ASSESSMENT OF FACTORS AFFECTING THE SOLVENCY OF PROPERTY-LIABILITY INSURANCE COMPANIES

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**Purpose.** This study aims to determine the effect of company size, investment return ratio, own-retention ratio and underwriting results on both the solvency ratio based on technical provisions \(Y_{TP}\), and the solvency ratio based on net premiums \(Y_{NP}\) of 12 property-liability (P/L) insurance companies in Algeria during 2018–2021. This study uses the multiple regression analysis with the help of the SPSS program.

**Results.** The results of this study indicate that the underwriting results have a positive and significant effect on \(Y_{TP}\) of P/L insurance companies in Algeria during 2018–2021, while other variables do not affect \(Y_{TP}\). This study also states that the own-retention ratio and underwriting results have a significant positive influence on \(Y_{NP}\) of P/L insurance companies in Algeria during 2018–2021, however the company size and investment return ratio do not affect \(Y_{NP}\) of these companies. The developed models explain only 32.4% of the variation in dependent variable \(Y_{TP}\) and 61.7% of the variation in dependent variable \(Y_{NP}\), implying that there are still other factors affecting solvency of P/L insurance companies in Algeria.

**Scientific novelty.** The scientific novelty of this research lies on knowing the factors affecting the solvency of insurance companies by focusing on Algeria, especially since the Algerian solvency system is still purely traditional and does not focus on the factors considered in this study.

**Practical value.** The findings will enable insurance companies in Algeria to optimally evaluate their solvency by focusing on the factors that have a significant effect on the solvency of insurance companies, thus ensuring the sustainability of these companies. Furthermore, the results of this study could be assistance to the insurance regulatory authority in Algeria to reconsider the rules of regulating solvency based on the factors that affect insurer’s solvency.

**Key words:** insurance company, solvency, company size, investment return ratio, own-retention ratio, underwriting result, Algeria.

**Introduction.** Insurance companies are service institutions that provide insurance coverage for the risks faced by the insured. At the same time, they are financial intermediary institutions by collecting premiums from insured and investing them in
several investment tools. Property-liability (P/L) insurance companies are a type of business insurance, which are based on the principle of compensation, meaning that the compensation can never exceed the loss to which the insured is exposed. P/L insurance companies specialize in providing property insurance policies (homeowner’s insurance, commercial property insurance, car insurance, natural disaster insurance, etc.), and liability insurance policies (general liability, professional liability, etc.).

In the community, a healthy insurance company is very much needed. Because the trust in an insurance company from the insured is based on the insurance company’s financial health. An insurance company can be said to be healthy if it always fulfills all its obligations. The fulfillment of obligations on insurers requires solvent position. Therefore, Solvency assessment is the core content of insurance regulations in various countries, such as the RBC system implemented in the United States, and the Solvency II Regulatory Framework launched by the European Union.

In the early years, many studies focused on the factors affecting insurance companies’ solvency, where the factors that have been addressed varied from one study to another. As a summary of these studies’ results, it appears that some researchers have found that factors such as company size, investment return ratio, own-retention ratio, and underwriting results have a positive effect on the solvency of insurance companies. Other researchers have found a negative effect of these factors on solvency, meanwhile, other researchers have not found any relationship between one of these factors and the solvency of insurance companies.

In Algeria, there is no study addressed the factors affecting the insurers’ solvency, there are a few previous studies focused only on the solvency regulation of insurance companies in Algeria and compared it with international systems. Therefore, the present study attempts to fill this research gap, which surely analyses the factors responsible for affecting the solvency of P/L insurance companies in Algeria.

