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Non-life Insurance Market and Macroeconomic Indicators in Baltic States

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Abstract: Knowing that insurance market might be sensitive to economic evolutions, the aim of this paper is to investigate the effect of few macroeconomic indicators on non-life insurance market in the Baltic States in the period 1993-2020. The results based on panel data models and panel cointegration suggest a low impact of economic growth on non-life insurance market described by direct premium written, insurance density, insurance penetration for non-life segment. Expenditure on tertiary education has a more significant impact on non-life insurance market, while growth in unemployment rates reduces the development of this market. All in all, this study validates the hypothesis that people with higher education are more eager to buy insurance products. On the other hand, the development of this sector has not determined yet sustainable development of the Baltic economies.

Keywords: non-life insurance market, direct premium written, insurance density, insurance penetration

JEL Classification: C51, C53

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1. Introduction

Since the EU accession in 2004, the non-life insurance markets in Baltic States met many opportunities for growth. Wieczorek-Kosmala (2016) analyzed the performance of non-life insurance markets in more EU new member states, including Baltic countries. The author proved on empirical basis that the polarization of non-life markets between these states and the other EU countries decreased slowly. On the other hand, the concentration of non-life markets in Baltic States remained high, with a significant increase in Latvia and Lithuania in 2015 compared to 2004.

The insurance market in Baltic States is supervised and monitored by specific authorities: *Finantsinspektsioon* (Estonia), *Finanšu un kapitāla tirgus komisija* (Latvia) and *Lietuvos bankas* (Lithuania) (Zarina et al., 2018). The financial stability of insurance companies in Lithuania was analyzed by Linartas (2012) under Solvency I framework. However, there are not studies to highlight the impact of macroeconomic indicators on the non-life insurance market in the Baltic States. Previous studies have focused on a larger group of countries.

Curak et al. (2009) analyzed ten EU new member states, including Baltic States, before their accession to the European community, in the period 1992-2007 using fixed-effects models. The main findings indicated a positive impact of overall insurance market, life and non-life insurance segments on economic growth. The results are in line with the study of Arena (2008) for 55 countries in the period 1976-2004 when dynamic panel data models are used. Moreover, the author identified a causal relationship from insurance market development to economic growth. Moreover, Han et al. (2010) employed dynamic panel data models for 77 countries in the period 1994–2005 and drew few conclusions: insurance density has a positive impact on economic growth.

Wanat et al. (2016) analyzed ten EU new member states later, in the period 1993-2013, to assess the impact of insurance market on economic growth. The results based on bootstrap panel causality test indicated that only in Estonia the insurance market growth contributed to economic development, while no causality relationship was observed in Latvia and Lithuania.

Considering the gap in the literature that does not provide a separate study for Baltic States to analyze the impact of economic indicators on non-life insurance market, this paper focuses on the evolution of certain macroeconomic variables (economic growth, unemployment, income, expenditure on tertiary education) on non-life insurance market indicators (non-life direct premiums written, non-life insurance density, non-life insurance penetration) in the period 1993-2020.

2. Data and methodology

The macroeconomic variables considered in the models proposed for the Baltic States (Lithuania, Estonia and Latvia) are: non-life direct premiums written (DPW), non-life insurance density, non-life insurance penetration, expenditure on tertiary education (% of government expenditure on education), GDP (constant 2010 US$), net primary income in constant prices (2010=100), GINI index, according to World Bank estimate, and unemployment rate (% of total labour force) according to national estimate. The data for those indicators associated to insurance market (non-life DPW, non-life insurance density and non-life insurance penetration) are taken from World Statistics (http://www.sigma-explorer.com/index.html). The data for the rest of the

