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# **INSURANCE COMPANIES – WHAT DETERMINATES THEIR CREDIT RATINGS**

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***JEL Classification:*** C23, G22, G24

***Keywords:*** credit rating, insurance companies, panel data models

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## **Abstract**

The aim of the paper has been to analyse factors' influence on insurance companies' credit ratings. It has been made a literature review, and as a result there have been put the following hypotheses. The first one is: Insurance companies' credit ratings are determined by capital adequacy, assets quality, management quality, efficiency and liquidity factors. The second one states: Countries' credit ratings influence statistically significantly on insurance notes. To the analysis there have been used long-term issuer credit ratings proposed by small and big credit rating agencies. To verify the presented hypotheses there have been used ordered logit panel data models. The research has been prepared on quarterly data for all assessed insurance companies from all of the world. Data have been collected from Thomson Reuters Database from 1995 to 2016.

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## Contents

Introduction .....	5
<b>1. Literature review .....</b>	<b>5</b>
<b>2. Research design .....</b>	<b>7</b>
<b>2.1. Hypotheses .....</b>	<b>7</b>
<b>2.2. Data description.....</b>	<b>8</b>
<b>2.3. Methodology.....</b>	<b>11</b>
<b>3. Findings .....</b>	<b>16</b>
Conclusions .....	20
References .....	21

## **Introduction**

A main goal of the credit rating agencies is to reduce the asymmetry of information between investors and issuers. The information about the default risk published by them is used by supervisors to assess the mentioned risk and also to analyse the impact of the probability of their insolvency on the condition of the financial system. They are also taken into consideration by investors to take decision about the location of the financial sources on the stock prices and bonds. The mentioned ratings are used especially by banks during the credit risk assessment, correspondent or also investment banking. The current regulations put a lot of attention on the systemic risk and one of the determinant that can be taken into analysis the mentioned risk are credit ratings.

The study has been prepared because of the four motivations. The first one is an investigation into the impact of financial factors prediction that could help to analyse the business risks. The mentioned results can be used by policy-makers to analyse the condition of the insurance companies. The second one is to research the methodology that is used by agencies. The next one is to verify the opinion that some of the credit agencies use the similar methods to assess the default risk. Fourth, we have not found the analysis of the financial determinants that can influence on the insurance sector for the entities from over the world. In most cases the analysis has been prepared for particular countries.

In literature we can find a lot of researches about the factors that can determine the countries' and companies credit ratings. Less popular are studies about the banks' notes. During the analysis of previous papers about the mentioned topic, it is observed the lack of researches about factors influencing on the insurance companies. As a result the main aim of the paper has been to analyse factors influence on insurance companies' credit ratings. It has been made a literature review, and as a result there have been put the following hypotheses. The first one is: Insurance companies credit ratings are determined by capital adequacy, assets quality, management quality, efficiency and liquidity factors. The second one seems: Countries' credit ratings influence statistically significantly on insurance notes. To the analysis there have been used long-term issuer credit ratings proposed by small and big credit rating agencies. To verify the presented hypotheses there have been used ordered logit panel data models.

The paper consists of three sections and conclusions. The next part of the paper is the literature review about factors that can influence on insurance companies' credit ratings. The second section is the hypothesis, data and methodology presentation. The third section is the description of findings and conclusions.

### **1. Literature review**

The analysis of previous studies about factors influencing credit ratings show that the most popular researches are about determinants of countries' and companies' notes. The less popular are banks' notes factors analyses. There is a lack of studies about insurance companies' credit ratings determinants. In the current literature we can find an information that during the analysis are taken financial and non-financial indicators (Grunert, Norden and Weber, 2005; Cantor and

Packer, 1995). The combined use of financial and non-financial factors leads to a more accurate prediction of future default events than a single use of each of these factors. On the other hand, a well-made construction of financial indicators is the basic element of credit ratings assessment. As a result in the presented analysis about factors influencing on the insurance companies it has been put attention on financial indicators. In previous opinion the insurance industry is less exposed to turbulence than other financial institutions. The mentioned situation can be connected with the more rigorous capital requirements, and as a result the credit events have smaller effect on the financial market (Harrington, 2009). In the insurance sector has not been noticed the impact of the banks runs (Das et al., 2003), as a result it is more stable.

Ambrose and Carroll (1994) found that external credit ratings are no better predictors of insurance company failure than conventional financial ratio analysis. The mentioned situation is strictly connected with level of competition between credit rating agencies. In their opinion they compete each other, as a result they do not want to loose a client. As a result they propose better ratings that they should give. There have been observed also differences between notes given by particular credit rating agencies (CRAs) (Skreta, Veldkampel, 2009; Bolton, et al., 2010; Mathis, et al., 2009; Camanho et al., 2012). The mentioned situation can create the credit inflation phenomenon. Doherty et al (2012) find that the new credit rating agencies can compete in credit ratings quality. In their opinion the entry into the market the another credit rating agency could help to improve the quality and accuracy of notes.

According to the opinion present by Doumpou et al. (2012) macroeconomic conditions such as gross domestic product (GDP) growth, inflation, and income inequality are the most robust predictors of the default risk of insurance companies. Other country-specific characteristics do not appear to matter. Caporale et al. (2016) found that both macroeconomic and financial factors play the important rules.

The analysis of the previous studies suggests that in most cases in previous researches have been taken into consideration the partial indicators like: return on equity (Born, 2001), the combined ratio (Fiegenbaum & Thomas, 1990), market share (Fiegenbaum & Thomas, 1990), and asset growth (Adams et al., 2003). Shiu (2011) found that insurers with higher leverage tend to purchase more reinsurance, and those with higher reinsurance tend to have a higher level of debt. In his analysis from 2007, he found that the size of insurance company, their liquidity, business line, organizational form and interest rate risk influence on the default risk. Adams et al. (2003) found that the liquidity and profitability influence positively on ratings. The mutual insurers receives generally higher ratings than non-mutual ones. In previous researches has been used a capital adequacy defined as the ratio of accumulated reserved to total assets (Bouzouita, Young, 1998). Brotman (1989) and Pottier (1997, 1998) suggest that high financial leverage has a negative impact on the capital condition in long future. Caporale et al. (2016) found that the significant impact of on the probability of default have got the business lines and reinsurance levels. Yu et al. (2006) found that insurer investment in risky assets and the volatility of asset portfolios are inversely related to franchise value, that is, ratings. Pottier (1997) by using the ordered logit and naïve model, verified the impact of the liquidity risk, investment risk, operating risk and financial risk indicators on the insurance companies credit ratings. Pottier and Sommer (1999) to analyse the default risk took into consideration capital, liquidity, investment risk,

reinsurance, size, leverage, growth, profitability, percentage of business in long-tail lines, geographical diversification and line-of-business diversification ratios. Burton et al. (2003) verified the impact of profitability, liquidity and organisational form on rating proposed by A.M. Best; and the leverage, profitability, liquidity ratios on S&P's notes in United Kingdom. Gaver and Pottier (2005) during the modelling ratings of 80 property-liability US insurers by using ordered logit analysed the influence of capitalization, liquidity, profitability and size of rated companies.

Previous analyses have been made for the particular countries, especially for United Kingdom (Adams et al., 2003; Burton et al., 2003), United States (Pottier, 1997; Pottier, Sommer, 1999; Gaver, Pottier, 2005). There have been observed determinants influencing for different agencies. In most cases there are taken notes proposed by one of them (Pottier & Sommer, 1999). To the analyses have been used differentiated models to forecast the ratings (Florez-Lopez, 2007; Van Gestel et al., 2007). The prediction models that are used in researches are hazard models (Kim, et al., 1995), logit analysis (Chen & Wong, 2004; Cummins, et al., 1995), genetic programming (Salcedo-Sanz, et al. 2005), and artificial neural networks (Hsiao & Whang, 2009).

The analysis of the impact of the crisis period on the condition of the insurance companies suggests that they are more vulnerable during the economic downturn (Baluch et al., 2011). Das et al., (2003) found that this situation can be connected with the reinsurance activities. As a result it may cause several primary insurance firms to fail at the same time. Acharya et al. (2015) suggest that the larger insurance companies invest in high-risk assets because they are correlated with different financial institutions.

The prepared literature review suggests that there is lack of researches about the determinants influencing on insurance companies' credit ratings. There are studies about the mentioned phenomenon for particular countries. The analysis has not been prepared for insurers from all over the world. In most cases researches are prepared for particular one credit rating agency. There have been noticed studies about the default risk determinants, but not for the credit ratings. In literature we can find a lot of researches about the factors that can determine the countries' and companies' credit ratings. Less popular are studies about the banks' notes. As a result the main aim of the paper has been to analyse factors influence on insurance companies' credit ratings.