**Review of literature.** Solvency reflects an insurer’s ability to fulfill its policy liability (Wu & Li, 2021). Therefore, solvency is a performance indicator variable that indicates the insufficient funds of fulfilling stakeholders’ debts in the long and short run (Mohammad Salameh, 2021). Ensuring solvency is not only vital for the insurance companies, but also important to protect the interests of the insured person and the policyholder (Wu & Deng, 2021). Typically, regulators are responsible for monitoring the solvency of insurance companies by defining the adequate capital required by the legal obligations toward the insured (Siddik et al., 2022). Therefore, various countries usually use their own defined solvency adequacy ratio indicators to require insurance companies to maintain a certain solvency ratio (Min & Jingfeng, 2018). This ratio reflects the “actual capital” and “minimum capital” of the insurance company, showing the ability of an insurance company to fulfil its policy claims and payment obligations (Wu & Deng, 2021). Any insurance company should have a solvency ratio of at least 100%. This percentage is emphasized and required to cover the assumed risks and safeguard the solvency of insurers (Siopi et al., 2023). The higher the ratio, the better the insurer’s solvency (Sukmaningrum et al., 2023).
Algerian legislator has issued a strict guideline for the maintenance of a ‘statutory’ solvency. The solvency margins of insurers for each class or line of business are specified in (Executive Decree, 2013). This Executive Decree helps to find the ‘solvency ratio’ (the available solvency margin divided by the required solvency margin). The “Available Solvency Margin” (ASM) consists of capital, reserves, regulatory provisions, and retained earnings. The determination of the “Required Solvency Margin” (RSM) differs from the P/L insurance segment to the life segment of the insurance business. Again, Required Solvency Margin of P/L insurers is based either on technical provisions (RSM-TP) or on net premiums (RSM-NP). In addition to this, The Available Solvency Margin (ASM) must not be less than 15 % of the technical provisions, and not be less than 20 % of the net premiums of the insurance companies.

Based on the explanation above, this paper uses the ratio of “available solvency margin” to “required solvency margin” as the measurement index of solvency ratio for P/L insurance companies in Algeria, where:

\[
\text{Available Solvency Margin (ASM)} = \text{capital} + \text{reserves} + \text{regulatory provisions} + \text{retained earnings},
\]

\[
\text{Required Solvency Margin based on Technical Provisions} = 15\% \cdot \text{Technical Provisions},
\]

\[
\text{Required Solvency Margin based on Net Premiums} = 20\% \cdot \text{Net Premiums}.
\]

Company size refers to the size of the insurance company and is one of the factors defining the insurer’s solvency (Sukmaningrum et al., 2023). According to Agustiyani (2019) company size describes the size of a company which can be expressed in terms of total assets or total net sales. While Barakat et al. (2022) states that variables used to measure company size are total assets, stock market value, average sales level and sales amount. According to Siopi et al. (2023), Sukmaningrum et al. (2023), and Ahmeti & Iseni (2022), company size is measured by the natural logarithm (\(Ln\)) of total assets. Therefore, in this paper, “\(Ln\) of total assets” was used as proxy for company size of P/L insurance companies.

According to Ambarwati & Hasib (2018), the ratio of return on investment is the ratio used to assess investment policies carried out by insurance companies. Because most of the investment results obtained are intended to be used as reserves to pay future claims, the insurance company’s investment must be safe (Rahayu Ningsih et al., 2021). This paper uses the ratio of “investment return” to “total investment” as the measurement index of investment return ratio for P/L insurance companies.

Own retention ratio according to Siopi et al. (2023) is the ratio of the ceded premium to reinsurance over the total gross written premium, ceded premium is the assigned portion of premiums collected by an insurance company to a reinsurer. The retention ratio reflects the comparison between net premiums and gross premiums (Pramusinta & Aryani, 2023). This is used to measure how much premium is retained compared to the premium received directly (Agustiyani, 2019). This paper uses the ratio of “net premium” to “gross premium” as the measurement index of own retention.
ratio for P/L insurance companies.

Underwriting is the process of classifying and determining the level of risk owned by a potential insured as these risks can be covered by some insurance products, and this process also includes how to decide to take the risk or reject it (Reschiwati & Rizki Putri, 2018). The measurement of underwriting result is based on the difference between underwriting income and underwriting expenses (Alamsyah & Ahmad, 2021). The high underwriting results generally indicate the good underwriting process that has been done. While the decline in underwriting results show the worsening performance of underwriting (Reschiwati & Rizki Putri, 2018). This paper uses the difference between underwriting income which consists of net premium income and underwriting expenses that consist of net claims expense and net commission charge as the measurement index of underwriting results for P/L insurance companies.

The effect of company size on solvency. The company that has large in size would be better in a diversifying its assets and tend to be lower chance of financial distress (Kebede et al., 2024). Larger companies generally have superior resources, lower transaction costs and excellent resistance to competition and economic shocks. In other words, companies with significant assets are generally more efficient (Sukmaningrum et al., 2023). In this case if the insurance company is large, the premiums obtained as the insurance company’s income are also high so that it can also contribute highly to the solvency level of the insurance company (Rahayu Ningsih et al., 2021). In addition, compared with large insurance companies, it is expected that small insurers are more vulnerable to insolvency, because regulators are less likely to liquidate large insurers (Joo, 2013). This is in accordance with research results of Ambarwati & Hasib (2018), Kumar & Kumar (2016), and Joo (2013), which show that company size has a positive effect on solvency.