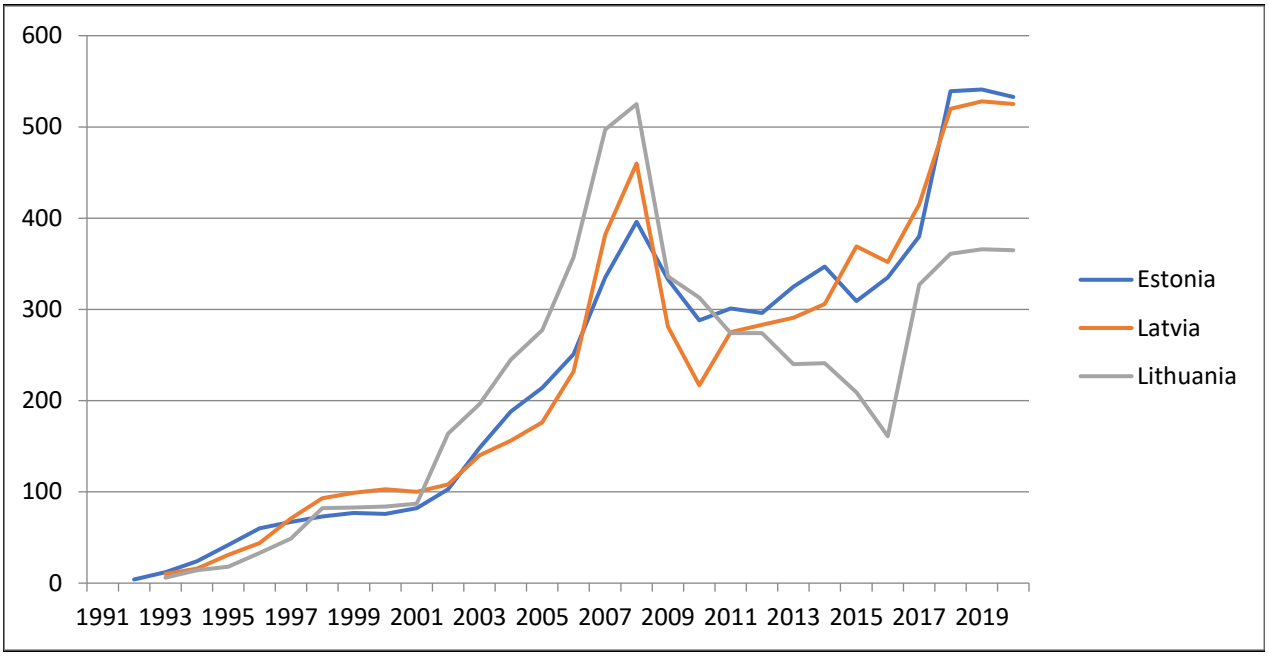
indicators are provided by Word Bank database (https://data.worldbank.org/). The data cover the period from 1993 to 2020.

The selection of the indicators associated to insurance market development is based on previous researches. Ul Din et al. (2017) described insurance market by three variables: insurance density, net written premiums, and penetration rate. The insurance market extension is described by insurance penetration in the studies of Curak et al. (2009), Han et al. (2010) and Dash et al. (2018).

Lee et al. (2018), Wanat et al. (2016), and Han et. al. (2010) employed insurance density to suggest the insurance market development. Insurance premiums reflect insurance activity and were used by Muye and Hassan (2016) and Arena (2008).

According to Figure 1, Estonia reported the most non-life DPW in the period 1993-1996 and in 2018. Lithuania was the leader in Baltic States according to DPW values in non-life insurance in the period 2002-2010 in the group of Baltic States. Latvia reported the most DPW in the period 1997-2001 and 2015-2017. The maximum value of non-life DPW in these countries was achieved by Estonia in 2019. However, in the context of the installation of global economic crisis, DPW suddenly dropped in all the countries in 2009.