## **2. Research design**

### **2.1. Hypotheses**

As it has been mentioned in previous section, the main goal of the paper has been to analyse factors that influence on insurance companies' credit ratings. The analysis of the previous researches about the determinants influencing on the insurance companies credit ratings suggest that the most popular factors determine the default risk are: profitability indicators (Born, 2001, Adams et al., 2003; Pottier, Sommer, 1999; Burton et al., 2003; Gaver, Pottier, 2005), quality of assets (Adams et al., 2003), capital factors (Shiu, 2011; Pottier, Sommer, 1999), liquidity (Shiu 2007; Adams et al., 2003; Pottier, 1997; Pottier, Sommer, 1999; Burton et al., 2003; Gaver, Pottier, 2005), size of rated company (Shiu, 2007; Pottier, Sommer, 1999; Gaver, Pottier, 2005),

business line (Shiu, 2007) and the organizational form (Adams et al., 2003; Shiu, 2007, Burton et al., 2003). The mentioned indicators are the most popular during the analysis. Because there are differences observed in particular researches about the significance and the direction and strength of impact of the mentioned indicators on default risk or credit ratings, we have classified them into five groups according to CAMEL indicators. The mentioned classification has been used to analyse the credit rating factors of banks' notes. Because the mentioned research has not been prepared before we have put the following hypothesis:

H1: Insurance companies' credit ratings are determined by capital adequacy, assets quality, management quality, efficiency and liquidity factors.

According to our practical knowledge and the previous studies about the impact of macroeconomic condition on credit ratings given for non-financial companies and banks notes we would like to check if it exists the statistically significant impact of countries' credit ratings on insurers' notes. It can be a measure of the systemic risk. Credit rating agencies during the analysis of the condition of particular entities take into consideration the financial condition, sector and economy situation. The last of the mentioned group of variable has not been noticed in methodologies presented by agencies. As a result we put the hypothesis seems as follows:

H2: Countries' credit ratings influence statistically significant on insurance notes.

To the analysis there have been used long-term issuer credit ratings proposed by small and big credit rating agencies. To verify the presented hypotheses there have been used ordered logit panel data models.

## **2.2. Data description**

The analysis has been presented by using three stages of insurance companies' default. The first one is the condition of the insurance entity, the second one is the analysis of the sector condition, the last one is the impact of the macroeconomic determinants on insurers ratings. The analysis has been started on the classification of the impact of the insurers financial indicators. There are taken into consideration the group of factors threaten as the CAMEL indicators. To the mentioned determinants belong factors connected with the capital adequacy, assets quality, management quality, earnings and liquidity.

The first group of determinants are these connected with the capital adequacy. To the mentioned indicators belong: tier 1 indicator, leverage ratio.

The ratio of the high risk assets to total equity measure the quality of investment and the investment risk. To the high risk assets, according to the opinion present by Moody, are included all investments other than investment grade bonds and mortgage loans. Higher rated insurance companies generally should have lower value of the risk exposed positions. The high risk investment can create problems with insolvency. On the other hand, if the financial condition of the insurance company is stable, company is present for a long period of time on the financial market and it is a big institution, credit rating agencies can tolerate the risk investment assets in



their portfolios. These companies should have got high stable capital and earnings profile. The mentioned situation is strictly connected with the risk of default. The next ratio is the *tier 1* ratio, measured as a capital minus 10% of high risk assets to the total assets minus 10% of high risk assets. Capital adequacy is important for an insurer because it provides a signal of financial capacity to customers. Insurance regulators also require minimum capital levels in order for the company to continue to operate. Capital as a percentage of total assets is a measure in defining how much capital cushion a company has available to support its policyholder obligations and other liabilities. Taken into consideration 10% of high risk assets is as a result of stress scenario. Companies that receive higher ratings, should have got have higher capital as percentage of total assets. In some cases it is used in methodology, a capital-to-total assets ratio because of its ability to be calculated consistently. The next measure of the capital adequacy is the *leverage ratio*. The mentioned indicator can be measured as the total assets for the fiscal interim to common shareholders' equity for the same period and is expressed as percentage.

To the measure of assets quality are included the following variables: *the value of fixed assets to total assets*, *the deferred tax assets as a percentage of total assets*, *investment assets to total assets*. As such assets have less liquidity than investments and other financial assets, significant levels of these assets relative to total assets may be discounted when assessing asset quality. The next measure is the ratio of the accumulated *reserves as a percentage of total assets*. The mentioned variable has been proposed by Bouzouita and Young (1998). The high value of this indicator can have got the negative consequences for insurance companies. As a result it can be observed the negative impact of the mentioned indicator on the credit ratings changes.

To the management assets' factors can be classified the probability of dividend payment, total dividends to total assets, non-insurance revenue to total revenue ratio, the goodwill and intangibles to equity ratio, investment ratio.

The *probability of dividend payment* during a last year measured as a dummy variable, where 1 means the dividend paid, and 0 where dividend are unpaid. The next variable that is strictly connected with the mentioned variable is the value of *total dividends to total assets*. The mentioned factor is measured as a percentage of surplus, which helps to assesses how much potential surplus cushion exists (i.e. by reducing policyholder dividends), which can act as a shock absorber to mitigate adverse asset performance and losses. The next determinant that has been taken into analysis is the value of the *non-insurance revenue to total revenue ratio*. The mentioned factor is a measure of the additional earnings generated by investment made by insurance companies. It can be strictly connected with the quality of investment decisions taken by insurance companies. The next measure of the quality of management assets is the value of the *goodwill and intangibles to equity*. The mentioned ratio has been measured as a sum of the goodwill, deferred policy acquisition costs and other intangible to total equity. The described value is a measure of the quality of the insurance companies' equity capital base. In the case of higher rated companies should be observed the lower value of the goodwill and other intangible assets. The increase of the acquisition usually creates credit risk. The mentioned situations are connected with the integration challenges and the uncertainty about the ultimate costs and benefits. The *investment ratio* is the ratio of net investment income for the fiscal interim to premiums earned for the same period and is expressed as percentage. The reinsurance activity

impact is unclear in previous literature. By transferring risk to a third party, reinsurance can help to reduce uncertainty regarding the frequency and magnitude of future losses and enable a primary insurer to sustain an external economic shock (Adams, 1996). The *reinsurance ratio* can be measured as the value of annual reinsurance ceded over annual premiums written.

The next group of indicators are these threaten as efficiency ratios. To the mentioned group of indicators belong: *the return on assets, the return on equity, the reinvestment rate*.

The *reinvestment rate* is calculated by dividing retained earnings for the fiscal interim by the average common shareholders' equity for the same period and is expressed as percentage. Retained earnings represent income available to common excluding extraordinary items minus gross dividends.

The last part of factors are the liquidity indicators. Liquidity (LIQ) is measured here by the ratio of *liquid assets to liquid liabilities* and therefore represents insurers' ability to fulfil their immediate obligations to policyholders in the event of claims (Pottier, 1998). If liquidity is too high, however, managers are provided with the means to invest in projects with negative net present values, reducing owners' wealth while simultaneously increasing managerial remuneration packages via the consumption of perquisites and the receipt of company size-related bonuses. According to researches presented by Carson and Scott (1997) and Bouzouita and Young (1998) it exists the negative relation between insurance companies' liquidity risk and their credit ratings. On the other hand credit rating agencies present opinion that the higher rated insurers have stronger liquidity profiles than lower rated insurers.

The first of factor that is strictly connected with the business profile is the *market share*. In our opinion the biggest institutions with the higher market share have got higher credit ratings. Important in the evaluation of a company's market share is the ability to exercise underwriting and pricing discipline and effectively utilize appropriate risk management in managing its business growth. Aggressive growth in an intensely competitive line of business or specific product can be a negative. On the other hand the significant market share within a smaller niche segment may be a positive.

The next determinant that can be taken into consideration is the *size* of the financial institutions. The mentioned variable can be measured by the logarithm of assets. If the assessed institution is bigger the credit rating in most cases is higher. As a result the size of the insurance company should be positively correlated with its' credit rating.

The *type of the ownership* can be also significant to estimate the default risk of the rated companies. We can distinguish two types of investors: private and government. Credit rating agencies can have got the higher tolerance for the risk default in the case of insurance companies where the investor is government. It can be connected with the recapitalization of the entity in the case of the insolvency problems. The mentioned situation is strictly connected with the "too big to fail" institutions, because in most cases entities there are big institutions. The described phenomenon is correlated with the size of rated companies.