The effect of investment return ratio on solvency. Typically, the discount of investment return of assets affect insurers’ current pricing strategies and profitability (Tsai & Lo, 2024), for that insurance companies have a high need to get investment income from their investment assets. Good investment management will be able to accommodate the level of investment risk that the company can tolerate with appropriate investment results, which ultimately can improve the solvency of the insurance company (Ambarwati & Hasib, 2018). This is consistent with research by Alamsyah & Wiratno (2017), which states that investment returns have a positive effect on solvency.

The effect of own retention ratio on solvency. Own retention ratio is used to compare the company’s ability to available funds/capital (Agustiyani, 2019). If the retention ratio is high, it means that the company’s ability to manage premium income is also high, which will have an impact on the financial health of the insurance company. According to the research results of Rahayu Ningsih et al. (2021), which stated that the retention ratio itself partially has a positive effect on the level of solvency.

The effect of underwriting results on solvency. Through the management of
underwriting process insurers ensure more stability in underwriting activity results especially by the good evaluate of the risks insured and establishes the best pricing (Chiaramonte et al., 2020). So, the better an insurance company’s risk management, the better its underwriting results, which may have an impact on the fulfillment of the solvency ratio (Alamsyah & Ahmad, 2021). According to research Rahayu Ningsih et al. (2021) and Alamsyah & Ahmad (2021), underwriting results have a positive influence on the solvency ratio. The greater the underwriting results of an insurance company, the greater the solvency level will be.

According to the above analysis, the factors studied (company size, investment return ratio, own retention ratio, and underwriting results) have a positive effect on the solvency of insurance companies. The specific influence mechanism of these factors affecting the solvency of P/L insurance companies in Algeria is shown in Figure 1 below.

**Figure 1. Conceptual framework**

*Source: prepared by the authors on the basis of Alamsyah & Ahmad (2021), Rahayu Ningsih et al. (2021), Ambarwati & Hasib (2018), Alamsyah & Wiratno (2017), Kumar & Kumar (2016), and Joo (2013).*

Based on the conceptual framework above, this study formulates the following hypotheses:

H₁. The company size has a positive effect on the solvency ratio based on the technical provisions \(Y_{TP}\) of P/L insurance companies in Algeria.

H₂. The investment return ratio has a positive effect on the solvency ratio based on the technical provisions \(Y_{TP}\) of P/L insurance companies in Algeria.

H₃. The own retention ratio has a positive effect on the solvency ratio based on the technical provisions \(Y_{TP}\) of P/L insurance companies in Algeria.

H₄. The underwriting results have a positive effect on the solvency ratio based on the technical provisions \(Y_{TP}\) of P/L insurance companies in Algeria.

H₅. The company size has a positive effect on the solvency ratio based on the net premiums \(Y_{NP}\) of P/L insurance companies in Algeria.

H₆. The investment return ratio has a positive effect on the solvency ratio based on the net premiums \(Y_{NP}\) of P/L insurance companies in Algeria.

H₇. The own retention ratio has a positive effect on the solvency ratio based on the net premiums \(Y_{NP}\) of P/L insurance companies in Algeria.
the net premiums \((Y_{NP})\) of P/L insurance companies in Algeria.

\(H_8\). The underwriting results have a positive effect on the solvency ratio based on the net premiums \((Y_{NP})\) of P/L insurance companies in Algeria.

**Materials and methods.** The population used in this study are property-liability insurance companies that are officially registered and supervised by the Insurance Directorate of the Ministry of Finance in Algeria (DASS) during the period 2018–2021, totaling 12 companies (public and private). The selected companies were used as research samples with an observation period of each company for 4 years, so in this study there were 48 observations. The required data was collected from the annual reports of DASS and the annual reports of the concerned companies. It should be noted that the reason why 2021 is chosen as the cutoff date for this study is that DASS did not publish any annual reports related to insurance business in Algeria for recent years.

Research variables are classified into two groups of variables, namely the independent variable and the dependent variable. The dependent variables in this study are Solvency Ratio based on Technical Provisions \((Y_{TP})\), and Solvency Ratio based on Net Premiums \((Y_{NP})\). Meanwhile, the independent variables are company size \((x_1)\), investment return ratio \((x_2)\), own retention ratio \((x_3)\) and underwriting results \((x_4)\). For more details, the variables and their indicators can be seen in Table 1 below.