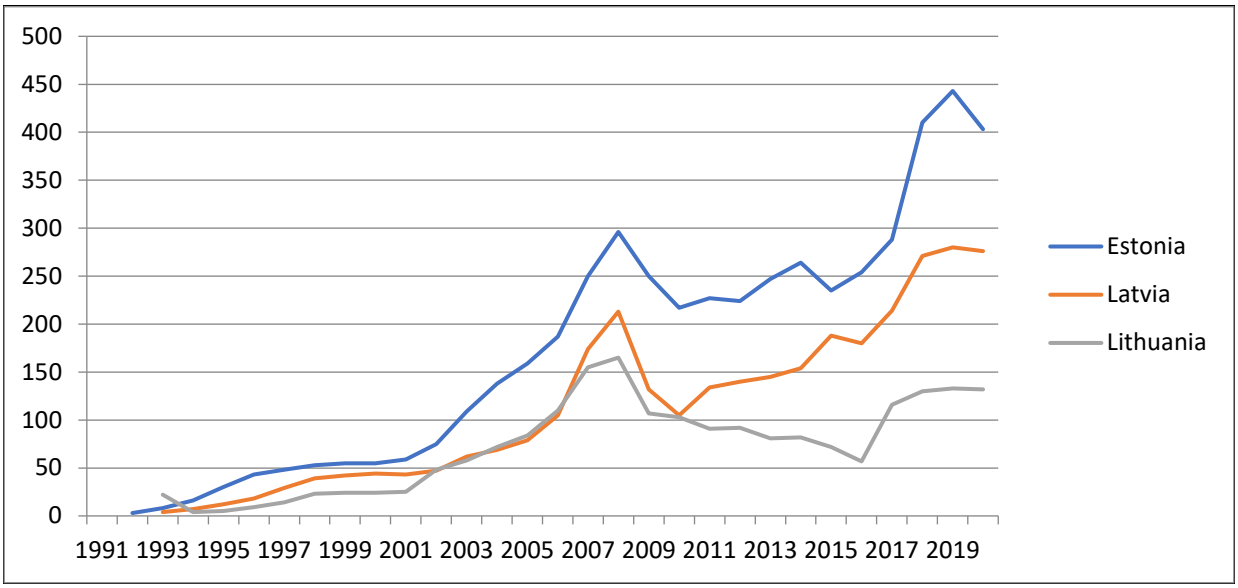
Figure 1. Non-life direct premiums written in the Baltic States in the period 1993-2020, in millions USD, constant prices



Source: Swiss Re Institute, 2021

According to Figure 2, Estonia reported the highest non-life insurance density in the period 1994-2020, outperforming the rest of the Baltic States. The maximum level of non-life insurance density was registered by this country in 2019. However, non-life insurance density dropped suddenly in this country starting with 2009.

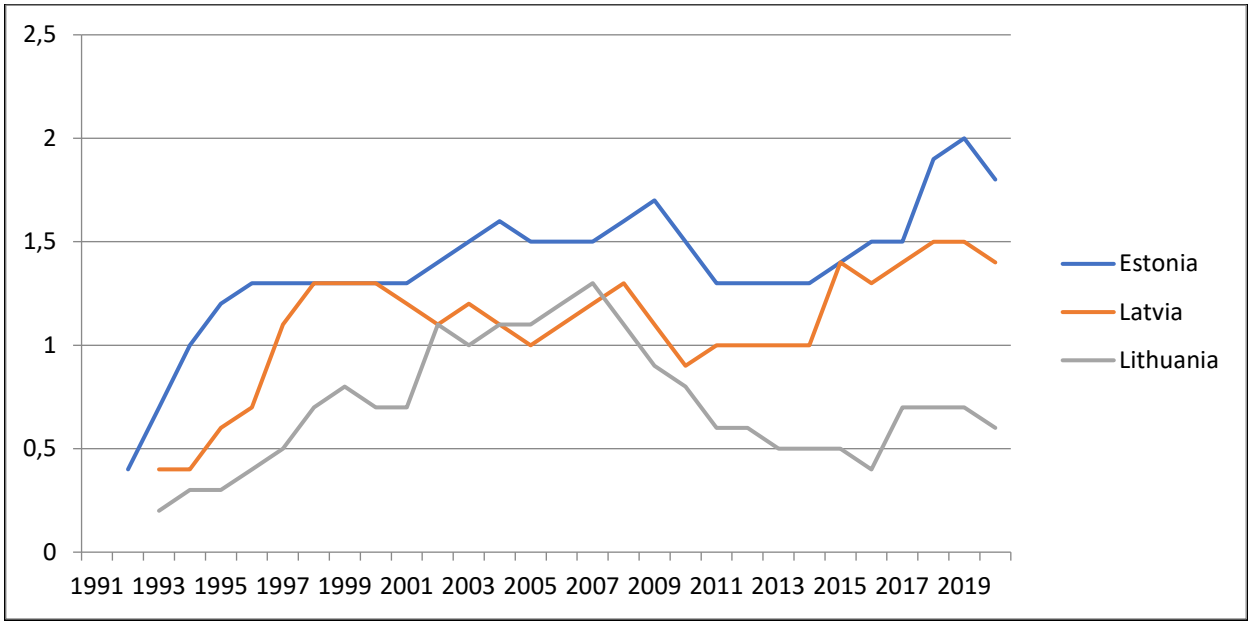
Figure 2. Non-life insurance density in the Baltic States in the period 1993-2020, USD, constant prices



