf | | 0.155*** | | 0.139*** | 0.136*** |
| | | (0.0292) | | (0.0279) | (0.0283) |
| extbal | | | -0.00265 | 0.00163 | 0.00144 |
| | | | (0.00709) | (0.00658) | (0.00659) |
| lnint | 0.0248* | 0.155* | 0.0713* | 0.236* | 0.276** |
| | (0.265) | (0.280) | (0.313) | (0.288) | (0.297) |
| lnurb | 0.112* | 0.0709* | 0.232* | 0.249* | 0.292* |
| | (0.311) | (0.323) | (0.337) | (0.312) | (0.321) |
| ro_dummy | | | | | 0.162 |
| | | | | | (0.282) |
| Constant | -0.201 | -0.120 | 1.964 | -2.062 | -2.416 |
| | (1.455) | (1.555) | (1.753) | (1.653) | (1.765) |
| | | | | | |
| Observations | 540 | 540 | 540 | 540 | 540 |
| R-squared | 0.129 | 0.054 | 0.002 | 0.170 | 0.170 |

| | | | | | |
|---|---|---|---|---|---|
| Number of years | 20 | 20 | 20 | 20 | 20 |

*Source: author's own calculation (Stata 16.1)*
*Standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1)*

The econometric analysis conducted using fixed-effects models for the 27 European Union member states over the period 2005-2024 highlights the crucial role of the macroeconomic environment and demographic factors in shaping the performance of the insurance sector. The dependent variables employed, ROA and ROE, capture the profitability of assets and equity, respectively, providing a comprehensive perspective on the financial efficiency and sustainability of the industry.

**Table no. 5: Empirical results (fixed effects) - ROE as dependent variable (used alternatively)**

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| VARIABLES | roe | roe | roe | roe | roe |
| pib | 1.343*** | | | 1.283*** | 1.272*** |
| | (0.197) | | | (0.193) | (0.193) |
| inf | | 1.688*** | | 1.470*** | 1.420*** |
| | | (0.322) | | (0.315) | (0.319) |
| extbal | | | -0.145* | -0.0977 | -0.101 |
| | | | (0.0780) | (0.0743) | (0.0744) |
| lnint | 2.163* | 3.878** | 3.627* | 6.601** | 7.352** |
| | (2.993) | (3.093) | (3.446) | (3.258) | (3.350) |
| lnurb | 8.320** | 7.071** | 6.468* | 10.93*** | 11.76*** |
| | (3.515) | (3.564) | (3.706) | (3.521) | (3.624) |
| ro_dummy | | | | | 3.073 |
| | | | | | (3.180) |
| Constant | -39.71** | -43.85** | -35.17* | -73.46*** | -80.17*** |
| | (16.46) | (17.17) | (19.28) | (18.68) | (19.92) |
| | | | | | |
| Observations | 540 | 540 | 540 | 540 | 540 |
| R-squared | 0.087 | 0.055 | 0.011 | 0.132 | 0.133 |
| Number of years | 20 | 20 | 20 | 20 | 20 |

*Source: author's own calculation (Stata 16.1)*
*Standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1)*

A key finding is the positive and statistically significant effect of GDP per capita on both performance indicators. The estimated coefficients (+0.144 for ROA and +1.272 for ROE) confirm that economic expansion stimulates demand for insurance products, increases the volume of gross written premiums, and strengthens firms' profit-generating capacity. This outcome aligns with the existing literature, which emphasizes the close relationship between economic cycles and the dynamics of the insurance market (Christophersen and Jakubik, 2014).

Inflation emerges as another major determinant, showing a positive, and significant impact on ROA (+0.136) and ROE (+1.420). Although inflation may erode the real value of technical reserves, the results suggest that, when anticipated accurately, insurers can incorporate these fluctuations into pricing strategies, and investment portfolios. Consequently, moderate inflation can contribute to nominal revenue growth, supporting the maintenance of profitability, consistent with the observations of Eling and Schmeiser (2010).

Regarding the external balance of goods, and services, the estimated coefficients indicate an insignificant effect on ROA and a modest negative effect on ROE (-0.145). This suggests that the trade balance does not directly determine insurance sector performance, with its influence occurring more indirectly through general economic activity.

Demographic and structural factors exhibit consistency, and relevant effects on financial performance. Urbanization shows a positive and significant impact on both ROA and ROE, with a particularly high coefficient for equity profitability (+11.76). This finding reflects the concentration of demand, and the infrastructure necessary for efficient insurance product distribution in urban areas, corroborating recent literature findings (Browne, Hoyt, and Marais, 2022).

Similarly, population access to the internet exerts a positive influence on performance, with a stronger effect observed for ROE (+7.352). Digitalization facilitates market expansion, reduces operational costs, and improves client interaction, resulting in more efficient capital utilization, in line with Fîrțescu (2014).

