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## Business Model Impact on the Financial Efficiency of Insurance Companies

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**Abstract:**

**Purpose:** The aim of the article is to examine the impact of the business model on the financial efficiency of insurance companies.

**Design/Methodology/Approach:** A critical review of literature is undertaken, contents of factors which influence business models of insurance companies are analysed, and econometric methods are applied. A panel model is constructed and results of its estimation are analysed. Insurance companies have been shared according to their business models into life insurance companies and non-life insurance companies. ROE (Return On Equity) was adopted as the dependent variable (explained feature) measuring the financial efficiency of insurance companies. The models explain efficiency of insurance companies measures by ROE as dependent on thirteen independent variables.

**Findings:** The research assumed the existence of a relationship between the business model of insurance companies and its financial efficiency. The results indicated that the variability of ROE is dependent by business model of insurance company. Factors of financial efficiency are different for life insurance companies and for non-life insurance companies.

**Practical Implications:** The results may be taken advantage of insurance companies. They indicated factors of financial efficiency of insurance companies in sharing into life insurance companies and non-life insurance companies.

**Originality/Value:** The paper contains the authors' original research into a representative group of insurance companies, which can be generalised to the entity population. The study will contribute to the development of theories concerning factors of the financial efficiency of insurance companies.

**Keywords:** Insurance market, life insurance companies, non-life insurance companies, efficiency of insurance companies.

**JEL codes:** G22, G32, M21.

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## **1. Introduction**

Studies on the profitability and financial efficiency of insurance companies are usually divided into two categories. The first study focuses on the profitability of life insurance companies, while another study focuses on the profitability of non-life insurance companies (Pjanić *et al.*, 335). It means that the scope of activity and different risk profiles affect financial results. This is confirmed by the principles of the supervisory assessment of KNF (2020) conducted by the Polish Financial Supervision Authority, as well as the research conducted by Geneva Association (2010) on risk profiles in insurance and as well as the research on the impact of risk profiles on the financial results of insurance companies (Lament, 2019; Bukowski and Lament, 2020; 2021a; 2021b).

Research in the literature on the subject shows that the financial efficiency of insurance companies is tested separately for life insurance companies and for non-life insurance companies. To examine the impact of business model on the efficiency of insurance companies, the research should be performed on a group of businesses from the same market, shared into life insurance companies and non-life insurance companies. It is the main author's aim. Research results will indicate various factors determining the financial efficiency of insurance companies, depending on the business model.

The aim of the article is to examine the impact of the business model on the financial efficiency of insurance companies. In connection with the goal defined in this way, the following research question was formulated: Is there a relationship between business model of insurance companies and their financial efficiency?

In search of an answer to the research question, the literature on the subject in the field of business model in insurance companies was reviewed, and an analysis based on econometric modeling was carried out. For this purpose, a balanced panel model was constructed. Model was estimated separately for life insurance companies and for non-life insurance companies.

The empirical research used annual financial data on the results of insurance companies operating in Poland in the years 2004-2019, from the database of the Polish Chamber of Insurance (PIU). The research was carried out using the STATISTICA 13 and GRET software.

The formulated goal and the research problem determined the structure of the article. It consists of three main parts. In the first part, the literature contents of factors which influence business models of insurance companies are analysed. The second part describes the methodology of the conducted research. The third part presents the results of own research and compared them to other research in this field.

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## 2. Literature Review

Between the insurance companies of branch I (life insurance company) and branch II (non-life insurance company) there are many differences and specificity of the insurance products offered affect the principles of financial management and the financial result of insurance companies (Lament, 2019; Bukowski and Lament, 2021a). Life insurance companies, as entities concluding long-term contracts are obliged to achieve a certain rate of return on investments, are more exposed to financial risk, expressed in the form of market and credit risk. This risk is mainly related to assets and is related to the management of the investment portfolio (Doan, 1998; Williams *et al.*, 2002; Stroiński, 2003). The subject of insurance in branch I is protection against the financial consequences of the insured's death or reaching a certain age, as well as deposit activity, where the value of the benefit depends on the savings accumulated on the insured's account.