Source: Swiss Re Institute, 2021

According to Figure 3, Estonia reported the highest non-life insurance penetration in 2007, before economic crisis start (0.8% of GDP). Latvia registered a very low variation of this indicator in the period 1993-2020, penetration varying between 0 and 0.2%.

Figure 3. Non-life insurance penetration in the Baltic countries in the period 1993-2020, in per cent



Source: Swiss Re Institute, 2021

The insurance market indicators are correlated with macroeconomic indicators that reflect economic activity (real GDP), level of education (expenditure on tertiary education), income and GINI index.

In this paper, panel data models are employed starting from stationary data series, respectively cointegrated data series. Few advantages recommend the use of panel data models: flexibility in modelling differences in behaviour associated to cross-sections and higher volume of data. Let us consider a basic framework with K regressors in x_{it}:

$$y_{it} = x'_{it} \cdot \beta + z'_i \cdot \alpha + \varepsilon_{it}$$

$$y_{it} = x'_{it} \cdot \beta + c_i + \varepsilon_{it}$$

ε_{it}- error
α, β- parameters
y_{it}- endogenous variable

The heterogeneity is included in the term $z'_i \cdot \alpha$. In this term, z_i consists in an intercept and group-specific variables that are constant in time. In case z_i is known for all cross-sections, the model becomes an ordinary least square model. For pooled regression, if z_i has only an intercept, OLS gives efficient and consistent estimates for slope vector β and α. If z_i is unobserved, β is inconsistent and biased, because of missing variable. The fixed effects model is represented as:

$$y_{it} = x'_{it} \cdot \beta + \alpha_i + \varepsilon_{it}$$

α_i- group-specific intercept
$\alpha_i = z'_i \cdot \alpha$ reflects observable effects

Pedroni Residual Cointegration Test uses Engle-Granger approach, checking for cointegration in panel data. Pedroni (2004) proposed tests for cointegration using trend parameters across cross-sections and heterogeneous intercepts. If x and y are integrated of order 1, we consider:

$$y_{i,t} = \alpha_i + \delta_i \cdot t + \beta_{1i} \cdot x_{1i,t} + \beta_{2i} \cdot x_{2i,t} + \cdots + \beta_{Mi} \cdot x_{Mi,t} + e_{i,t}$$

t=1,2,…,T; i=1,2,…,N; m=1,2,…,M.

δ_i- trend effects
α_i- individual effects

There are different methods of building statistics to check for null hypothesis of no cointegration. The standardized statistic of Pedroni test is asymptotically normally distributed.

3. Empirical analysis

The scope of analysing the connection between insurance market indicators and real economy starts from the hypothesis that changes in the national economies are reflected in the evolution of insurance sector. Some macroeconomic indicators might affect the insurance sector, but other ones have no influence. Therefore, an empirical analysis of the macroeconomic indicators that affect non-life insurance sector in Baltic States is necessary.

According to Levin-Lin-Chu (LLC) test, stationary data in level were detected for few variables at 10% level of significance: unemployment rate, GINI index and net primary income. For the rest of the variables we detected stationary data in the first difference.