Concerning the Romania dummy variable, the coefficients are not statistically significant, indicating that the Romanian insurance market does not structurally deviate from general EU trends. Therefore, the models can be considered relevant, and applicable to the national context as well.

Overall, empirical results support the hypothesis that insurance sector performance is strongly shaped by macroeconomic developments, while demographic and digital factors enhance profitability through operational efficiency and market expansion mechanisms. These conclusions underscore that the development of the insurance market is intrinsically linked to ongoing economic, and structural transformations within the European Union.

**Conclusions**

The empirical findings of this study indicate that the financial performance of insurance companies within the European Union is closely linked to macroeconomic developments and the demographic structure of national markets. Indicators such as GDP per capita growth and inflation dynamics emerge as key determinants of profitability, highlighting the sector's capacity to adapt to economic changes through adjustments in underwriting and investment strategies. These results align with existing literature, which emphasizes the role of economic

expansion in stimulating demand for insurance products and in reinforcing the financial stability of industry.

Furthermore, the degree of urbanization exerts a positive influence on financial performance, reflecting the importance of urban environments as areas with higher insurance demand and more efficient service distribution. Internet access (digitalization) also shows a positive and significant effect, particularly on equity profitability, suggesting that digital channels facilitate market expansion and improve operational efficiency. In contrast, the external balance of goods and services does not show a direct significant effect on ROA and ROE, suggesting that its influence on the insurance sector is more likely indirect, operating through general economic activity.

Overall, the study's conclusions underscore the necessity of analyzing the insurance sector within an integrated framework that considers both macroeconomic conditions, and the structural characteristics of individual markets. Strengthening the sector's performance depends on maintaining a stable economic environment, developing urban infrastructure, and gradually leveraging digitalization processes- factors essential for supporting the sustainable growth of the industry over the long term.

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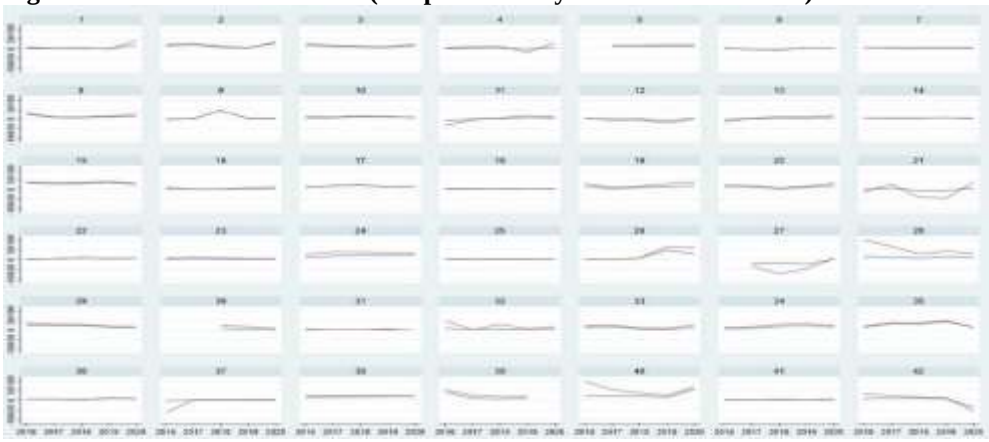
**Appendix 1**

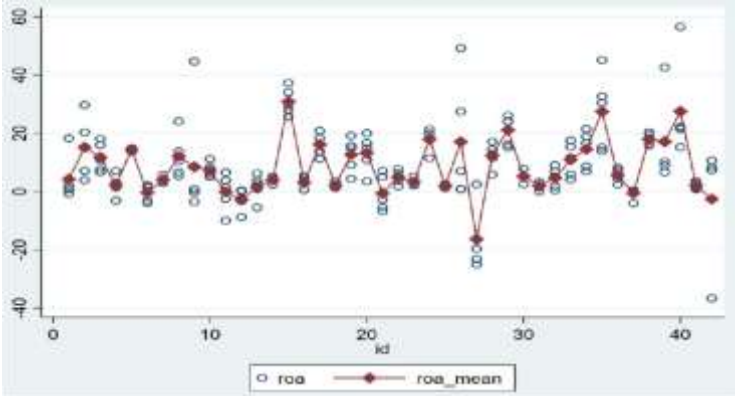
**Figure no. 1: Initial Assessment (Graphical Analysis of ROA and ROE)**



*Source: author's own calculation (Stata 16.1)*
*ROA – blue line, ROE – red line, x-axis – year; y-axis – ROA, ROE*

**Appendix 2**

**Figure no.: Cross-country heterogeneity in ROA and ROE**




*Source: author's own calculation (Stata 16.1)*