The next stage of the analysis is to verify the condition of the insurance sectors. To the study there are used the following indicators: insurance penetration and insurance density. The first of the mentioned variable is the *insurance penetration*. It is measured by the total value of life and non-life industry insurance premiums to the value of GDP. The mentioned indicator analyse the significance of the insurance market in the national economy. The *insurance density* is the percentile rank, worldwide of total industry-wide insurance premiums per capita. Insurance density addresses the extent of utilization of insurance protection in a given country.

The analysis of the macroeconomic condition has been prepared by using the following indicators: *GDP per capita*, *the unemployment rate*, *the country's credit rating*, *CPI*. The higher developed market should have positively influence on the condition of the insurance sector. The higher value of the inflation rate and the unemployment indicator may have a negative impact on the credit ratings. In previous literature, especially in the case of the banks' credit ratings has been noticed the strong relationship between the country's credit ratings. The mentioned phenomenon is known as a 'ceiling effect' or 'sovereign effect'.

### **2.3. Methodology**

The analysis has been prepared for insurance companies' credit ratings. As a result to verify factors influencing on the mentioned ratings there have been collected all long term issuer credit ratings given to insurance companies from the first quarter of 1995 to the fourth quarter of 2016. The analysis has been prepared for the biggest three CRAs, i.e. S&P, Fitch and Moody; and also for the smaller agencies. Insurance companies, if have got ratings, they usually buy it for the bigger agencies; as a result in some cases the analysis cannot be completed, because of too small number of observations. The mentioned credit ratings are collected from Thomson Reuters database. Because of the existing strong differentiation on the period of beginning the activity of credit rating agencies, there are prepared analysis in subsamples into the type of credit rating agencies, domestic and foreign credit ratings. The credit ratings of 300 insurance companies from 47 countries are analysed. To analyse the impact of particular determinants on insurers' credit rating the linear decomposition proposed by Ferri, Liu, Stiglitz (1999) is used. The same methodology has been used in other researches presented in the literature review. It could not been used the nonlinear method of decomposition, because according to it, to the analysis there should be used the CDS spreads of insurance companies. It is too small number of observations to prepare it. The linear method of decomposition has been presented in the table below.

Table 1. Decomposition of Moody's, S&P's, Dominion Bond Rating Service, ER, Fitch and R&I long term issuer credit ratings.

Moody's Long-term Issuer Rating		S&P's Long-term Issuer Rating		Dominion Long-term Issuer		ER Long-term Issuer National Scale Rating		Fitch Long-term Issuer Rating		R&I Long-term Issuer Rating	
Rating	Code	Rating	Code	Rating	Code	Rating	Code	Rating	Code	Rating	Code
Aaa	100	AAA	100	AAA	100	AAA	100	AAA	100	AAA	100
Aa1	95	AA+	95	AA (high)	96	AA+	95,24	AA+	94,74	AA+	95,24
Aa2	90	AA	90	AA	92	AA	90,48	AA	89,47	AA	90,48
Aa3	85	AA-	85	AA (low)	88	AA-	85,71	AA-	84,21	AA-	85,71
A1	80	A+	80	A (high)	84	A+	80,95	A+	78,95	A+	80,95
A2	75	A	75	A	80	A	76,19	A	73,68	A	76,19
A3	70	A-	70	A (low)	76	A-	71,43	A-	68,42	A-	71,43
Baa1	65	BBB+	65	BBB (high)	72	BBB+	66,67	BBB+	63,16	BBB+	66,67
Baa2	60	BBB	60	BBB	68	BBB	61,90	BBB	57,89	BBB	61,90
Baa3	55	BBB-	55	BBB (low)	64	BBB-	57,14	BBB-	52,63	BBB-	57,14
Ba1	50	BB+	50	BB (high)	60	BB+	52,38	BB+	47,37	BB+	52,38
Ba2	45	BB	45	BB	56	BB	47,62	BB	42,11	BB	47,62
Ba3	40	BB-	40	BB (low)	52	BB-	42,86	BB-	36,84	BB-	42,86
B1	35	B+	35	B (high)	48	B+	38,10	B+	31,58	B+	38,10
B2	30	B	30	B	44	B	33,33	B	26,32	B	33,33
B3	25	B-	25	B (low)	40	B-	28,57	B-	21,05	B-	28,57
Caa1	20	CCC+	20	CCC (high)	36	CCC+	23,81	CCC	15,79	CCC+	23,81
Caa2	15	CCC	15	CCC	32	CCC	19,05	CC	10,53	CCC	19,05
Caa3	10	CCC-	10	CCC (low)	28	CCC-	14,29	C	5,26	CCC-	14,29
Caa	5	CC	5	CC (high)	24	CC	9,52	RD	-5	CC	9,52
C	0	NR	0	CC	20	C	4,76	D	-5	C	4,76
WR	-5	SD	-5	CC (low)	16	D	-5	WD	-5	D	-5
NULL	0	NULL	0	C (high)	12	SD	-5			SD	-5
		D	-5	C	8	NR	0			NR	0
				C (low)	4						
				SD/D	-5						

Source: own elaboration.

Table 2. Decomposition of RusRating, RAM, AK&M and RA long term issuer credit ratings.

RusRating Long-term Issuer National Scale Rating		RusRating Long-term Issuer International Scale Rating		AK&M Rating Agency		RA Expert Long-term Issuer Rating	
Rating	Code	Rating	Code	Rating	Code	Rating	Code
AAA	100	AAA	100	A++	100	A++	100
AA+	94,44	AA+	94,44	A+	80	A+	83,33
AA	88,89	AA	88,89	A	60	A	66,67
AA-	83,33	AA-	83,33	B++	40	B++	50,00
A+	77,78	A+	77,78	B	20	B+	33,33
A	72,22	A	72,22			B	16,67
A-	66,67	A-	66,67				
BBB+	61,11	BBB+	61,11				
BBB	55,56	BBB	55,56				
BBB-	50,00	BBB-	50,00				
BB+	44,44	BB+	44,44				
BB	38,89	BB	38,89				
BB-	33,33	BB-	33,33				
B+	27,78	B+	27,78				
B	22,22	B	22,22				
B-	16,67	B-	16,67				
CCC+	11,11	CCC+	11,11				
CCC	5,56	CCC	5,56				

Source: own elaboration.

Table 3. Decomposition of Egan-Jones, Dagong, Tiwan Ratings, JCR long term issuer credit ratings.

Egan-Jones Commercial Paper		RAM Long-term Issuer Scale Credit Rating		Dagong Long-term Issuer Credit Rating		Taiwan Ratings Long-term Issuer Credit Rating		JCR Long-term Issuer Rating	
Rating	Code	Rating	Code	Rating	Code	Rating	Code	Rating	Code
A1+	100	AAA	100	AAA	100	AAA	100	AAA	100
A1	88,88888889	AA1	95	AA+	95,2381	AA+	94,7368421	AA+	94,74
A2	77,77777778	AA2	90	AA	90,47619	AA	89,4736842	AA	89,47
A3	66,66666667	AA3	85	AA-	85,71429	AA-	84,2105263	AA-	84,21
B	55,55555556	A1	80	A+	80,95238	A+	78,9473684	A+	78,95
B-1	44,44444444	A2	75	A	76,19048	A	73,6842105	A	73,68
B-2	33,33333333	A3	70	A-	71,42857	A-	68,4210526	A-	68,42
B-3	22,22222222	BBB1	65	BBB+	66,66667	BBB+	63,1578947	BBB+	63,16
C	11,11111111	BBB2	60	BBB	61,90476	BBB	57,8947368	BBB	57,89
D	-5	BBB3	55	BBB-	57,14286	BBB-	52,6315789	BBB-	52,63
NR	0	BB1	50	BB+	52,38095	BB+	47,3684211	BB+	47,37
		BB2	45	BB	47,61905	BB	42,1052632	BB	42,11
		BB3	40	BB-	42,85714	BB-	36,8421053	BB-	36,84
		B1	35	B+	38,09524	B+	31,5789474	B+	31,58
		B2	30	B	33,33333	B	26,3157895	B	26,32
		B3	25	B-	28,57143	B-	21,0526316	B-	21,05
		CCC1	20	CCC+	23,80952	CCC	15,7894737	CCC	15,79
		CCC2	15	CCC	19,04762	CC	10,5263158	CC	10,53
		CCC3	10	CCC-	14,28571	C	5,26315789	C	5,26
		CC	5	CC	9,52381	NR	0	RD	-5
		C	0	C	4,761905	SD	-5	D	-5
		WR	-5	D	0	NULL	0	WD	-5
		NULL	0			D	-5	WR	-5

Source: own elaboration.

To analyse the impact of the mentioned financial determinants panel data models are used. It has been conduct ordered logit panel data models in which the dependent variable is insurance companies' long term issuer credit ratings.