The direct premiums written (DPW) in the first difference were explained using a POOLED regression model and a fixed effects model. After checking for redundant fixed effects model, we got that POOLED model is better than fixed effects model (statistic of the test =4.33, p-value=0.11). For POOLED regression model, Durbin-Watson statistic is close to 2 (DW=1.78), suggesting errors independence. White test indicates the errors are homoscedastic (p-value=0.231).

Table 1. POOLED regression model to explain the variation in non-life direct premiums written in the Baltic States (1993-2020)

Variable	Coefficient	t-statistic	P>|z|
GDP in first difference	$2.2 \cdot 10^{-3}$	6.95	0.000
Net primary income	$1.06 \cdot 10^{-3}$	2.25	0.000
Unemployment rate	-5.51	-4.56	0.000
Constant	60.75	3.97	0.0002

Source: own computations in EViews

According to regression model in Table 1 for non-life direct premiums written in the Baltic States, this variable is explained by real GDP absolute growth from one year to another, net primary income and unemployment rate. A very low and positive correlation between GDP growth and non-life DPW and between net primary income and non-life DPW. On the other hand, there is a strong and negative influence of unemployment rate on non-life DPW. The increase in unemployment rate by one percent determines a decrease in non-life DPW by 5.51 USD in constant prices. As expected, non-life DPW are sensitive to tensions on labour market reflected in unemployment intensification. The positive influence of GDP on DPW was also observed by Levine (1998), Arena (2008) and Christophersen and Jakubik (2014).

Knowing that GDP, expenditure on tertiary education and non-life DPW are integrated of order 1, cointegration relationship is checked using Pedroni test in more variants as Table 2 indicates.

Table 2. Pedroni Residual Cointegration Test between non-life DPW, expenditure on tertiary education and GDP in the Baltic States (1993-2020)

Pedroni test	**Statistic**	**p-value**
Panel v-Statistic	-0.577925	0.7183
Panel rho-Statistic	0.339668	0.6329
Panel PP-Statistic	0.031249	0.5125
Panel ADF-Statistic	-1.201047	0.1149
Weighted Panel v-Statistic	-0.763591	0.7774
Weighted Panel rho-Statistic	0.106963	0.5426
Weighted Panel PP-Statistic	-0.273546	0.3922
Weighted Panel ADF-Statistic	-1.851990	0.0320
Group rho-Statistic	1.094478	0.8631
Group PP-Statistic	0.553435	0.7100
Group ADF-Statistic	-1.470109	0.0708

Source: own computations in Eviews

According to Pedroni test, there is a cointegration relationship between non-life DPW, expenditure on tertiary education and GDP at 5% level of significance. Therefore, Panel Dynamic Least Squares (DOLS) was used to estimate the influence of real GDP on non-life DPW (see Table 3).

According to DOLS method of estimation, real GDP has a positive and very low influence on non-life DPW at 5% level of significance. The errors are zero from statistical point of view at 5% level of significance up to 10^{th} lag. According to Jarque-Bera test, the errors follow a normal distribution (JB statistic=1.14, p-value=0.56). There is a positive and strong influence of expenditure on tertiary education on non-life DPW.

Table 3. Panel Dynamic Least Squares (DOLS) to explain the variation in non-life direct premiums written in the Baltic States (1993-2020)

Variable	**Coefficient**	**t-statistic**	**P>|z|**
Real GDP	$2.55 \cdot 10^{-3}$	10.51	0.000
expenditure on tertiary education	23.21	-5.69	0.0001

Source: own computations in EViews

An increase in expenditure on tertiary education by one percent of GDP generates in average a decrease in non-life DPW. This result is according to expectations and it might reflect that higher educated people are more interested in non-life insurance products.

According to Pedroni test, there is a cointegration relationship between non-life insurance density and expenditure on tertiary education in the Baltic States.

