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INVESTMENT ACTIVITIES OF INSURANCE COMPANIES OPERATING IN VISEGRAD GROUP COUNTRIES – THEORETICAL AND EMPIRICAL APPROACH

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Purpose: The objective of this article is to assess the relationship between the investment activities of insurance companies and the gross premium written as well as the selected profitability and liquidity indicators. The research hypothesis assumes that such a relationship can be identified, and it depends on the type of activity and varies for each country.
Design/methodology/approach: The study period covers 2013-2020 in a panel approach. Insurance companies operating in the Visegrad countries were subjected to the study. Econometric panel data models were estimated and verified.
Findings: The study covering life and non-life insurance companies, indicated confirmation of the assumed research hypothesis. In the case of life insurance companies, considering all companies of the Visegrad Group countries together, the following factors have a statistically significant impact on the level of investments: gross premium written, profit after tax. However, this conclusion cannot be generalised by treating individual countries separately. In comparison, when analysing the performance of non-life insurers, only gross premiums written have a statistically significant impact on the level of investments.
Research limitations/implications: The analysis covers only the companies of the insurance sector of the Visegrad countries. In the next step, similar research should be carried out for companies from other groups of countries.
Practical implications: The considerations and research results contained in the article can serve insurance company managers in making investment-related decisions based on the technical results obtained. They can also be used by state governments and regulators to predict the future investment behaviour of insurance companies.
Originality/value: The uniqueness of the proposed article is demonstrated by the use of panel data and panel estimation used to describe the above-mentioned relationships as well as a comparison of results by type of activity and country.

Keywords: insurance company, investments, Visegrad Group, investments, panel data estimation.

Category of the paper: research paper.

1. Introduction

From the point of view of the Solvency II Directive, the superior principle for the investment of assets held is a prudent investor principle, whereby insurance companies only invest in assets and instruments for which the risks can be properly identified, measured, and monitored by insurers. At the same time, entities must manage and report on these assets correctly.

The Directive establishes that all assets, including in particular those covering the minimum capital requirement and the solvency capital requirement, must be invested to guarantee the safety, quality, liquidity, and profitability of the entire portfolio. On the other hand, assets to cover technical provisions must be invested to match the nature and duration of insurance and reinsurance liabilities. In doing so, the interests of all policyholders and beneficiaries must also be taken into account, considering the disclosed objectives of the investment policy in place.

According to the European Insurance and Occupational Pensions Authority (EIOPA), when managing investment risk, an insurance company should individually develop sets of key risk indicators that are consistent with its investment risk management principles and its business strategy. When managing investment risk, an insurance company cannot limit itself to information obtained from other financial institutions, asset managers or rating agencies. First of all, the insurer is obliged to review and monitor the safety, quality, liquidity and profitability of entire investment portfolios regularly.

In conducting its investment policy, the insurance company should pay particular attention to limits of liability, including policyholder guarantees, any disclosed policy on future discretionary benefits and the reasonable expectations of policyholders, as well as the acceptable level and nature of risk;

The location and availability of assets and the regulation of the investment economy in other countries are also extremely important.

According to the current legal regulations, when investing assets covering technical provisions, an insurance entity obliged to take into account the type of business it conducts, paying particular attention to the nature and duration of its obligations under insurance or reinsurance contracts. At the same time, assets covering technical provisions for solvency purposes must be invested in accordance with the interests of policyholders, insured persons and beneficiaries of insurance contracts, while taking into account the objectives of the investment policy pursued.

The insurance company is obliged to diversify its assets in order not to lead to excessive dependence on one specific asset, issuer or group of issuers related to each other or a specific geographical area and excessive accumulation of risk in the entire portfolio. On the other hand, investments in assets issued by the same issuer or a group of related issuers must not expose a given insurance company to excessive risk concentration.