**Table 1**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Measurement</th>
<th>Measuring scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solvency Ratio based on Technical Provisions ((Y_{TP}))</td>
<td>Available Solvency Margin (\frac{15% \cdot Technical\ Provision}{100})</td>
<td>Ratio</td>
</tr>
<tr>
<td>Solvency Ratio based on Net Premiums ((Y_{NP}))</td>
<td>Available Solvency Margin (\frac{20% \cdot Premiums}{100})</td>
<td>Ratio</td>
</tr>
<tr>
<td>Company Size ((x_1))</td>
<td>(\ln (Total\ Assets))</td>
<td>Nominal</td>
</tr>
<tr>
<td>Investment Return Ratio ((x_2))</td>
<td>(\frac{Investment\ Return}{Total\ Investment} \cdot 100)</td>
<td>Ratio</td>
</tr>
<tr>
<td>Own Retention Ratio ((x_3))</td>
<td>(\frac{Net\ Premium}{Gross\ Premium} \cdot 100)</td>
<td>Ratio</td>
</tr>
<tr>
<td>Underwriting Results ((x_4))</td>
<td>Underwriting Income – Underwriting Expenses</td>
<td>Nominal</td>
</tr>
</tbody>
</table>

*Source: prepared by the authors on the basis of Executive Decree (2013), Pramusinta & Aryani (2023), Siopi et al. (2023), Sukmaningrum et al. (2023), Ahmeti & Iseni (2022), Rahayu Ningsih et al. (2021), Agustiyani (2019), and Ambarwati & Hasib (2018).*

As discussed above, eight hypotheses will be tested using the multiple regression analysis to see the impact of different factors \((x_1, x_2, x_3,\ and\ x_4)\) on both Solvency Ratio based on technical provisions \((Y_{TP})\), and Solvency Ratio based on net premiums \((Y_{NP})\).

The equation for a multiple linear regression is:

\[ Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \varepsilon, \quad (4) \]

where \(Y\) is the Solvency Ratio based on technical provisions \((Y_{TP})\), or the Solvency Ratio based on net premiums \((Y_{NP})\);

\(\beta_0\) is the intercept value;
\( x_i \) are the fourth independent variables (company size, investment return ratio, own retention ratio and underwriting results);
\( \beta_i \) are the estimated regression coefficients of respective independent variables;
\( \varepsilon \) is the model error, i.e. the variation of our estimate of \( Y \) with respecting to the real value.

**Results and discussion.**

1. **Descriptive Statistical Analysis.** The Table 2 shows the descriptive statistics such as minimum, maximum, mean and standard deviation values for the variables under consideration.

   **Table 2**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company size</td>
<td>22.38</td>
<td>25.27</td>
<td>23.75</td>
<td>0.93</td>
</tr>
<tr>
<td>Investment return ratio</td>
<td>0.0075</td>
<td>0.1432</td>
<td>0.0479</td>
<td>0.0202</td>
</tr>
<tr>
<td>Own retention ratio</td>
<td>0.0364</td>
<td>0.8917</td>
<td>0.2966</td>
<td>0.2162</td>
</tr>
<tr>
<td>Underwriting results (millions dzd)</td>
<td>733.00</td>
<td>12481.00</td>
<td>3643.27</td>
<td>3179.26</td>
</tr>
<tr>
<td>Solvency ratio based on technical provisions</td>
<td>208.57</td>
<td>1281.50</td>
<td>636.18</td>
<td>276.12</td>
</tr>
<tr>
<td>Solvency ratio based on net premiums</td>
<td>149.31</td>
<td>755.35</td>
<td>437.43</td>
<td>164.78</td>
</tr>
</tbody>
</table>

*Source:* based on the output SPSS ver. 23 program.

An examination of Table 2 makes it clear that all variables are widely distributed over the period of study with a positive mean. Table 2 shows that all P/L insurance companies in Algeria have much higher Available Solvency Margins than required during 2018–2021. The mean Solvency Ratio based on Technical Provisions margin is 6 times higher than required for P/L insurance companies, while the mean Solvency Ratio based on Net Premiums is 4 times higher for these companies.

2. **Multiple Linear Regression Analysis of Solvency of P/L Insurers in Algeria.**

The main purpose of this analysis is to determine how much the dependent variable \( Y_{TP} \) or \( Y_{NP} \) is affected by the four independent variables (company size, investment return ratio, own retention ratio, and underwriting result) using SPSS ver. 23 program.