Logit is the probability unit which is then transformed into its cumulative probability value from a normal distribution. An ordered logit model is

$$y_{it}^* = \beta x'_{it} + \gamma Z_{it} + \varepsilon_{it}$$

$Y_{it}^*$  is an unobservable latent variable that measures the creditworthiness of a bank  $i$  in period  $t$ .  $X'_{it}$  is a vector of time varying explanatory variables and  $\beta$  is a vector of unknown parameters.  $Z_{it}$  contains time invariant regressors that are generally dummy variables and  $\varepsilon_{it}$  is a random disturbance term. If the distribution of  $\varepsilon_{it}$  is chosen to be normal, then ultimately this produces an ordered logit model. As usual,  $y_{it}^*$  is unobserved.  $y_{it}^*$  is related to the observed variable  $y_i$ , which is the credit rating in this case, in the following way:

$$\begin{aligned} y_i &= -5 \text{ if } y_i^* < \tau_0 \\ &0 \text{ if } \varepsilon_0 < y_i^* < \tau_1 \\ &5 \text{ if } \varepsilon_1 < y_i^* < \tau_2 \\ &10 \text{ if } \varepsilon_2 < y_i^* < \tau_3 \\ &15 \text{ if } \varepsilon_3 < y_i^* < \tau_4 \\ &20 \text{ if } \varepsilon_4 < y_i^* < \tau_5 \\ &\dots \\ &100 \text{ if } \varepsilon_{21} < y_i^* < 0 \end{aligned}$$

where the  $\tau_s$  ( $\tau_0 < \tau_1 < \tau_2 < \dots < \tau_{22}$ ) are known threshold parameters to be estimated. The following model may be named as factor ordered logit model:

$$y_{it}^* = \beta F'_{it} + \gamma Z_{it} + \delta(F * Z)_{it} + \varepsilon_{it}$$

where:

$y_{it}$  is an unobservable latent variable that measures the credit-worthiness of a insurance companies  $i$  in period  $t$  (AK&M Long-term Issuer Rating, Dominion Bond Rating Service (DBRS) - Long-term Issuer, ER Long-term Issuer National Scale Rating, Fitch Long-term Issuer Rating, R&I Long-term Issuer Rating, RA Expert Long-term Issuer Rating, RAM Long-term Issuer National Scale Credit Rating, RusRating Long-term Issuer National Scale Rating, S&P Long – Term Issuer Rating, Moody's Long -Term Issuer Rating) for insurance companies from all over the world.

$F_{it}$  is a vector of explanatory variables, i.e.:

$$F_{it} = [tier_{it}, lev_{it}, fix_{it}, def_{it}, inv_{it}, res_{it}, prob_{it}, div_{it}, roe_{it}, roa_{it}, non_{it}, goo_{it}, ir_{it}, re_{it}, ri_{it}, hhi_{it}, size_{it}, type_{it}, ins_{it}, den_{it}, gdp_{it}, inf_{it}, cr_{it}; unmp_{it}]$$

where:

$tier_{it}$  is the value of capital to total assets;  $lev_{it}$  is the leverage ratio;  $fix_{it}$  is the percentage of the fixed assets to total assets;  $def_{it}$  is the deferred tax assets as a percentage of total assets;  $inv_{it}$  is the ratio of the investment assets to total assets;  $res_{it}$  is the ratio of the cumulated reserves as a percentage of total assets;  $prob_{it}$  is the probability of dividend payment;  $div_{it}$  is the value of total dividends to total assets;  $roe_{it}$  is the return on equity;  $roa_{it}$  is the return on assets;  $non_{it}$  is the non-insurance revenue to total revenue ratio;  $goo_{it}$  is the value of the goodwill and intangibles to equity;  $ir_{it}$  is the investment ratio;  $re_{it}$  is the reinsurance ratio;  $ri_{it}$  is the reinvestment rate;  $hhi_{it}$  is the market share;  $size_{it}$  is the logarithm of assets;  $type_{it}$  is the type of the ownership;  $ins_{it}$  is the insurance penetration;  $den_{it}$  is the insurance density;  $gdp_{it}$  is the GDP growth;  $inf_{it}$  is the inflation ratio;  $cr_{it}$  is the country's credit rating given by particular credit rating agency (AK&M Long-term Issuer Rating, Dominion Bond Rating Service (DBRS) - Long-term Issuer, ER Long-term Issuer National Scale Rating, Fitch Long-term Issuer Rating, R&I Long-term Issuer Rating, RA Expert Long-term Issuer Rating, RAM Long-term Issuer National Scale Credit Rating, RusRating Long-term Issuer National Scale Rating, S&P Long – Term Issuer Rating, Moody's Long -Term Issuer Rating);  $unmp_{it}$  is the unemployment rate;

$Z_{it}$  contains time invariant regressors that are generally dummy variables;  
 $\varepsilon_{it}$  is a random disturbance term.

### **3. Findings**

The aim of the paper was to analyse factors influence on insurance companies' credit ratings. The analysis has been started on preparing the descriptive statistics. Results have been presented in the table 4. Because the research has been prepared for domestic and foreign credit ratings, to the analysis were collected data connected with that dependent variable. It is a small number of observations connected with the particular credit ratings, as a result to the study have been used the domestic notes proposed by: S&P, Moody and Egan Jones. The same situation has been noticed in the case of the foreign ratings. To notes, that have been taken into consideration during analysis of insurance companies' notes, belong the following ratings: Fitch Long-term Issuer Rating, Moody's Long -Term Issuer Rating, S&P Long – Term Issuer Rating and Egan Jones Long Term Investor Credit Rating.

The first part of the analysis relay on the verification of the impact of financial indicators on domestic notes given for insurance companies. Results of the analyses have been presented in the table 5-7. The most popular credit rating agencies, for which we have got the biggest database of credit ratings changes was S&P. The first group of determinants that impact has been analysed, where capital adequacy indicators. To the mentioned indicators belong: tier 1 indicator, leverage ratio. The measure that impact has been verified was the leverage ratio. For long term issuer credit rating proposed by S&P it has not been observed the statistically significant influence of the mentioned indicator. The same situation has been noticed in the case of Egan Jones credit ratings. The high value of the mentioned variable can increase the default risk. As a result the mentioned variable should be negatively correlated with the insurers' credit ratings. For Moody it has been observed the opposite reaction. It can be connected with the specification of the sector. On the other hand the high value of this variable can create additional profits for investors. In the case of the foreign credit ratings from the entire mentioned group of determinants has been also



verified the leverage ratio. In the case of S&P's and Fitch notes has been observed the positive statistically significant relationship between credit ratings and the leverage ratio. The opposite direction between influence on the capital adequacy indicator has been noticed for Moody's notes. The strong significant impact of the leverage ratio can suggest that credit rating agencies takes it into consideration only to analyse the foreign credit ratings. During the estimation process the impact of the mentioned variable is ambiguous, that has been confirmed in their methodologies. From one point of view, the high value of this variable can create additional profits for investors, on the other hand it can create the default risk.

The next group of the determinants that have been analysed were the assets quality indicators. To the group of these variables, that impact has been verified, we included: the value of fixed assets to total assets, the deferred tax assets as a percentage of total assets, the investment assets to total assets, the reserves as a percentage of total assets. The first variable that impact has been verified was the value of the reserves as a percentage of total assets. The high value of this indicator can have got the negative consequences for insurance companies. As a result it can be observed the negative impact of the mentioned indicator on the credit ratings changes. The mentioned indicator has got the strong significant impact during the estimation the S&P's notes. The next variable that influence has been verified was the value of fixed assets to total assets. The mentioned variable is strictly connected with the type of the business line. For example, the life insurance companies have got the high value of the long term investment. As a result the impact of this variable should be compared with the value of the investment assets to total assets and the deferred tax assets as a percentage of the total assets. The value of investment assets to total assets has got the positive influence on the insurers' notes given by S&P, but the high value of the fixed assets to total assets has got the negative impact on credit ratings. It can be strictly connected with the high value of the goodwill, intangibles and other fixed assets, that value can be too high. The ratio of the deferred tax assets as a percentage of the total assets has got also the statistically significant influence on the analysed default risk. The weaker statistically significant negative impact of the fixed assets and the investment assets to total assets has been noticed for Moody's notes. The mentioned relationship has not been observed in the case of Egan Jones domestic credit ratings. As a result the impact of the quality of assets is strictly connected with the business line. The most important variable that should be taken during the analysis of the default risk is the value of reserves and the investment assets to total assets. The mentioned opinion has been confirmed in the case of the foreign insurers' credit ratings. The prepared analysis suggests that only Moody takes into consideration the ratio of the long term investment to total assets. The mentioned relationship is negative, what can suggest the impact of the business line on the mentioned notes. The high ratio of the long term investment creates additional risk connected with the quality of investing capital. The value of the mentioned ratio has got the positive statistically significant impact on the default risk estimated by S&P and Fitch. The location capital into treasury bonds and good high rated quality of assets is threaten as a safe form of investing capital.