Non-life insurance companies conclude short-term contracts and they are most exposed to insurance risk. The effects of contracts are more difficult to forecast than in life insurance. Additionally, their financial results depend mainly on the degree of implementation of insurance contracts (loss ratio). The subject of insurance in branch II are the property interest in the form of property and property rights as well as other personal insurance (Williams *et al.*, 2002; Borda, 2006). This means that the main factor differentiating business model of insurance company is the insurance activity and the related subject of insurance, as well as the specificity of the offered insurance products.

In the literature we are various factors that impact the performance of insurance companies (Mutairi *et al.*, 2021; Cristea and Thalassinou, 2016). Studies on the financial efficiency of insurance companies are usually divided into two categories: life insurance companies and into non-life insurance companies. Research for non-life insurance companies was carried out by:

- Isik (2021), research Turkish insurers. The results show that ROA is significantly affected by the variables such as debt ratio, premium retention ratio, listed status, and growth of total assets are significant factors that determine the profitability of domestic-owned companies. The factors affecting the profitability of foreign-owned insurers are company size, debt ratio, underwriting risk, premium retention ratio, listed status, and company age, respectively.
- Killins (2020), research Canadian insurers. The results show that ROA and ROE are significantly affected by the variables such as size, liquidity, capital ratio, industry concentration, equity market returns, and GDP growth.
- Batool and Sahi (2019), research the US and the UK insurance companies. Determinants that influence the profitability of the companies in the insurance sector of both countries are similar.

- Pjanić *et al.* (2018), research Serbian insurers. The results show that ROA is significantly affected by the variables such as profit growth, equity ratio, operating costs, premium growth, underwriting risk, and size.
- Kramaric *et al.* (2017), research insurance companies from four CEE (Central and Eastern European) - Croatia, Slovenia, Hungary and Poland. The results show that ROA and ROE are significantly affected by the variables such as age and gross domestic product (GDP) growth.
- Kaya (2015), research Turkish insurers. The results show that Technical Profitability Ratio and Sales Profitability Ratio are significantly affected by the variables such as the size of the company, age of the company, loss ratio, current ratio, and premium growth rate.

Research for life insurance companies was carried out by:

- Bukowski and Lament (2021a), research Polish insurers. The results show that ROE is significantly affected by the variables such as share in the insurance market, measured by the gross written premium, retention ratio and combined ratio.
- Chen and Wan (2014), research Taiwan insurers. The results show that corporate image is significantly affected by the variables such as underwriting and financial operations.
- Bawa and Chattha (2013), research Indian insurers. The results show that ROA is significantly affected by the variables such as liquidity and size and capital.
- Charumathi (2012), research Indian insurers. The results show that ROA is significantly affected by the variables such as liquidity and size of the company (positive impact) and equity capital, leverage and premium growth (negative impact).
- Ahmed *et al.* (2011), research Pakistan insurers. The results show that ROA is significantly affected by the variables such as growth, profitability, age and liquidity.

Research in the literature on the subject shows that the financial efficiency of insurance companies is tested separately for life insurance companies and for non-life insurance companies. The obtained research results indicate various factors determining the financial efficiency of insurance companies, depending on the business model. Therefore the following research hypothesis was formulated: business model of insurance companies influences their financial efficiency.

### **3. Data and Methods**

Annual financial figures of insurance companies operating in the Polish market in 2004-2019, collected by the Polish Chamber of Insurance (PIU), are utilised in this study. Selection of the insurance companies to study is purposive. Insurance companies active in the entire time surveyed are chosen. Thus, insurance companies

that commenced or discontinued their activities in those years are not taken into consideration. The insurance companies examined are characterised in Table 1.

**Table 1.** Characteristics of the insurance companies studied of the Polish insurance market in 2004-2019

Specification	Insurance companies studied	Insurance companies studied by businesses models (branches)	
		Life insurance (Branch I)	Non-life insurance (Branch II)
Number of insurance companies	43	20	23
Structure (%)	100.0	46.5	53.5

**Source:** The authors' own research on the basis of PIU. Database, <https://ibd.piu.org.pl> (Access: 10.09.2021).

Table 2 presents the share of the studied insurance companies in the total number of insurance companies operating on the Polish insurance market in 2004-2019.