Firstly, before performing the multiple linear regression, the assumptions of this model were analyzed. After that, the ANOVA statistics, the degree of emerging model’s predicting the dependent variable in consequence of the standard regression \( (R) \), the degree of the model’s explaining the variance in the dependent variable \( (R^2) \), and the T-test are used in this study.

2.1. **Assumptions.** The main assumptions of the multiple linear regression are no multicollinearity, the residuals have constant variance (homoscedasticity), the residuals are normally distributed (multivariate normality), and the absence of outliers.

Prior to no multicollinearity, the Variance Inflation Factor (VIF) and the Tolerance are used to verify this assumption (Trufnio et al., 2022). The findings concerning these values for each independent variable are shown in Table 3 below.
Collinearity statistics

<table>
<thead>
<tr>
<th>Input variable</th>
<th>Tolerance</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company size</td>
<td>0.255</td>
<td>3.923</td>
</tr>
<tr>
<td>Investment return ratio</td>
<td>0.976</td>
<td>1.025</td>
</tr>
<tr>
<td>Own retention ratio</td>
<td>0.639</td>
<td>1.566</td>
</tr>
<tr>
<td>Underwriting results</td>
<td>0.311</td>
<td>3.214</td>
</tr>
</tbody>
</table>

Source: based on the output SPSS ver. 23 program.

As a general rule, VIF values greater than 5 indicate potential multicollinearity. Sometimes researchers use a VIF value of 10 instead, depending on the field of study (Zach, 2021). In addition to these, if Tolerance values are higher than 0.10, no multiple relations between variables is decided (Uyanık & Güler, 2013). When looking at the Table 3, The VIF values were always less than 5 and the Tolerance values were always greater than 0.1, so the absence of multicollinearity was verified.

For the 2nd assumption, Homoscedasticity, it is possible to verify it by building the graph of “standardized residuals” against the “standardized predicted value” (Trunfio et al., 2022). Multiple linear regression assumes that the residuals have constant variance at every point in the linear model. When this is not the case, the residuals are said to suffer from heteroscedasticity. If the points in the scatter plot exhibit a pattern, then heteroscedasticity is present (Zach, 2021).

Figure 2 and Figure 3 show the graphs of “standardized residuals” against the “standardized predicted value” used to verify that the variance of the residuals is constant. Based on these figures, the points in the scatter plots do not exhibit a pattern, which means that heteroscedasticity is not present in the models.

Figure 2. Plot of “standardized residuals” against the “standardized predicted value”, dependent variable: $Y_{TP}$

Source: based on the output SPSS ver. 23 program.
Figure 3. Plot of “standardized residuals” against the “standardized predicted value”, dependent variable: $Y_{NP}$

Source: based on the output SPSS ver. 23 program.

To check the Multivariate Normality, a quantile-quantile (Q–Q) plot can be used to determine whether or not the residuals of a model follow a normal distribution. If the points on the plot roughly form a straight diagonal line, then the normality assumption is met (Zach, 2021). As can be seen from the Figure 4, and the Figure 5 below, the points are quite close to the lines, which means that the residuals roughly follow a normal distribution.

Figure 4. Normal Q-Q plot of Solvency based on Technical Provisions ($Y_{TP}$)

Source: based on the output SPSS ver. 23 program.
2.2. Result of Multiple Linear Regression Analysis for Solvency Ratio based on Technical Provisions of P/L insurance companies in Algeria. The findings obtained by doing the multiple linear regression analysis concerning whether or not the four independent variables predicted significantly the Solvency Ratio based on Technical Provisions ($Y_{TP}$) of insurance companies in Algeria are shown in Table 4 below.

An examination of Table 4 makes it clear that the value of the calculated $F$ is 5.156 ($p$-value < 0.05) for the variance generated by the regression. The critical value of $F$, at the significance level of 0.05 with 4 degrees of freedom at the numerator and 43 at the denominator is 2.59. By comparing the values of $F$ (5.156 > 2.59) it results that it is compulsory to accept the alternative hypothesis, meaning that the analysis of variance is significant, i.e. there is indeed a linear dependence between the dependent variable ($Y_{TP}$) and the four explanatory variables (company size, investment return ratio, own retention ratio, and underwriting result).
Table 4