The purpose of this article is to assess the relationship between the investment activities of insurance companies and the gross premium written as well as the selected profitability and liquidity indicators. This relationship will be presented for life and non-life insurance companies separately. The research hypothesis, tested in the paper, assumes that such a relationship can be identified and that it varies according to the type of activity and depends on the country. The sample covers the financial results of insurance companies of the Visegrad Group countries from 2013 to 2020. The calculations were made in the Gretl program. The structure of the article includes a description of the idea and principles of investment, a review of previous research in this area, a description of the proposed research methodology as well as the results and conclusions obtained.

2. Literature review

In the literature, you can find many articles on dependencies in insurance companies. The more important of them are presented below.

According to D. Wieczorek-Bartczak (2017, p. 51), investment activity is such an area of the insurer's business that should be analysed in terms of the risks arising from it. According to the prudent investor principle, if an insurance company is unable to identify the risks associated with an investment, or is unable to measure or monitor those risks, it should not make such an investment.

According to Jędrzychowska and Poprawska (2008), the investment policy of insurance companies is mainly influenced by two factors: the individual investment decisions of the company, which shows itself in the appearance of the portfolio and changes in its structure as well as the market situation. M. Lament (2013) is of the opinion that the investment policy of insurance companies is to allocate assets in order to guarantee a certain rate of return on investment at an assumed level of risk that preserves the financial security of the insurance company, as well as enabling its ongoing ability to settle its liabilities. On the other hand, the objectives of an insurance company's investment policy are a consequence of the strategic objectives it pursues, the scope of its business, and the applicable legislation.

Gründl, Dong and Gal (2016) highlighted the different investment strategies of insurance companies. According to them, these strategies are primarily impacted by regulatory requirements, which can both encourage and discourage long-term investment. Another factor that influences the investment policy of insurance companies is the type of insurance offered (life, non-life). Non-life insurers prefer to maintain a high degree of liquidity in the investments they hold, as claims can occur within a short period of time (from the conclusion of the contract). Life insurance, on the other hand, is dominated by long-term, less liquid assets, where a 'buy and hold' strategy is most often applied.

The question of the substance of investment activities was also addressed by Hao, Li and Yang (2022). They stated that insurance companies are an important institutional investor playing a vital role in the sustainable development of the capital market, and national policies should properly guide their investment structure. At the same time, the supervision of insurance companies should be strengthened in order to prevent the risks associated with speculative trading.

A key tool in analysing the profitability of insurance companies' investment activities is indicator analysis. Kopczyńska (2000) believes that indicator analysis makes it possible to systematically assess the financial situation in terms of the current and forecast financial performance. On the other hand, based on her research, Mioduchowska-Jaroszewicz (2012), concluded that the financial indicators used to assess the situation of insurance companies must take into account the specifics of the insurance business. This is due to the fact that sectoral indicators used in general for all sectors can be easily manipulated, falsified or errors can be committed in relation to insurance, since the insurer's report does not include many of the items that make up the formula of the indicators (for example, sales revenues, short-term liabilities, long-term liabilities, trade receivables or trade payables). A proposal for indicators to assess the financial situation was proposed by, among others: Monkiewicz, Gąsiorkiewicz, Hadyniak (2000). On the other hand, recommendations in this regard are provided on an ongoing basis by the Financial Supervisory Commission. According to Janowicz-Lomott, Spigarska et al. (2020), an insurance company uses the following groups of indicators to assess its activities:

- Profitability indicators.
- Performance indicators.
- Correlation indicators.

Research that indicates the relationship between individual financial indicators has been carried out by a number of foreign researchers. For example, Aktas and Ünal (2015) studying the Turkish market found that there is a statistically significant relationship between insurance companies' performance indicators and share price. Their study covered the period from 2005Q1 to 2012Q4 and involved seven insurance companies whose shares were traded on Borsa Istanbul during the sample period.

On the other hand, Abidin and Cabanda (2011) studying non-life insurance companies in Indonesia between 2005 and 2007 found that, based on the use of DEA (Data Envelopment Analysis), large insurance companies are more efficient when compared to small ones. They also stated that there were significant relationships between net premiums (NPM) and performance, while there was no significant relationship between premiums and ROA and ROE indicators.