**Table 2.** Share of insurance companies studied in the total number of insurance companies of the Polish insurance market in 2004-2019

Specification	Years															
	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19
Number of insurance companies in the Polish insurance market																
Total	79	68	68	69	65	66	65	61	59	58	56	57	61	61	60	59
By businesses models:																
Life insurance companies (Branch I)	37	31	32	32	29	30	30	28	28	27	26	27	27	27	26	25
Non-life insurance companies (Branch II)	42	42	36	37	36	36	35	33	31	31	30	30	34	34	34	34
Share of insurance companies studied in the total number of insurance companies (%)																
In total	54.4	63.2	63.2	62.3	66.1	65.1	66.1	70.5	72.9	74.1	76.8	75.4	70.5	70.5	71.7	72.9
By businesses models:																
Life insurance companies (Branch I)	54.1	64.5	62.5	62.5	68.9	66.7	66.7	71.4	71.4	74.1	76.9	74.1	74.1	74.1	76.9	80.0
Non-life insurance companies (Branch II)	54.8	54.8	63.9	62.2	63.9	63.9	65.7	69.7	74.2	74.2	76.7	76.7	67.6	67.6	67.6	67.6

**Source:** The authors' own research on the basis of PIU. Database, <https://ibd.piu.org.pl> (Access: 10.09.2021).

The assessment of the share of insurance companies studied in the total number of insurance companies of Polish insurance market in 2004-2019 shows that the number of insurance companies that were assessed corresponds to 54.4% to 80% of insurance companies operating in a given year. In relation to insurance companies operating in branch I - life insurance - the number of insurance companies that were assessed corresponds to 54.1% to 80% of insurance companies operating in a given year. In relation to insurance companies operating in branch II - non-life insurance - the number of insurance companies that were assessed corresponds to 54.8% to 76.7% of insurance companies operating in a given year. Therefore, it can be assumed that the surveyed insurance companies constitute a representative sample, and the results of the conducted research can be generalized to all insurance companies operating on the Polish insurance market.

The aim of the research undertaken is to assess the impact of business model on the financial efficiency of insurance companies from the Polish insurance market.

Insurance companies have been shared according to their business models into life insurance companies and non-life insurance companies. To achieve the research goal, an econometric model was constructed. The return on equity (ROE) was adopted as the dependent variable (explained feature) representing financial efficiency. The model explains effectiveness of insurance companies measures by:

ROE as dependent on thirteen independent variables:

RG – gross financial result

RN – net financial result

TR – technical insurance result

ROA – return on assets

ROS – return on sales

DS – income of policyholder’s dynamics

DR – dynamics of technical provisions

DI – dynamics of investments

RR – retention ratio

LR – nett loss ratio

RI – profitability of investments

AC – share of acquisition costs in gross written premium

CR – combined ratio.

The methods of calculating these variables are presented in Table 3.

**Table 3.** *Methods of calculating the variables analysed*

Variable	Variable designation	Method of calculating the variable
Gross financial result	$RG_{i,t}$	Total revenues – total costs
Net financial result	$RN_{i,t}$	Gross financial result – corporate income tax
Technical insurance result	$TR_{i,t}$	Technical insurance revenues – technical insurance costs
ROE	$ROE_{i,t}$	Net profit * 100/ Equity
ROA	$ROA_{i,t}$	Net profit * 100/ Assets
ROS	$ROS_{i,t}$	Net profit * 100/ Gross written premium
Income of policyholder’s dynamics	$DS_{i,t}$	Gross written premium in the current year * 100/ Gross written premium in the past year
Dynamics of technical provisions	$DR_{i,t}$	Technical provisions in the current year * 100/ Technical provisions in the past year
Dynamics of investments	$DI_{i,t}$	Investments in the current year * 100/ Investments in the past year
Retention ratio	$RR_{i,t}$	Written premium net of reinsurance * 100/ Gross written premium
Net loss ratio	$LR_{i,t}$	(Claims and benefits paid net of reinsurance +/- Change in provisions against outstanding claims and benefits net of reinsurance) * 100/ Earned premium net of reinsurance

Profitability of investments	$RI_{i,t}$	Profit of investments*100/Investments
Share of acquisition costs in gross written premium	$AC_{i,t}$	Acquisition costs * 100 / Gross written premium
Combined ratio	$CR_{i,t}$	(Claims paid net of reinsurance + costs of insurance activities net of reinsurance + other technical costs net of reinsurance + dividend paid) * 100/ Earned premium net of reinsurance

*Source: The author's own compilation.*

Key descriptive statistics that characterise the variables are shown in Table 4.