To the management assets factors, that impact has been verified, can be classified the probability of dividend payment, total dividends to total assets, non-insurance revenue to total revenue ratio and investment ratio. Insurance companies, that have got credit ratings, in most cases pay

dividends, as a result for the analysis of the domestic notes, the mentioned variable does not have the statistically significant impact on their ratings. The value of the dividends to total assets is low, as a result the coefficient near the mentioned variable is very high. It is only significant for the estimation process proposed by S&P. The value of the non-insurance revenue to total revenue is insignificant for the estimation prepared by S&P and Egan Jones. The opposite reaction has been noticed for the analysis proposed by Moody. The mentioned determinant has got the negative influence on insurers' notes. It can suggest that the other type investment than offering insurance can create the additional risk for the insurance companies. As a result according to the opinion presented by Moody, the increase of the mentioned variable causes lower credit ratings. The last from the management factors, that impact has been analysed was the investment ratio. It has been only significant for notes presented by Moody, but the strength of the impact is very low. The study prepared for the foreign credit rating given by insurance companies suggests that the management quality indicators do not play the significant role during the analysis of the default risk.

To the analysis have been also used the earnings ratios, to which we have included: the return on assets, the return on equity, the reinvestment rate. One of the most important determinants from the mentioned group of indicators is the return on assets. The strongest impact has been noticed in this case for Egan Jones ratings. The presented analyses suggest that the increase of the mentioned variable on one percentage point causes the increase notes on three degrees. The return on equity has got the insignificant influence on the mentioned indicator. The same situation has been noticed in the case of the reinvestment ratio. The research prepared for foreign long term issuer credit ratings suggest that the return on assets is only an important variable during the estimation process prepared by S&P. The reinvestment rate has got the positive impact on the foreign notes. The mentioned situation can suggests that both foreign and domestic notes are strictly correlated with the earnings ratios.

The last group of factors that impact has been analysed were the liquidity indicators. To the mentioned indicators belongs the value of the liquid assets to liquid liabilities. The mentioned factor has been taken into consideration during the analysis the domestic ratings by Egan Jones. For the rest of agencies has not been observed the mentioned relationship. In the case of the foreign long term issuer credit ratings this impact has been noticed for the Moody's estimation process. If the value of liquid assets to liquid liabilities rises, it reduces the liquidity risk and as a result in long period of time the default risk. The described relationship is consistent with the assumptions.

To the analysis has been taken also the size of the analysed insurance companies. The previous studies suggest that if the rated company is bigger, it receive higher notes. The same relationship has been noticed in the case of Moody. More significant factor, observed for credit rating agencies is the market share of the insurance companies. If the rated entity has got the bigger market share, their credit rating is higher. The mentioned impact has been noticed for S&P and Moody domestic credit ratings. Usually market share is strictly connected with the size of the rated company. The most significant impact of the mentioned variable has been observed for Moody. The positive impact of the mentioned variables is observed also in the case of the foreign long term credit ratings. This relationship has been noticed for S&P's and Fitch notes. In the case

of the Moody's credit ratings, it has been observed the negative significant impact of the size of the insurance company on the default risk. It can be connected with the systemic risk, because the insolvency of the bigger company can move on the condition of the whole financial sector. The prepared analysis suggests also that the market share of rated company is insignificant for the analysis of the default risk by Moody.

The next step was to verify the impact of the macroeconomic and sector condition variables. To the macroeconomic indicators, that have been analysed, belong GDP growth, the inflation ratio and the unemployment ratio. The research prepared for the domestic long term issuer credit ratings suggests that the significant impact on the insurers' notes has got only the GDP growth. The relationship between these variables is weaker than for banks (Chodnicka-Jaworska, 2016). In the case of the foreign credit ratings the mentioned relationship is significant but nearly zero. More attention agencies put on the analysis of the inflation and unemployment ratios. The first of the mentioned variables play a statistically significant impact on the ratings given by all of the credit rating agencies. The relationship is positive and the strongest influence has been noticed for Fitch notes. It can be connected with the increasing demand on good and services and as a result also the insurance products. The unemployment rate has got the negative influence on presented notes. The strongest reaction has been observed for Fitch ratings. The presented relationship can be connected with the situation on the labour market. The unemployed do not have the buy the insurance products, because they do not earn. As a result it has not been created the demand on the mentioned services, which causes the reduction of insurers' revenues.

Domestic credit ratings given by Moody react on countries' credit ratings changes. If the mentioned variable increases on one degree, the insurers' credit ratings are higher also on little more than one note. The described situation suggests that Moody's notes are strictly correlated with the countries' default risk and it can suggest that it exists the systemic risk phenomenon. The mentioned relationship has not been observed for S&P. In the case of the foreign credit ratings for all types of agencies, the impact of the countries' notes is significant. The same like in the case of domestic notes, the strongest reaction has been noticed for Moody's credit ratings.

The impact of macroeconomic and sector condition has not been verified for Egan Jones credit ratings, because, the mentioned institution does not assessed countries. The analysis of the sector condition for domestic credit ratings suggests that S&P's notes are sensitive only on insurance penetration for life insurance companies. The rest of the variables are insignificant for the estimation the default risk of rated entities. The opposite reaction has been observed for Moody. Both density and insurance penetration have got the statistically significant impact on the credit ratings. The analysis of the impact of the insurance sector variables on foreign notes creates the opinion, that the insurers' ratings are sensitive on the sector condition. The insurance density impact has been the highest in the case of the Fitch ratings. The insurance penetration ratio influences the strongest on the Moody's notes.

The presented analysis suggests that both of the hypotheses have been verified. The insurance companies' credit ratings are determined by capital adequacy, assets quality, management quality, efficiency and liquidity factors, but the strength and significance of the impact is different for the domestic and foreign ratings. The mentioned notes are also dependent on the

macroeconomic and sector condition, especially in the case of foreign ratings. Countries' credit ratings also influence statistically significantly on insurance notes, which confirms the opinion about the systemic risk phenomenon and the contagion effect.

### **Conclusions**

Credit rating agencies are specialized in the analysis of the default risk of corporates. There is lack of analysis about the factors that can impact on the insurers' notes. As a result the aim of the paper has been to analyse factors influence on insurance companies' credit ratings. There have been put two hypotheses. The first one is: Insurance companies credit ratings are determined by capital adequacy, assets quality, management quality, efficiency and liquidity factors. The second one seems: Countries' credit ratings influence statistically significantly on insurance notes. Both of them have been verified for the domestic and foreign credit ratings proposed by bigger and smaller rating agencies. The received results suggest that the capital adequacy indicators have got the insufficient impact on the insurance companies' notes. It can be connected with the fact, that for a short time the mentioned factors are popular, because the first time that they have been used in regulations were Basel II and Basel III. The significant impact of the capital adequacy ratios has been noticed during the analysis of the foreign credit ratings. The ambiguous relationship between the mentioned variables can be connected with the opinion of some agencies, that the higher value of these factors can be connected with additional profits for investors, on the other hand it can suggest the rising default risk.

The next part for of factors that have analysed were the assets quality indicators. From the mentioned determinants the most significant impact has been noticed in the case of the value of reserves to total assets. The important impact has got also the value of the investment assets to total assets, but it is strictly connected with the business line of the insurance companies. The assets quality factors are not taken to the research by Egan Jones Credit Rating Agency. The significance of reserves is strictly connected with the probability of ruin.

The management quality indicators play a significant role during the analysis of the insurers' credit ratings, except credit ratings given by Egan Jones. For S&P the significant impact has got only the value of the dividend payment. The presented analysis suggests that for Moody both the ratio of the non-insurance revenue to total revenue and investment ratio have got the significant impact on credit ratings given for the insurance companies. The received results suggest that the high value of the non-insurance can generate additional risk connected with the risky investment. The relationship between the management quality indicators and the foreign long term issuer credit ratings has not been noticed.

From the efficiency ratios the most important variables is the return on assets. This indicator is statistically significant during the estimation the default risk presented by all credit rating agencies. The mentioned relationship is observed also for the analysis prepared by banks. The same relationship has been also noticed in the case of the foreign credit ratings. For this types of credit ratings the significance is also noticed for the reinvestment rate. The liquidity ratios have got the statistically significant impact only in the case of the foreign long term credit ratings. The mentioned relationship has not been observed during the estimation the domestic notes.

The analysis of the impact of size and the market share suggests that domestic notes of bigger companies and those that have got the higher market share are bigger. The mentioned institutions are threatened as more stable. The same relationship has been observed in the case of foreign notes presented by Fitch and S&P. In the case of Moody's ratings it has been noticed the negative impact of the size of insurance companies and the insignificant influence of the market share. The mentioned relationship can suggest that bigger institutions can generate the systemic risk.