In the case of Bangladesh, Siddik, Hosen et al. (2022), using panel data from 2011-2019, studied the relationship between non-life insurance company insolvency and profitability. Based on the results, the insolvency of insurance companies has a noticeable negative impact on their profitability. It was also stated that there were relationships between leverage and

profitability as well as between profitability and the age of the insurance company. It was noted that insurance companies are less sensitive to market changes as they age and that inflation negatively affects profitability (a significant negative impact was found).

Panel data models were also used by Morara and Sibind (2021) when analysing insurance companies in Kenya. 37 non-life and 16 life insurance companies were analysed between 2009 and 2018 to determine what factors impact their financial performance. Based on the research carried out, it was concluded that there was a positive relationship between the size of the insurance company and the profits made. On the other hand, as in the case of Bangladesh, financial performance is negatively correlated with the age of the insurance company. It was also noted that insurance companies with a high leverage indicator perform better than those with a low indicator. Panel data and the pooled ordinary least squares, fixed effects and random effects models were used for estimation.

On the other hand, the US and UK markets were analysed by Batool and Suhi (2019). For the study, they used quarterly data from 24 insurance companies between 2007 and 2016 and panel data models. The size of the insurance firm, liquidity, leverage and asset turnover as well as factors such as GDP (Gross Domestic Product), CPI (Cost per Impression), interest rate and WTI (West Texas Intermediate) were used as explanatory variables. The selected dependent variables were ROA (Return on Assets) and ROE (Return on Equity). The authors stated that in the US, significant factors were the size of the insurance firm, liquidity, leverage, asset turnover, GDP and WTI (positive impact) and CPI and interest rate (negative impact). On the UK market statistically significant were size of the insurance firm, liquidity, GDP, CPI and WTI (positive impact) and leverage, asset turnover and interest rate (negative impact).

The literature cited above points to a research gap in the analysis of combined results for more than one country. Hence, the proposed analysis of insurance companies of the Visegrad Group countries partially fills the gap.

3. Data and methodology

The empirical analysis covers annual data on the activities of insurance companies operating in the countries of the Visegrad Group in 2013-2020. They were obtained from the Orbis database. The Gretl program was used to estimate the proposed models and calculations. The research sample covered life insurance companies and non-life insurance companies separately. The number of insurance companies in the analysed countries is shown in Table 1.

Table 1.
Number of analysed insurance companies

Country	Life insurance	Non-life insurance
Czechia	3	13
Hungary	5	8
Poland	11	9
Slovakia	2	1
Total	21	31

Source: own presentation based on the data from Orbis database.

The proposed panel data model, describing the level of investment in individual insurance companies, takes the form of:

$$TI_{it} = \alpha_0 + \alpha_1 GPW_{it} + \alpha_2 PAT_{it} + \alpha_3 ROE_{it} + \alpha_4 ROA_{it} + \alpha_5 SR_{it} + \xi_{it} \quad (1)$$

where the endogenous variable is the total investment TI_{it} in the insurance company i-th in the year t. All regressors were selected on the basis of the literature. In this case, they are: gross premium written (GPW), profit/loss after tax (PAT), return on equity (ROE), return on assets (ROA) and solvency ratio (SR). The variables TI, GPW and PAT used for modelling were given in Euro, while the ratios ROE, ROA and SR were expressed as percentages. Structural parameters are denoted by $\alpha_0, \alpha_1, \ldots, \alpha_5$ and ξ_{it} is the error term. The proposed model has been assessed separately for life insurance companies and non-life ones. The data for each group formed an unbalanced panel. Then, applying the diagnostic tests the type of the model that the type of model that best describes the investment level of the analyzed insurance companies was selected.

4. Empirical results

In the first step of the empirical analysis, the correlations between the selected factors describing the level of investment and that level were examined. The results for life insurance companies and non-life insurance company are presented in Table 2.