**Table 4.** Basic statistics concerning the variables studied in insurance companies of the Polish insurance market in 2004-2019

Variables	Average	Median	Minimum	Maximum	Variance	Standard deviation
ROE	0.071971	0.082000	-2.34100	0.653000	0.047530	0.218014
RG	15747	8644.500	-300114	5402319	3.142640E+11	560592.6
RN	134349.4	6859.000	-203492	5106345	2.438884E+11	493850.6
TR	89188.90	4090.000	-267169	2987965	1.119821E+11	334637.3
ROA	0.018826	0.015000	-0.470000	5.614000	0.050402	0.224503
ROS	-0.03385	0.031500	-31.0000	2.749000	1.509636	1.228672
DS	1.379952	1.073000	0.158000	72.10000	12.16143	3.487324
DR	1.860487	1.096000	0.479000	316.5000	161.0687	12.69128
DI	1.146126	1.087500	0.520000	5.094000	0.101825	0.319100
RR	0.851926	0.958500	0.066000	1.090000	0.041837	0.204542
LR	0.673663	0.586500	0.00	48.83200	3.645954	1.909438
RI	0.046089	0.044000	-0.093000	0.530000	0.001246	0.035305
AC	0.522347	0.212500	0.00	179.0000	46.50179	6.819222
CR	1.050938	0.946000	-0.245000	15.31700	0.844288	0.918851

*Source: The authors' own research on STATISTICA 13.*

**Explanation:**

ROE – return on equity

RG – gross financial result

RN – net financial result

TR – technical insurance result

ROA – return on assets

ROS – return on sale

DS – income of policyholder's dynamics

DR – dynamics of technical provisions

DI – dynamics of investments

RR – retention ratio

LR – nett loss ratio

RI – profitability of investments

AC – share of acquisition costs in gross written premium

CR – combined ratio.

#### 4. Model and Empirical Results

After analysing the data, the backward stepwise regression method was used, eliminating statistically insignificant predictors and collinearity. On this basis, we have built following panel data model for purpose of verification hypothesis:

$$ROE_{i,t} = a_1 + a_2TR_{i,t} + a_3ROA_{i,t} + a_4RR_{i,t} + a_5RI_{i,t} + a_6CR_{i,t} + u_{i,t} \quad (1)$$

$ROE_{i,t}$  – return on equity

$TR_{i,t}$  – technical insurance result

$ROA_{i,t}$  – return on assets

$RR_{i,t}$  – retention ratio

$RI_{i,t}$  – profitability of investments

$CR_{i,t}$  – combined ratio.

The performed statistical tests showed that there is autocorrelation of residuals and heteroscedasticity. Therefore, we used Weighted Least Squares (WLS) a method of model's estimation. Results of the model estimation were prepared separately for life insurance companies and for non-life insurance companies. Results of the model estimation for life insurance companies are shown in Table 5.

**Table 5.** Model: WLS, using 320 observations. Included 20 cross-sectional units. Dependent variable: ROE. Weights based on per-unit error variances (Life insurance companies)

Specification	Coefficient	Std. Error	t-ratio	p-value	
Const.	-0.173246	0.121291	-1.428	0.1542	
ROA	0.0628458	0.0242614	2.590	0.0100	**
TR	1.42422e-07	1.80408e-08	7.894	<0.0001	***
RR	0.308137	0.121661	2.533	0.0118	**
RI	0.141333	0.131324	1.076	0.2827	
CR	-0.0596255	0.0112313	-5.309	<0.0001	***
Statistics based on the weighted data:					
Sum squared resid		306.5488	S.E. of regression		0.989641
R-squared		0.301882	Adjusted R-squared		0.288500
F(3, 313)		22.55810	P-value(F)		4.40e-22
Log-likelihood		-447.1893	Akaike criterion		908.3786
Schwarz criterion		934.7569	Hannan-Quinn		918.9119
Statistics based on the original data:					
Mean dependent var		0,114609	S.D. dependent var		0.189204
Sum squared resid		8,118809	S.E. of regression		0.161055

**Source:** Own research on GRETL.

**Explanation:**

\*\*\* The variable is significant at the significance level of 0.01,

\*\* The variable is significant at the significance level of 0.05,

\* The variable is significant at the significance level of 0.1.

