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.

**Paper type:** Research article.

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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). Its mean that the scope of activity and different risk profiles affects 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. For the 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 authors aim. Research results will have 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 GRETL 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.
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; Wiliams 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 Thalassinos, 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 | Number of insurance companies | Structure (%) |
|---------------|-------------------------------|---------------|
| Life insurance (Branch I) | 43 | 100.0 |
| Non-life insurance (Branch II) | 20 | 46.5 |
|                      | 23 | 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 | 88 | 88 | 69 | 65 | 66 | 65 | 64 | 59 | 58 | 56 | 56 | 57 | 61 | 64 | 60 | 59 |
| By businesses model: Life insurance companies (Branch I) | 37 | 31 | 32 | 32 | 29 | 30 | 28 | 28 | 27 | 26 | 27 | 27 | 27 | 26 | 25 | 25 | 25 | 25 |
| Non-life insurance companies (Branch II) | 42 | 42 | 36 | 37 | 36 | 36 | 35 | 33 | 31 | 30 | 30 | 35 | 34 | 34 | 34 | 34 | 34 | 34 |
| Share of insurance companies studied in the total number of insurance companies (%) | Total    | 54.4 | 63.2 | 63.2 | 62.5 | 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 model: 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 | 65.3 | 69.7 | 74.2 | 74.2 | 76.7 | 76.7 | 76.7 | 87.6 | 87.6 | 87.6 | 87.6 |

**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 designations | 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

| 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   | 3.142640E+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 | -0.031500| 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 author’s 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 – net loss ratio
RI – profitability of investments
AC – share of acquisition costs in gross written premium
CR – combined ratio.

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   | 3.142640E+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 | -0.031500| 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           |
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:

\[ \text{ROE}_{it} = \alpha_1 + \alpha_2 \text{TR}_{it} + \alpha_3 \text{ROA}_{it} + \alpha_4 \text{RR}_{it} + \alpha_5 \text{RI}_{it} + \alpha_6 \text{CR}_{it} + u_{it} \quad (1) \]

\( \text{ROE}_{it} \) – return on equity  
\( \text{TR}_{it} \) – technical insurance result  
\( \text{ROA}_{it} \) – return on assets  
\( \text{RR}_{it} \) – retention ratio  
\( \text{RI}_{it} \) – profitability of investments  
\( \text{CR}_{it} \) – 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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