Table 4. Pedroni Residual Cointegration Test between non-life insurance density and expenditure on tertiary education in the Baltic States (1993-2020)

Pedroni test	**Statistic**	**p-value**
Panel v-Statistic	2.576779	0.0050
Panel rho-Statistic	-0.899159	0.1843
Panel PP-Statistic	-0.367296	0.3567
Panel ADF-Statistic	-1.379519	0.0839
Weighted Panel v-Statistic	1.858178	0.0316
Weighted Panel rho-Statistic	-0.475025	0.3174
Weighted Panel PP-Statistic	-0.113215	0.4549
Weighted Panel ADF-Statistic	-0.855752	0.1961
Group rho-Statistic	0.210986	0.5836
Group PP-Statistic	0.404139	0.6569
Group ADF-Statistic	-0.673398	0.2503

Source: own computations in Eviews

According to Panel Fully Modified Least Squares method of estimation, there is a significant and positive impact of expenditure on tertiary education on non-life insurance density (see Table 5). Errors are independent at 5% level of significance up to 10th lag. An increase in the expenditure on tertiary education by one percentage points generated, in average, an increase in the non-life insurance density by 5.39 units. The results confirm the expectations and the previous studies from literature that analysed the relationship between level of education and non-life insurance demand (Browne and Kim, 1993; Outreville, 2015).

Table 5. Panel Fully Modified Least Squares model to explain the variation in non-life insurance density and explain the variation in non-life insurance penetration in the Baltic States (1993-2020)

Variable	**Variation in non-life insurance density**			**Variation in non-life insurance penetration**		
	Coefficient	**t-statistic**	**P>|z|**	**Coefficient**	**t-statistic**	**P>|z|**
expenditure on tertiary education	5.39	7.50	0.000	0.052	11.23	0.000

Source: own computations in EViews

According to Pedroni test, there is a cointegration relationship between non-life insurance penetration and expenditure on tertiary education at 5% level of significance (see Table 6). Therefore, Panel Dynamic Least Squares (DOLS) was used to estimate the influence of expenditure on tertiary education on non-life insurance penetration (see Table 5).

Table 6. Pedroni Residual Cointegration Test between non-life insurance penetration and expenditure on tertiary education in the Baltic States (1993-2020)

Pedroni test	**Statistic**	**p-value**
Panel v-Statistic	0.702585	0.2412
Panel rho-Statistic	-0.409792	0.3410
Panel PP-Statistic	-0.809272	0.2092
Panel ADF-Statistic	-0.535310	0.2962
Weighted Panel v-Statistic	0.618203	0.2682
Weighted Panel rho-Statistic	-0.286607	0.3872
Weighted Panel PP-Statistic	-0.626248	0.2656
Weighted Panel ADF-Statistic	-0.419656	0.3374
Group rho-Statistic	0.199734	0.5792
Group PP-Statistic	-0.366841	0.3569
Group ADF-Statistic	-0.411202	0.3405

Source: own computations in Eviews

Table 5 also indicates a low and positive influence of expenditure on tertiary education on non-life insurance penetration. More educated people tend to buy more non-life insurance products compared to less educated ones, as previous studies show (Outreville, 2015).

4. Conclusions

This paper investigates the impact of macroeconomic evolutions on non-life insurance market in the Baltic States in the period 1993-2020, after the insurance market was regulated in these countries that belonged to the same communist bloc before 1990. The results indicated a low and positive effect of economic growth on non-life insurance market. A more significant and positive impact was observed in the case of expenditure on tertiary education. Moreover, higher unemployment rates reduce the indicators associated to the non-life insurance market (non-life direct premiums written, non-life insurance density, non-life insurance penetration). The results are in line with the expectations and suggest that more efforts should be made to correlate insurance market with economic growth. Policy recommendations should be made to encourage people to buy non-life insurance products during periods of economic growth. On the other hand, an economic crisis might have less significant impact on non-life insurance market.

Our study is based on the period 1993-2020 that includes the years before and after the integration of the Baltic States in the EU. Therefore, in a future study the robustness of the results should be checked for the separate periods before and after the accession in the EU. Moreover, a separate analysis could be made for each country in the sample since the results for overall sample might be different compared to cross-country analysis.

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