Table 2.
Correlations between selected factors for analysed insurance companies

Life insurance companies						
Variable	**TI**	**GPW**	**PAT**	**ROE**	**ROA**	**SR**
TI	1	0.9628*	0.9505*	0.3342*	0.0581	-0.2554*
GPW		1	0.9557*	0.2461*	0.5591*	-0.0872
PAT			1	0.3064*	0.1871*	-0.0858
ROE				1	0.2162*	-0.1920*
ROA					1	0.5658*
SR						1

Cont. table 2.

Non-life insurance companies						
Variable	**TI**	**GPW**	**PAT**	**ROE**	**ROA**	**SR**
TI	1	0.9057*	0.3353*	-0.0256	-0.1029	-0.2550*
GPW		1	0.6178*	0.0477	0.0587	-0.2440*
PAT			1	0.3339*	0.4136*	-0.0412
ROE				1	0.5093*	-0.1813*
ROA					1	0.0449
SR						1

*) statistically significant at 5% significance level.

Source: own calculation based on the data from Orbis database in Gretl program.

We can notice significant relationships between the investment level and almost all selected factors (except ROA) and between pairs of selected factors for life insurance companies. In the case of non-life insurance companies the investment level is correlated with the gross premium written, profit after tax and solvency ratio. Also, some of the pairs of variables are significantly correlated.

Then the proposed model 1 was estimated, for all companies from all selected countries of the Visegrad Group that constituted one panel. Results, presented in the Table 3, show that the fixed effects model in the one that best describes the level of investment for both, life and non-life insurance companies. The positive, significant influence for life companies have gross premium written and profit after tax. In the case of the non-life insurance only the gross premium written significantly influences the level of investment.

Table 3.
Estimates of the total investment model as well as statistics of the tests for all the companies in all countries in 2013-2020

Variable	**Life companies model**		**Non-life companies model**	
	pooled model	**fixed effects**	**pooled model**	**fixed effects**
constant	369624***	655554***	-10897.5	51703.2***
GPW	1.7191***	1.2023***	2.2440***	1.4958***
PAT	8.0874***	3.3818***	-5.3072***	
ROE	3282.06**		932.4760**	
ROA	7072.64		-4023.87**	
SR	-7336.07***		438.108	
Joint significance test	99.8664#		70.4032#	
Breusch-Pagan test	112.2570#		138.0150#	
Hausman test	41.7116#		177.9650#	

*) **) ***) statistically significant at the level of 0.1, 0.05 and 0.01 respectively.
#) the null hypothesis is rejected at 0.05 significance level.

Source: own estimation using the Gretl package.

In the next step, the country effects were analysed. First, omitting the effect in Slovak companies, as they constitute the smallest number of companies in the samples, and then omitting the constant in the model. Results are given in Table 4. As we can see the life companies show the country effects, while non-life ones not. In such cases the fixed effects models showed to be more appropriate for modelling the investment level.

Table 4.
Estimates of the total investment model as well as statistics of the tests for all the companies in all countries, including country effects in 2013-2020

Variable	Life companies model		Non-life companies model	
	pooled model	pooled model	pooled model	pooled model
constant	405032***		-16448.4	
GPW	1.6871***	1.6871***	2.2629***	2.2629***
PAT	8.2520***	8.2520***	-5.1629***	-5.1629***
ROE	2292.80	2292.80	790.3150**	790.3150**
ROA	7078.67	7078.67	-3203.34	-3203.34
SR	-7014.49**	-7014.49**	177.635	177.637
Czechia	94857.4	499889**	38534.5	22086.1
Hungary	-69536.7	335495***	228.260	-16220.1
Poland	817.127	405849***	-18438.0	-34886.4
Slovakia		405032***		-16448.4
Joint significance test	119.851#		76.0285#	
Breusch-Pagan test	117.195#		146.813#	
Hausman test	45.7606#		152.816#	

*) **) ***) statistically significant at the level of 0.1, 0.05 and 0.01 respectively.
#) the null hypothesis is rejected at 0.05 significance level.