The results in Table 5 are shown that all explanatory variables are statistically significant. The signs at the coefficients of the variables are consistent with the theory. The analysis of the model estimation results shows that the explanatory variables explain the variability of the dependent variable in 30%, taking into account the coefficient of determination, and in 28.85%, taking into account the adjusted coefficient of determination. Results of the model estimation for non-life insurance companies are shown in Table 6.

**Table 6.** Model: WLS, using 368 observations. Included 23 cross-sectional units. Dependent variable: ROE. Weights based on per-unit error variances (Non-life insurance companies)

Specification	Coefficient	Std. Error	t-ratio	p-value	
Const.	0.0301419	0.0116506	2.587	0.0101	**
ROA	2.50406	0.0603646	41.48	<0.0001	***
TR	1.64695e-08	1.76505e-08	0.9331	0.3514	
RR	0.00884047	0.00317354	2.786	0.0056	***
RI	0.166017	0.103676	1.601	0.1102	
CR	-0.0528153	0.0128325	-4.116	<0.0001	***
Statistics based on the weighted data:					
Sum squared resid		348.1083	S.E. of regression		0.981982
R-squared		0.853789	Adjusted R-squared		0.851359
F(3, 313)		351.3395	P-value(F)		2.3e-147
Log-likelihood		-511.9446	Akaike criterion		1037.889
Schwarz criterion		1065.246	Hannan-Quinn		1048.758
Statistics based on the original data:					
Mean dependent var		0.034894	S.D. dependent var		0.234294
Sum squared resid		7.977388	S.E. of regression		0.148654

**Source:** Own research on GRETL.

**Explanation:**

\*\*\* The variable is significant at the significance level of 0.01,

\*\* The variable is significant at the significance level of 0.05,

\* The variable is significant at the significance level of 0.1.

The results in Table 6 are shown that all explanatory variables are statistically significant except for the variables TR (technical insurance result) and RI (profitability of investments). The signs at the coefficients of the variables are consistent with the theory.

The analysis of the model estimation results shows that the explanatory variables explain the variability of the dependent variable in 85.37%, taking into account the determination coefficient and in 85.13%, taking into account the adjusted coefficient of determination.

## 5. Conclusion

The conducted research allowed for a positive verification of the formulated research hypothesis, business model of insurance companies influences their financial efficiency. This is confirmed by both the conducted literature research and own research covering insurance companies operating on the Polish insurance market in the years 2004-2019.

Literature on the financial efficiency of insurance companies are usually divided into two categories, life insurance companies (Bukowski and Lament, 2021a; Bawa and Chattha, 2013; Chen and Wan, 2014; Charumathi, 2012; Ahmed *et al.*, 2011) and into non-life insurance companies (Isik, 2021; Killins, 2020; Batool and Sahi, 2019; Batool and Sahi, 2019; Pjanić *et al.*, 2018; Kramaric *et al.*, 2017; Kaya, 2015). It shows that the financial efficiency of insurance companies is tested separately for life insurance companies and for non-life insurance companies.

Our own research shown that financial efficiency of life insurance company (branch I) affects ROA, technical insurance results (TR), retention ratio (RR) and combined ratio (CR). The financial efficiency of non-life insurance company (branch II) affects ROA, retention ratio (RR) and combined ratio (CR). This means that various variables influence the financial efficiency of insurance companies. The significance level of the variables are different too. It depends on business model of insurance companies. Its mean that business model of insurance companies influences their financial efficiency and hypothesis was positive verified. Further research should concern insurance markets other than Polish. This will be the subject of further research by the authors.

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