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Unstandardized coefficients</th>
<th>Standardized coefficients</th>
<th>t</th>
<th>Sig. (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>1517.429</td>
<td>1656.909</td>
<td>-</td>
<td>0.916</td>
</tr>
<tr>
<td>Company size</td>
<td>-44.090</td>
<td>73.473</td>
<td>-0.149</td>
<td>-0.600</td>
</tr>
<tr>
<td>Investment return ratio</td>
<td>380.985</td>
<td>1737.371</td>
<td>0.028</td>
<td>0.219</td>
</tr>
<tr>
<td>Own retention ratio</td>
<td>-196.852</td>
<td>200.403</td>
<td>-0.154</td>
<td>-0.982</td>
</tr>
<tr>
<td>Underwriting results</td>
<td>0.057</td>
<td>0.020</td>
<td>0.652</td>
<td>2.899</td>
</tr>
<tr>
<td>F (ANOVA)</td>
<td></td>
<td></td>
<td></td>
<td>5.156</td>
</tr>
<tr>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td>0.569</td>
</tr>
<tr>
<td>R Square</td>
<td></td>
<td></td>
<td></td>
<td>0.324</td>
</tr>
<tr>
<td>Cook’s Distance</td>
<td></td>
<td></td>
<td></td>
<td>Min = 0.000</td>
</tr>
</tbody>
</table>

Source: based on the output SPSS ver. 23 program.

From the Table 4, the model’s degree of predicting the dependent variable is $R = 0.569$. The model’s degree of explaining the variance in the dependent variable is $R^2 = 0.324$ which means that 32.4% of the variation in Solvency Ratio based on Technical Provisions ($Y_{TP}$) of insurance companies in Algeria can be explained by the four explanatory variables.

Looking at these coefficients ($F$, $R$, and $R^2$), it may be said that the model predicts the dependent variable very well.

Base on the Table 4 above, the results of the coefficients of the model and hypothesis testing ($t$-test) to determine the effect of each independent variable on the dependent variable ($Y_{TP}$), are shown below:

From the results of estimating the influence of the Company Size variable on the Solvency Ratio based on Technical Provisions ($Y_{TP}$), it is obtained that the calculated $t$-value is $-0.600$, which is smaller than the $t$-table (at the probability level $\alpha = 0.05$ and $df = 48 - 5$, the $t$-table value = 2.0167), with a regression coefficient of $-44.090$ indicating a negative direction. The significance value of this variable is 0.552, which is greater than 0.05 means that the Company Size variable does not have a significant influence on the Solvency Ratio based on the Technical Provisions of P/L insurance companies in Algeria. This means that Hypothesis 1 is rejected.

From the results of estimating the influence of the Investment Return Ratio variable on $Y_{TP}$, it is obtained that the calculated $t$-value is $0.219 < 2.0167$ $t$-table, with a regression coefficient of $380.985$ indicating a positive direction. The significance value of the Investment Return Ratio variable is $0.827 > 0.05$, which means that this variable does not have a significant influence on the Solvency Ratio based on the Technical Provisions of P/L insurance companies in Algeria. Thus, it is concluded that Hypothesis 2 is rejected.

From the results of estimating the influence of the Own Retention Ratio variable on $Y_{TP}$, it is obtained that the calculated $t$-value is $-0.982 < 2.0167$ $t$-table, with a regression coefficient of $-196.852$ indicating a negative direction. The significance
value of the Own Retention Ratio variable is 0.331 > 0.05, which means that this variable does not have a significant influence on the Solvency Ratio based on the Technical Provisions of P/L insurance companies in Algeria. This means that Hypothesis 3 is rejected.

From the results of estimating the influence of the Underwriting Result variable on $Y_{TP}$, it is obtained that the calculated $t$-value is $2.899 > 2.0167$ $t$-table, with a regression coefficient of 0.057 indicating a positive direction. The significance value of the Underwriting Result variable is $0.006 < 0.05$, which means that this variable has a significant positive influence on the Solvency Ratio based on the Technical Provisions of P/L insurance companies in Algeria. This means that Hypothesis 4 is accepted.

From the results above, the regression equation is:

$$Y_{(TP)} = 1517.429 - 44.090 x_1 + 380.985 x_2 - 169.852 x_3 + 0.057 x_4,$$

where $Y_{(TP)}$ – Solvency Ratio based on Technical Provisions;

$x_1$ – company size;

$x_2$ – investment return ratio;

$x_3$ – own retention ratio;

$x_4$ – underwriting result (millions dzd).

2.3. Result of Multiple Linear Regression Analysis for Solvency Ratio based on Net Premiums of P/L insurance companies in Algeria. Table 5, shows the results of multiple linear regression results related to Solvency Ratio based on Net Premiums ($Y_{NP}$) of insurance companies in Algeria.