Source: own estimation using the Gretl package.

Finally, the model was estimated for each country companies separately. Results of estimations for life companies are given in the Table 5 and for non-life insurance companies in the Table 6.

Table 5.
Estimates of the total investment model as well as statistics of the tests for life insurance companies from countries separately in 2013-2020

Variable	Czechia	Hungary	Poland	Slovakia
	pooled model	pooled model	fixed effects	fixed effects
constant	-43563.9	33936.4	1279630***	450610***
GPW	5.2250***	3.2255***	0.8187***	1.7087**
PAT		45.7089***	3.0172***	32.0585*
ROE		-8941.70**	15500.7*	
ROA	1714.18***		-102239*	-175997**
SR	27314.4**		-16095.9*	
Joint significance test			84.8216#	
Breusch-Pagan test			28.3159#	
Hausman test			74.4752#	

*) **) ***) statistically significant at the level of 0.1, 0.05 and 0.01 respectively.
#) the null hypothesis is rejected at 0.05 significance level.

Source: own estimation using the Gretl package.

Table 6.
Estimates of the total investment model as well as statistics of the tests for non-life insurance companies from countries separately in 2013-2020

Variable	Czechia	Hungary	Poland	Slovakia[1]
	fixed effects	fixed effects	fixed effects	fixed effects
constant	88163.9***	-5002.95	135593***	
GPW	0.9858***	1.2263***	0.9027***	
PAT	-0.2342***		5.2151***	
ROE				
ROA		-578.744***		
SR		193.812**		
Joint significance test	634.007#	9.9315#	4.7962#	
Breusch-Pagan test		24.6010#	1.4708	
Hausman test	9094.88#	9.5789#	28.4601#	

*) **) ***) statistically significant at the level of 0.1, 0.05 and 0.01 respectively.
#) the null hypothesis is rejected at 0.05 significance level.
[1]) for Slovakia only one company was analysed that caused not enough degree of freedom to estimate the model.

Source: own estimation using the Gretl package.

As we can see for companies of all countries the gross premium written is the significant factor that influence the investment. Such relationship is positive. You can also see the influence of different factors in different countries. Diagnostic tests allowed for the selection of appropriate models. Usually, as the most relevant one, turned out to be the fixed effect model.

5. Conclusions

The analysis carried out has shown that it is possible to identify factors influencing the level of investment by insurance companies. They are different for life insurance companies and non-life insurance companies. Taking the performance of insurance companies together, it can be seen that the investment level of life insurance companies is mainly influenced by the gross premium written and profit/loss after tax, while non-life insurance companies are only influenced by gross premium written. Fixed effects models proved to be the best. The obtained results fit into the identified research gap, i.e. they were allowed to draw conclusions regarding insurance companies of the Visegrad group.

Taking into account country specificities and selecting the best of the estimated models, country effects were also noted. The common factor having a significant impact on the level of investment was again found to be the gross premiums written. This means that the higher the premium, the higher the level of investment for each type of insurance and in each of the countries analysed. Profit/loss after tax significantly affects the investment levels of life insurance companies in Hungary, Poland and Slovakia. On the other hand property insurance: for companies in Czechia and Poland. ROE proved to be significant only for life insurance companies in Hungary and Poland. On the other hand, ROA significantly influences the investment level of life insurance companies in Czechia, Poland and Slovakia, while for non-

life insurance companies only for Hungarian companies. When it comes to the last factor, namely the solvency indicator, it was noted to be significant for Czech and Polish insurers, while for non-life insurers only for Hungary. It can therefore be concluded that the research hypothesis established in the introduction has been confirmed. Furthermore, the results obtained confirm the conclusions of other authors of research carried out in other markets, cited earlier in this article. The article's contribution to the development of science also results from the use of panel data and panel estimations used to describe the financial dependencies of insurance companies, as well as the comparison of results by type of activity of these companies and the country of operation.

The conclusions from the audit may be used to make economic decisions for the stakeholders of insurance companies and supervisory authorities in order to assess the activities of the audited entities.