The macroeconomic variables have got the significant impact on insurers' credit ratings. The strongest reaction in the case of the domestic notes has been noticed on GDP growth. The rest of the variables have been insignificant. The situation has been changed for foreign credit ratings. The inflation ratio has been positively correlated with credit ratings and the unemployment rate conversely. This relationship can help us think that the credit rating agencies during the analysis the default risk take into account the condition of the economy, even if the rated company is big. The mentioned opinion has been confirmed by the statistically significant impact of the country's notes on the insurers' default risk, both in the case of the domestic and foreign credit ratings. The impact of the insurance sector variables is differentiated by the type of the rating agency. The strongest significant dependence between the analysed ratings has been noticed for the foreign than domestic notes.

The presented results suggest that credit rating agencies and notes proposed by them are varied by taken into consideration their methodologies. The presented research helps to prepare the list of factors that can be taken into consideration by supervisors during the analysis the probability of default the insurance companies. The described results also can be taken into analysis during the investment decisions. They also help to understand differences between factors that are used during the estimation the risk to prepare the domestic and foreign credit ratings. In the paper have not been presented results connected with the moment of the business cycle and the type of the ownership, which will be verified in next papers.

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Table 4. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
lev	10170	7.010003	7.812756	-64.407	393.7462
def	4652	.0130395	.0166089	0	.1298629
inv	9962	.569993	.2081374	0	2.056588
res	5621	.3788006	.2446543	-.2640229	1.378209
roe	10069	.0170288	.3841341	-35.57692	5.637347
roa	10048	.0059783	.0236016	-1.54853	.2589034
div	8160	.0050518	.0077125	0	.0943012
non	9793	.130431	6.446009	-630.3703	66.14286
goo	2299	.4196764	.5000603	-.4699729	4.927722
ir	8553	3091.232	225286.1	-1310.123	2.08e+07
re	2243	.7841801	7.371912	-57.00962	222.6995
ri	9924	1.174019	11.77579	-560.3619	495.6531
hhi	7682	.0007556	.0026058	1.79e-07	.0448058
size	10171	22.49297	2.384969	15.69737	28.56998
fix	10171	.6736668	.1819815	0	2.168391
liq	9,143	145.9866	1536.526	-18256.25	94722.1
lifeins	8606	3.086084	1.796143	.006631	14.9428
nonins	8666	2.485715	1.009658	.216493	3.70724
den	8068	35.23739	18.33731	.870841	112.218
gdp	9700	39556.78	14866.52	501.1855	102910.4
inf	9551	2.510412	2.559186	-4.863278	54.91538
unmp	10212	5.897503	2.66482	.164	26.094
cr_dom_d	1195	96.19414	8.466456	60	100
cr_fitch_d	7339	6.948279	31.87292	-5	100
cr_jcr_d	3146	94.52438	14.11846	-5	100
cr_moody_d	4986	84.50562	16.30426	20	100
cr_ri_d	6834	94.98195	17.93973	-5	100
cr_ram_d	488	98.43238	4.927767	75	100
cr_sp_d	9991	92.53929	12.60344	20	100
cr_dom_f	2423	96.96079	8.162756	56	100
cr_fitch_f	7682	12.83232	37.80478	-5	100
cr_jcr_f	3146	93.93382	14.92009	-5	100
cr_moody_f	4869	83.80366	16.76059	20	100
cr_ri_f	7491	93.11021	19.0753	-5	100
cr_sp_f	5712	85.70028	15.74118	20	100
in_dag_d	12	100	0	100	100
in_dom_d	74	80.97297	6.8426	68	88
in_fitch_d	52	14.67105	34.40367	-5	73.68421
in_jcr_d	65	89.23482	15.63893	-5	100
in_moody_d	666	64.5045	18.88774	-5	100
in_ri_d	57	81.03592	4.803495	76.19048	85.71429
in_ra_d	4	100	0	100	100
in_ram_d	10	1000	0	1000	1000
in_sp_d	8,619	59.02889	25.12483	-5	100
in_egan_d	153	88.74364	13.7854	0	100
in_tai_d	105	86.46617	4.778115	78.94736	89.47369
in_feller_d	23	1000	0	1000	1000
in_dom_f	217	60.47926	36.15695	0	88
in_fitch_f	3,093	17.05056	35.09881	-5	100
in_jcr_f	65	89.23482	15.63893	-5	100
in_moody_f	703	65.91038	11.31757	45	100
in_ri_f	57	81.03592	4.803495	76.19048	85.71429
in_sp_f	2,268	66.06922	21.35602	0	95
in_egan_f	110	87.9798	15.21037	0	100

Source:

own

calculations.



Table 5. Analysis of determinants influencing on S&P's long term domestic credit ratings of the insurance companies.

in_sp_d	Coef.	P>z	Coef.	P>z	Coef.	P>z	Coef.	P>z	Coef.	P>z	Coef.	P>z	Coef.	P>z
lev	-.123779	0.683	-.0614297	0.845	.05833	0.851	.0781342	0.805	-.3214861	0.370	-.4420527	0.243	-.2337806	0.585
fix	-57.23727	0.001	-52.27088	0.004	-75.73102	0.011	-56.78394	0.025	-22.38208	0.362	-26.06393	0.329	-49.80987	0.142
def	204.1606	0.000	210.3066	0.000	266.1299	0.000	240.1275	0.000	184.5866	0.000	202.3234	0.000	229.132	0.000
inv	55.17652	0.002	50.13405	0.006	73.34703	0.014	54.30155	0.034	20.12752	0.412	24.04881	0.369	48.07167	0.157
res	-52.99505	0.000	-56.62635	0.000	-57.12471	0.000	-59.93619	0.000	-54.73218	0.000	-51.23257	0.000	-49.35786	0.000
roa	106.4511	0.026	102.0238	0.034	97.75748	0.052	87.46133	0.076	114.6169	0.021	133.5315	0.011	126.961	0.027
div	205.9225	0.258	229.0806	0.213	381.5764	0.064	327.8205	0.105	357.5841	0.097	433.6596	0.059	525.4869	0.030
non	-2.020266	0.263	-2.269431	0.202	-1.291636	0.515	-2.057444	0.257	-2.825364	0.123	-2.915477	0.120	-1.392153	0.517
ir	.0096525	0.721	.0108738	0.675	.0000494	0.999	.0063079	0.810	.0173509	0.503	.0210336	0.428	.0069353	0.818
re	2.918873	0.150	3.182824	0.121	3.262102	0.124	3.301467	0.116	2.671768	0.209	2.471157	0.250	2.986708	0.184
ri	-.0325544	0.630	-.0321955	0.637	-.0437603	0.535	-.0340452	0.626	-.0185387	0.796	-.0246996	0.735	-.0442768	0.548
liq	.003594	0.167	.004177	0.121	.0035689	0.182	.0040062	0.132	.0043215	0.113	.0034014	0.224	.0035393	0.219
hhi	-3672.541	0.010	-1987.354	0.405	1547.67	0.586	1475.435	0.628	7450.542	0.036	9504.276	0.019	11625.21	0.017
size	5.741993	0.000	5.685326	0.000	5.020968	0.000	5.321913	0.000	5.16915	0.000	4.79382	0.000	3.664855	0.004
prob	.5945377	0.544	.7793187	0.440	.8104326	0.442	.9895958	0.341	.7743226	0.457	.4468608	0.682	.7559877	0.512
roe	-6.044612	0.238	-5.592124	0.282	-4.080286	0.424	-4.070496	0.430	-8.653811	0.125	-9.956198	0.086	-7.038492	0.258
cr_sp_d			.0529562	0.379	-.1384299	0.220					-.203226	0.184	-.2376363	0.168
gdp					.0002415	0.062	.0001117	0.112					.0003909	0.039
inf					-.1598875	0.318	-.1916517	0.224					.1159211	0.579
unmp					.0843572	0.784	.0333841	0.913					.4499064	0.236
den									.2006455	0.344	.3236824	0.170	.1770825	0.500
lifeins									2.086646	0.111	1.757486	0.209	4.074175	0.041
nonins									-3.375613	0.276	-1.549562	0.643	-6.970751	0.112
/cut1	94.5082	0.000	97.65526	0.000	73.53821	0.000	87.73608	0.000	88.87235	0.000	71.40144	0.003	49.78663	0.062
/cut2	98.65784	0.000	101.5408	0.000	77.8651	0.000	91.73654	0.000	92.69097	0.000	75.20619	0.002	53.88851	0.045
/cut3	101.0571	0.000	104.0179	0.000	80.51069	0.000	94.36222	0.000	95.43682	0.000	78.00041	0.001	56.94449	0.035
/cut4	106.2574	0.000	109.474	0.000	86.33057	0.000	100.2037	0.000	101.3627	0.000	83.98146	0.001	63.15635	0.021
/cut5	112.6187	0.000	115.98	0.000	92.51372	0.000	106.702	0.000	108.4812	0.000	91.02575	0.000	69.50464	0.012
no obs	85		85		85		85		85		85		85	
no gov	6		6		6		6		6		6		6	
Wald	0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000	
LR	0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000	

Source: own calculations.