### Table 5

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Unstandardized coefficients</th>
<th>Standardized coefficients</th>
<th>$t$</th>
<th>Sig. (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>-338.260</td>
<td>-</td>
<td>-0.454</td>
<td>0.652</td>
</tr>
<tr>
<td>Company Size</td>
<td>25.538</td>
<td>33.017</td>
<td>0.145</td>
<td>0.773</td>
</tr>
<tr>
<td>Investment Return Ratio</td>
<td>15.790</td>
<td>780.725</td>
<td>0.002</td>
<td>0.020</td>
</tr>
<tr>
<td>Own Retention Ratio</td>
<td>194.332</td>
<td>90.056</td>
<td>0.255</td>
<td>0.037</td>
</tr>
<tr>
<td>Underwriting Results</td>
<td>0.030</td>
<td>0.009</td>
<td>0.586</td>
<td>3.463</td>
</tr>
<tr>
<td>F (ANOVA)</td>
<td>17.303</td>
<td></td>
<td></td>
<td>0.000</td>
</tr>
<tr>
<td>R Square</td>
<td></td>
<td></td>
<td>0.785</td>
<td></td>
</tr>
<tr>
<td>R Square</td>
<td></td>
<td></td>
<td>0.617</td>
<td></td>
</tr>
<tr>
<td>Cook’s Distance</td>
<td>Min = 0.000</td>
<td>max = 0.135</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Source: based on the output SPSS ver. 23 program.*

The multiple linear regression model, with $Y_{NP}$ as a dependent variable, now has a calculated $F$ of 17.303 ($p$-value < 0.05) and the critical value of $F_{(4,43)}$ is 2.59. By comparing the values of $F$ (17.303 > 2.59) it results that the analysis variance is significant, meaning that there is a linear dependence between the dependent variable ($Y_{NP}$) and the four explanatory variables (company size, investment return
ratio, own retention ratio, and underwriting result).

Based on Table 5, the R value is 0.785 and the $R^2$ value is 0.617, which means that the four independent variables can explain the Solvency Ratio based on Net Premiums of 61.7%, while the remaining 38.3% is influenced by other variables not examined in the study.

From the coefficients of the model and the results of the t-test, which are shown in the Table 5 above, the following conclusions can be drawn:

The p-value of the Company Size variable is 0.443 > 0.05 and the t-count is 0.773 < 2.0167 t-table with a regression coefficient of 25.538 indicating a positive direction, which means that the Company Size variable does not have a significant influence on the Solvency Ratio based on the Net Premiums of P/L insurance companies in Algeria. Thus, it is concluded that Hypothesis 5 is rejected.

The p-value of the Investment Return Ratio variable is 0.984 > 0.05 and the t-count is 0.020 < 2.0167 t-table with a regression coefficient of 15.790 indicating a positive direction, which means that the Investment Return Ratio variable does not have a significant influence on the Solvency Ratio based on the Net Premiums of P/L insurance companies in Algeria. So, the Hypothesis 6 is rejected.

The p-value of the Own Retention Ratio variable is 0.037 < 0.05 and the t-count is 2.158 > 2.0167 t-table. The regression coefficient is 194.332 with a positive direction, which means that the Own Retention Ratio variable has a significant positive influence on the Solvency Ratio based on the Net Premiums of P/L insurance companies in Algeria. Thus, it is concluded that Hypothesis 7 is accepted.

The p-value of the Underwriting Result variable is 0.001 < 0.05 and the t-count is 3.463 > 2.0167 t-table. The regression coefficient is 0.030 with a positive direction, which means that the Underwriting Result variable has a significant positive influence on the Solvency Ratio based on the Net Premiums of P/L insurance companies in Algeria. Thus, it is concluded that Hypothesis 8 is accepted.

From the unstandardized coefficients above, the regression equation is:

$$Y_{(NP)} = -338.260 + 25.538 \cdot x_1 + 15.790 \cdot x_2 + 194.332 \cdot x_3 + 0.030 \cdot x_4,$$

where $Y_{(NP)}$ – Solvency Ratio based on Net Premiums;

$x_1$ – company size;

$x_2$ – investment return ratio;

$x_3$ – own retention ratio;

$x_4$ – underwriting result (millions dzd).