The analyses carried out can contribute to improving the efficiency of insurance companies and provide managers with useful information for making investment-related decisions.

References

1. Abidin, Z., Cabanda, E. (2011). Efficiency of non-life insurance in Indonesia, *Journal of Economics, Business and Accountancy Ventura*, *Vol. 14, No. 3, December 2011*, pp. 197-202. Accreditation No. 110/DIKTI/Kep/2009.
2. Act of 11 September 2015 on insurance and reinsurance activity. Journal of Laws 2015, Item 1844 as amended.
3. Aktas, R., Seyfettin Ünal, S. (2015). The Relationship Between Financial Efficiency Ratios and Stock Prices: an Empirical Investigation on Insurance Companies Listed in Borsa Istanbul. *Finansal Araştırmalar ve Çalışmalar Dergisi, Cilt 7, Sayı 12, Ocak,* ISSN 1309-1123, pp. 1-16, DOI: 10.14784/jfrs.53994.
4. Batool, A, Sahi, A. (2019). Determinants of Financial Performance of Insurance Companies of USA and UK during Global Financial Crisis (2007-2016). *International Journal of Accounting Research, 7, 194*. doi: 10.35248/2472-114X.19.7.194.
5. Directive 2009/138/EC of the European Parliament and of the Council of 25 November 2009 on the taking-up and pursuit of the business of Insurance and Reinsurance (Solvency II) Official Journal of the European Union L 335/1.
6. Gründl, H., Dong, M., Gal, J. (2016). The evolution of insurer portfolio investment strategies for long-term investing. *OECD Journal: Financial Market Trends, Vol. 2016, Iss. 1*. OECD.
7. Hao, F., Li, B., Yang, J. (2022). The impact of insurance company participation on the capital market's sustainable development - empirical evidence based on investor sentiment

and stock price synchronicity. *Front. Environ. Sci., 10, 1072094*. doi: 10.3389/fenvs.2022. 1072094.

8. Janowicz-Lomott, M., Spigarska, E., Dąbrowski, I., Łyskawa, K. (2020). *Insurance Finance*. University of Gdansk, ISBN: 978-83-8206-224-3.
9. Jędrzychowska, A., Poprawska, E. (2008). Location politics of life insurance companies. *Studies and Works of the Economic and Management Sciences Department, 10.* University of Szczecin.
10. Kopczynska, L. (2000). How to read the financial statements of insurance companies. *Controlling and Management Accounting in a Company, 1*.
11. Lament, M. (2013). *Insurance company solvency assessment and the accounting information system*. CeDeWu. Warsaw.
12. *Management system guidelines.* EIOPA-BoS-14/253 PL. Westhafen Tower, Westhafenplatz 1 - 60327 Frankfurt, Germany.
13. Mioduchowska-Jaroszewicz, E. (2012). Indicators for assessing the financial position of insurers versus sectoral comparisons. *Theoretical Accounting Books, vol. 65(121).* Warsaw: SKwP, pp. 19-44.
14. Monkiewicz, J., Gąsiorkiewicz, L., Hadyniak, B. (2000), *Managing insurance finance.* Warsaw: Poltext.
15. Morara, K., Sibindi, B. (2021). Determinants of Financial Performance of Insurance Companies: Empirical Evidence Using Kenyan Data. *Journal of Risk and Financial Management, 14, 566*. https://doi.org/ 10.3390/jrfm14120566.
16. Siddik, A.L,, Hosen, E., Miah, F., Kabiraj, S., Joghee, S., Swamynathan Ramakrishnan, S. (2022). Impacts of Insurers' Financial Insolvency on Non-Life Insurance Companies' Profitability: Evidence from Bangladesh. *International Journal of Financial Studies, 10, 80*. https://doi.org/10.3390/ijfs10030080.
17. Wieczorek-Bartczak, D. (2017). The prudent investor principle as a basis for new regulation of the investment activities of insurance companies. *Assurance Law, 1(90).*