Table 6. Analysis of determinants influencing on Moody's long term domestic credit ratings of the insurance companies.

in_moody_d	Coef.	P>z	Coef.	P>z	Coef.	P>z	Coef.	P>z
lev	.128206	0.048	3.117031	0.041	1.181312	0.013	.0849848	0.203
fix	-11.65578	0.023	-47.78035	0.712	25.90205	0.718	-13.34562	0.006
inv	-16.21091	0.000	-55.80205	0.585	-77.32211	0.254	-22.00936	0.000
roa	41.4447	0.068	-996.9701	0.179	-719.23	0.190	81.16073	0.003
non	-.1815682	0.434	1.622439	0.352	1.294055	0.147	-.5568846	0.037
ir	-.0177563	0.001	-.0355785	0.049	-.0160273	0.115	-.0078922	0.059
ri	-.0001079	0.984	.1533857	0.490	-.0214476	0.915	-.0033181	0.576
liq	.0002065	0.212	-.0110871	0.489	-.0095691	0.408	.0001307	0.357
hhi	3378.257	0.000	15736.1	0.031				
size	-2.596417	0.000	-11.69845	0.066	8.578691	0.125	.4671236	0.438
cr_moody_d			-.2331406	1.000	6.90023	0.000		
gdp					-.0002786	0.042		
inf					.7515077	0.305		
unmp					-.8570155	0.615		
den							.3717562	0.001
lifeins							4.963241	0.000
nonins							1.769874	0.020
/cut1	-96.84056	0.000	-280.0911	0.999	861.8108	.	-30.89277	0.032
/cut2	-89.04335	.	-268.9179	0.999	866.7667	0.000	-24.2639	0.076
/cut3	-72.66736	.	-255.2209	0.999	874.2022	0.000	-2.298021	0.844
/cut4	-70.46757	0.000					.7034311	0.952
/cut5	-68.66345	0.000					3.434274	0.769
/cut6	-66.04446	0.000					6.816808	0.561
/cut7	-65.95405	0.000					6.946239	0.553
/cut8	-65.86582	0.000					7.064362	0.547
/cut9	-64.82153	0.000					8.387907	0.472
/cut10	-64.72609	0.000					8.51229	0.465
no obs	284		63		63		63	
no gov	10		3		3		3	
Wald	0.0000		0.0000		0.0000		0.0000	
LR	0.0000		0.0000		0.0000		0.0000	

Source: own calculations.

Table 7. Analysis of determinants influencing on Egan Jones long term domestic credit ratings of the insurance companies.

in_egan_d	Coef.	P>z
lev	.1252147	0.678
fix	.3430631	0.963
inv	4.336127	0.310
roa	455.6331	0.014
non	-1.61153	0.237
ir	.0000771	0.874
ri	-.503328	0.124
liq	.0057719	0.012
size	-.4697998	0.499
prob	-26.581	0.146
/cut1	-42.03008	.
/cut2	-40.42187	0.000
/cut3	-39.59915	0.000
/cut4	-36.6862	0.000
/cut5	-29.18793	0.000
no obs	84	
no gov	6	
Wald	0.0000	
LR	0.0000	

Source: own calculations.

Table 8. Analysis of determinants influencing on S&P's long term foreign credit ratings of the insurance companies.

in_sp_f	Coef.	P>z	Coef.	P>z	Coef.	P>z	Coef.	P>z	Coef.	P>z	Coef.	P>z	Coef.	P>z
lev	.2335283	0.000	.2551641	0.000	0,253589	0.000	0,153385	0.000	0,15167	0.000	0,145392	0.000	0,169247	0.000
roa	4.481134	0.274	24.03474	0.009	1,067117	0.804	12,74348	0.191	7,675624	0.100	7,771967	0.101	3,718089	0.436
size	.1900168	0.107	.0121124	0.937	2,03611	0.000	3,009526	0.000	1,359218	0.000	1,474763	0.000	2,485771	0.000
inv	7.09831	0.000	7.369971	0.000	11,77365	0.000	9,329963	0.000	9,350209	0.000	9,396934	0.000	11,19687	0.000
non	-.0020038	0.495	-.0020803	0.473	-0,02204	0.295	-0,0355	0.143	-0,00634	0.776	-0,00672	0.765	-0,0252	0.291
cr_sp_f			.1827979	0.000			0,369429	0.000			0,005278	0.080	0,00067	0.840
gdp					-0,00012	0.000	-0,00024	0.000					-0,00014	0.000
inf					-0,02757	0.615	0,175264	0.044					-0,08449	0.255
unmp					-0,27145	0.000	-0,50421	0.000					-0,2566	0.000
den									0,3399	0.000	0,32013	0.000	0,16202	0.000
lifeins									1,344838	0.000	1,576581	0.000	1,358227	0.000
nonins									1,40924	0.000	1,19301	0.000	3,35629	0.000
/cut1	-2.153701	0.486	11.25571	0.026	32,40377	0.000	78,88807	0.000	9,735416	0.142	14,49099	0.021	28,88247	0.000
/cut2	-2.029982	0.512	11.38184	0.025	33,08872	0.000	79,78756	0.000	10,36147	0.115	15,15373	0.015	30,12357	0.000
/cut3	-1.989009	0.520	11.42444	0.024	33,29073	0.000	80,05619	0.000	10,53277	0.108	15,33123	0.014	30,43298	0.000
/cut4	-1.949438	0.529	11.46551	0.024	33,4583	0.000	80,26722	0.000	10,67914	0.103	15,48207	0.013	30,66897	0.000
/cut5	-1.717074	0.579	11.71508	0.021	34,30266	0.000	81,65571	0.000	11,39015	0.081	16,21849	0.009	31,7082	0.000
/cut6	-1.366167	0.660	12.11579	0.017	35,22918	0.000	83,19768	0.000	12,0521	0.064	16,91331	0.006	32,6824	0.000
/cut7	-1.013511	0.745	12.53719	0.014	36,98982	0.000	85,8071	0.000	12,87108	0.047	17,7802	0.004	33,98788	0.000
/cut8	-.0540552	0.986	13.63625	0.008	39,20508	0.000	88,64151	0.000	14,57363	0.024	19,53047	0.002	36,1138	0.000
/cut9	1.244273	0.691	14.42674	0.005	41,00868	0.000	89,72798	0.000	16,37106	0.011	21,34335	0.001	37,99437	0.000
/cut10	4.22106	0.176	17.29686	0.001	45,15823	0.000	94,11055	0.000	20,48314	0.001	25,80957	0.000	42,52491	0.000
/cut11	6.580216	0.035	19.16051	0.000	47,44782	0.000	95,91048	0.000	23,05053	0.000	28,43295	0.000	45,16357	0.000
/cut12	10.84055	0.001	22.89399	0.000	51,56892	0.000	99,15032	0.000	27,65203	0.000	33,02926	0.000	49,81954	0.000
/cut13	13.22166	0.000	25.68269	0.000	54,00673	0.000	102,6387	0.000	30,64212	0.000	35,9609	0.000	52,77166	0.000
/cut14	15.15395	0.000	28.14183	0.000	56,03611	0.000	105,6773	0.000	32,66348	0.000	38,01841	0.000	54,90747	0.000
/cut15	18.54266	0.000	31.95615	0.000	60,01303	0.000	110,2877	0.000	36,63268	0.000	42,33334	0.000	59,7403	0.000
/cut16	22.09332	0.000	36.1391	0.000	63,62829	0.000	114,815	0.000	40,13094	0.000	45,71937	0.000	63,18999	0.000
/cut17	27.67186	0.000	42.06376	0.000	69,29951	0.000	120,6362	0.000	46,15957	0.000	51,69674	0.000	69,05217	0.000
no obs	2125		2125		1843		1144		1560		1528		1528	
no gov	49		49		43		43		39		39		39	
Wald	0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000	
LR	0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000	

Source: own calculations.