3. Discussion. The research results show that the company size does not affect the solvency of P/L insurance companies in Algeria during 2018–2021. If the company size increases or decreases, it will not affect the solvency of these companies. This result supports the research conducted by Agustiyani (2019) and Utami & Khoiruddin (2016) which found that company size has no effect on the company’s solvency level. This study obtained different results from research by Ambarwati & Hasib (2018), Kumar & Kumar (2016), and Joo (2013), which stated that company size had a positive effect on the solvency of insurance companies. However, Rahayu Ningsih et al. (2021)
obtained the results that company size had a negative effect on solvency. This study states that there is a positive relationship but does not affect the investment return ratio to the solvency ($Y_{TP}$ or $Y_{NP}$) of P/L insurance companies in Algeria. This can be assumed because the investment returns obtained by P/L insurance companies in Algeria are less profitable. It can be seen, in the Table 2 above, that the average of investment return is 4.78% of the total investment each year. Therefore, investment returns do not affect on solvency. The results of this study support research that has been carried out by Rahayu Ningsih et al. (2021), Ambarwati & Hasib (2018), and Joo (2013) which said that investment returns do not affect on solvency. This study obtained different results from research by Alamsyah & Wiratno (2017), which stated that investment returns had a significant positive influence on the solvency ratio.

This study shows that the own retention ratio has a positive effect on the Solvency based on the Net Premiums of P/L insurance companies in Algeria. Because increasing the retention ratio means the insurance company is able and reliable to manage its own premium income without having to spread the risk to other reinsurance companies so that it has an impact on the solvency. This result supports the research conducted by Rahayu Ningsih et al. (2021), which results in the retention ratio having a positive effect on solvency. This study obtained different results from research by Agustiyani (2019) and Utami & Khoiruddin (2016), which stated that the own retention ratio did not affect the level of solvency. If the retention ratio itself increases or decreases, it will not affect the company’s solvency level.

This study states that there is a positive effect of underwriting results on the solvency ($Y_{TP}$ or $Y_{NP}$) of P/L insurance companies in Algeria during 2018–2021. This means that if underwriting results increase, the solvency ratio can also increase. Based on the results of Table 2, it is clear that insurance companies achieved very high underwriting results during 2018–2021, which enabled them to achieve high solvency ratios. The results of this study support all previous research conducted by Rahayu Ningsih et al. (2021) and Alamsyah & Ahmad (2021), which concluded that underwriting results had a positive effect on the company’s solvency level.

**Conclusions.** This work aimed to examine how the effect of four independent variables (company size, investment return ratio, own retention ratio and underwriting results) on both the solvency ratio based on technical provisions ($Y_{TP}$) and the solvency ratio based on net premiums ($Y_{NP}$) for all P/L insurance companies in Algeria in the four-year period 2018–2021. The method of analysis used in this study is multiple linear regression with its stages.

Firstly, the assumptions necessary for the multiple linear regression analysis were examined in the research, and the regression analysis was performed with the data that were thought to satisfy the assumptions. The model’s degree of explaining the variance in the dependent variable ($Y_{TP}$) was $R^2 = 0.324$, however, the $R^2$ value for the dependent variable ($Y_{NP}$) was 0.617.

Based on the results of the tests and discussions that have been described previously, it can be concluded that the underwriting results variable has a significant
positive influence on the solvency based on technical provisions of P/L insurance companies in Algeria during 2018–2021. Whereas, other variables (company size, investment return ratio, and own retention ratio) were insignificantly influence the solvency of these companies. For the solvency based on the net premiums, the results stated that all independent variables have a positive relationship with solvency, but only two variables (own retention ratio and underwriting result) were significantly influencing the solvency based on the net premiums of P/L insurance companies in Algeria during 2018–2021.

Research limitations and research perspectives. The paper has certain limitations related to the insufficient amount of available information and the timeliness of its updating. Adding to this, the paper focuses mainly on P/L insurance companies in Algeria, and only explains 32.4% of the variation in dependent variable \( Y_{TP} \) and 61.7% of the variation in dependent variable \( Y_{NP} \), implying that there are still other factors affecting solvency of P/L insurance companies in Algeria. Consequently, similar research on the identification of variables affecting an insurer’s solvency should take into consideration other variables such as asset growth, claims ratio, and return on assets (ROA). Future research can benefit from updated information and reports and should expand the study period which will have a positive impact on the number of recorded observations in which we will obtain a broader picture about the solvency of insurance companies. Future research may also focus on analyzing factors that affect the solvency in other insurance companies currently operating in the Algerian insurance market like life insurance, reinsurance companies, and Takaful insurance companies (General Takaful or Family Takaful). While also exploring the possibility of integrating solvency models used in international insurance markets to enhance the solvency of insurance companies in Algeria. Finally, future research could also make comparisons between the factors affecting an insurer’s solvency in Algeria and those in other countries.

References


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