Table 9. Analysis of determinants influencing on Fitch long term foreign credit ratings of the insurance companies.

in_fitch_f	Coef.	P>z	Coef.	P>z	Coef.	P>z	Coef.	P>z	Coef.	P>z	Coef.	P>z	Coef.	P>z
lev	.0347439	0.010	-.026232	0.199	-.0788633	0.014	.0031012	0.902	.0050735	0.743	.0554746	0.092	-.0351228	0.290
roa	8.204232	0.171	-4.409331	0.426	-8.281189	0.126	-6.067295	0.300	-5.912081	0.257	-14.05069	0.012	-12.01902	0.031
size	-.4976395	0.001	.2214646	0.043	.9704355	0.000	.9533794	0.000	1.343344	0.000	1.443797	0.000	1.000059	0.000
non	.182487	0.122	.1620855	0.179	.2063995	0.138	.1519123	0.245	.1609881	0.190	.2105104	0.137	.1863144	0.182
inv	.5320587	0.471	4.776404	0.000	6.046119	0.000	8.909087	0.000	5.232846	0.000	11.67963	0.000	7.637263	0.000
liq	4.85e-06	0.759	.0000259	0.111	.0000164	0.351	6.32e-06	0.703	.0000144	0.380	5.53e-06	0.756	6.76e-06	0.701
ir	-.0002887	0.086	-.0000103	0.847	-8.36e-06	0.823	-.0000119	0.922	-7.14e-06	0.922	-5.29e-06	0.899	-.0001283	0.749
ri	.0212603	0.051	.0149711	0.042	.0300619	0.000	.0318562	0.007	.0191389	0.022	.0200609	0.023	.0211963	0.008
hhi	440.2471	0.003	218.3736	0.090	81.60509	0.752	-17.65099	0.947	1029.145	0.003	1294.956	0.001	1255.883	0.000
cr_fitch_f			.0370917	0.000	.0038708	0.060					.0044386	0.037	.0044878	0.037
gdp					-.0006807	0.000	-.0006852	0.000					-.0005485	0.000
inf					.993028	0.000	.9959267	0.000					1.387487	0.000
unmp					-.9486127	0.000	-.9248255	0.000					-.4825988	0.000
den									-131841	0.000	.1840993	0.000	.3102984	0.000
lifeins									.262267	0.342	2.205191	0.000	1.749413	0.000
nonins									11.72455	0.000	17.44289	0.000	7.215594	0.000
/cut1	-10.50012	0.003	10.02198	0.000	-6.578023	0.270	-4.83326	0.411	66.62409	0.000	98.19691	0.000	35.19611	0.000
/cut2	-10.49552	0.003	10.03304	0.000	-6.56171	0.271	-4.818944	0.413	66.63623	0.000	98.21356	0.000	35.21545	0.000
/cut3	-10.49321	0.003	10.03857	0.000	-6.553539	0.272	-4.811757	0.413	66.64228	0.000	98.22185	0.000	35.22514	0.000
/cut4	-10.48631	0.003	10.05521	0.000	-6.528619	0.274	-4.789886	0.415	66.66045	0.000	98.24691	0.000	35.25477	0.000
/cut5	-10.46086	0.003	10.11647	0.000	-6.437426	0.280	-4.709759	0.423	66.72723	0.000	98.33915	0.000	35.36384	0.000
/cut6	-10.43513	0.004	10.17781	0.000	-6.346651	0.287	-4.629993	0.431	66.79413	0.000	98.43136	0.000	35.47267	0.000
/cut7	-10.36846	0.004	10.27269	0.000	-6.205937	0.298	-4.427379	0.452	66.96518	0.000	98.57448	0.000	35.64136	0.000
/cut8	-10.3393	0.004	10.34005	0.000	-6.107246	0.306	-4.340914	0.460	67.03868	0.000	98.67554	0.000	35.75928	0.000
/cut9	-10.2207	0.004	10.5632	0.000	-5.780716	0.332	-4.001229	0.496	67.32736	0.000	99.01238	0.000	36.14757	0.000
/cut10	-9.997988	0.005	10.94034	0.000	-5.236158	0.380	-3.423071	0.561	67.81986	0.000	99.57198	0.000	36.78278	0.000
/cut11	-9.823957	0.006	11.25597	0.000	-4.782086	0.423	-2.98694	0.612	68.1854	0.000	100.033	0.000	37.30639	0.000
/cut12	-9.512972	0.008	11.72887	0.000	-4.113499	0.491	-2.225518	0.705	68.81164	0.000	100.7202	0.000	38.06966	0.000
/cut13	-9.027064	0.012	12.4412	0.000	-3.16466	0.596	-1.179138	0.841	69.62677	0.000	101.685	0.000	39.1023	0.000
/cut14	-7.958127	0.026	13.91168	0.000	-1.245936	0.835	.9272403	0.875	71.11187	0.000	103.575	0.000	41.10233	0.000
/cut15	-7.422876	0.038	14.73634	0.000	-.0556037	0.993	2.137446	0.718	71.81604	0.000	104.6634	0.000	42.32138	0.000
/cut16	-5.348188	0.135	16.81061	0.000	2.832198	0.638	6.018507	0.311	74.44366	0.000	107.3908	0.000	45.21169	0.000
/cut17	-5.025004	0.161	17.24797	0.000	3.367471	0.577	6.385151	0.282	74.86453	0.000	107.9136	0.000	45.73056	0.000
no obs	2013		1873		1873		2013		2013		1865		1865	
no gov	54		54		54		54		54		54		54	
Wald	0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000	
LR	0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000	

Source: own calculations.

Table 10. Analysis of determinants influencing on Moody's long term foreign credit ratings of the insurance companies.

in_moody_f	Coef.	P>z	Coef.	P>z	Coef.	P>z	Coef.	P>z	Coef.	P>z	Coef.	P>z
lev	.0101638	0.848	-.1595627	0.005	-.198471	0.034	.0739024	0.198	-.0817928	0.363	-.331882	0.010
roa	-2.354549	0.762	-56.8239	0.575	-100.6944	0.370	3.491898	0.694	-71.94539	0.554	-132.9374	0.336
size	-1.928716	0.000	-5.216747	0.000	-6.861379	0.000	-.8375088	0.017	-9.061351	0.000	-13.32913	0.000
non	-.2835931	0.174	-.2612765	0.437	.2081683	0.599	-.3146414	0.217	-.0689581	0.863	.3854385	0.450
inv	-8.11462	0.000	-13.10005	0.000	-16.98686	0.000	-8.154241	0.000	-19.73749	0.000	-23.65698	0.000
liq	.0008569	0.374	.0088863	0.005	.0147467	0.213	.0007433	0.505	.0139294	0.000	.0197455	0.000
ri	.0041002	0.411	.0884503	0.230	.1145839	0.140	.0058682	0.252	.1376288	0.089	.1482813	0.077
ir	-.0001328	0.617	-.0073422	0.055	-.005603	0.164	-.0059011	0.096	-.0010525	0.796	-.0021258	0.622
hhi	-96.57046	0.688	287.8752	0.135	481.9119	0.097	-296.3275	0.272	-72.22682	0.821	1244.091	0.026
cr_moody_f			.2243933	0.000	.2319464	0.007			.3830329	0.001	.3231564	0.038
gdp					.0000737	0.114					.0000963	0.146
inf					.649987	0.015					.7176121	0.053
unmp					.2998047	0.418					-.5999128	0.197
den							.4893019	0.000	.110574	0.444	.1711307	0.383
lifeins							2.054924	0.000	.3329402	0.554	2.702222	0.006
nonins							3.568008	0.000	7.880383	0.000	8.402436	0.000
/cut1	-58.04723	0.000	-124.0888	0.000	-159.0028	0.000	-38.81296	0.000	-228.1471	0.000	-334.6595	0.000
/cut2	-54.75667	0.000	-116.7801	0.000	-150.9571	0.000	-33.95235	0.000	-216.958	0.000	-320.7437	0.000
/cut3	-51.5684	0.000	-112.8029	0.000	-146.7665	0.000	-29.69977	0.000	-211.8	0.000	-315.5965	0.000
/cut4	-49.63606	0.000	-107.3187	0.000	-140.4915	0.001	-27.17172	0.001	-205.8052	0.000	-308.0262	0.000
/cut5	-47.40482	0.000					-24.43363	0.003				
/cut6	-47.15567	0.000					-24.13149	0.004				
/cut7	-46.57414	0.000					-23.41826	0.005				
/cut8	-46.26726	0.000					-23.03952	0.005				
/cut9	-45.54091	0.000					-22.15691	0.007				
/cut10	-45.46819	0.000					-22.06565	0.008				
no obs	402		135		135		395		131		131	
no gov	12		5		5		12		5		5	
Wald	0.0000		0.0000		0.0000		0.0000		0.0000		0.0000	
LR	0.0000		0.0000		0.0000		0.0000		0.0000		0.0000	

Source: own calculations.