

# Overall Governance Index for Developed and Emerging European Life Insurance Markets<sup>1</sup>

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**Abstract:** The present study evaluates the relationship between governance and the development of the life insurance market in 31 European countries. For this, we considered the six Worldwide Governance Indicators. An overall governance index, which we called WGI, was computed based on them, using the principal component analysis. Afterwards, we employed the dynamic panel methodology in the system-GMM form to analyze the influence of WGI upon the life insurance market, having as proxy life insurance density. Additionally, we employed several socio-economic control variables. To serve our purpose, we have also divided the sample into developed and emerging economies by creating a dummy variable introduced in the analysis. All models were estimated in the robust form. Governance proved to have significant influence upon the life insurance market in the analyzed period: 2002 – 2012. The long-run coefficient is positive and significant. When the dummy is introduced in the analysis, the significance of the governance indicator decreases for the short term coefficient, while it disappears for the long-term one.

**Keywords:** Governance, Principal Component Analysis, Life Insurance Market, Europe

## INTRODUCTION

As legal differences and lack of trust in justice and financial system affect individual attitudes over life insurance, we aim to investigate to what magnitude the institutional quality of a country may impede the development of the life insurance sector.

In our analyses we have used the Worldwide Governance Indicators as proxies for governance issues in different countries assessed. The reason for this is that according to the literature, the reliability of the institutional environment can be judged using six measurements

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of governance initiated by Kaufmann et al. (2010): Voice and Accountability, Political Stability and Absence of Violence, Government Effectiveness, Regulatory Quality, Rule of Law and Control of Corruption. These six dimensions of governance are not independent; they are strongly positively correlated across countries. In contrast to other indexes used both in economics and other fields, there is no global assessment of these indicators. That is why we have constructed an overall governance index (WGI) that we used as proxy for the institutional quality. We have used the principal component analysis in order to establish a sound statistical relationship between the components and the final index.

A short review of the literature shows that the method of principal component analysis was previously used in studies related to governance issues or to the financial and insurance markets. However, none of these studies constructed and overall index for the six governance indicators presented by the World Bank.

Results are presented and divided into two main parts. In the first one we propose the new governance index. In the second one we employ this index in the assessment of governance issues upon the development of life insurance market in European countries following the same methodology as in Dragos et al. (2016). Additionally, we are interested to see if any differences exist between developed and emerging European economies, in terms of the influence the new governance index has upon the development of the life insurance market. In the end, some conclusions and policy implications are drawn.

## **PRINCIPAL COMPONENT ANALYSIS IN GOVERNANCE ISSUES**

The principal component analysis (PCA) is very much used in numerous researches, Economics included, if a large number of variables is evaluated. Pearson (1901) is the one that introduced this technique. Its goal is to reduce the number of variables and explain the relationships among them (Chen, 2008). Thusly, the dimension of the data set is significantly reduced, without losing variance (Shan et al., 2011). Each dimension contains a certain number of interdependent variables, obtained by preserving as much as possible from the existing variance in the initial data set.

Several empirical researches have examined the relationship between corporate governance indicators and different economic and social outcomes (economic performance indicators). Among them, Larcker et al. (2007) have considered it purposeful the use of principal component exploratory analysis to identify the main dimensions of corporate governance and determine the indicators associated with each factor. Only indicators with reasonable significance level and validity were kept for each corporate governance dimension. Thusly, they evaluated a set of 39 structural indicators on a sample of 2016 companies. The principal component analysis identified 14 dimensions of corporate governance. Dey (2008) is another study that investigates factors or variables related to corporate governance using the principal component analysis for 22 indicators.

Louizi and Kammoun (2016) have analyzed the methodologies used by rating agencies in the evaluation process of corporate governance systems. They took into account the fact that more and more stakeholders and creditors incorporate these corporate governance practices in risk evaluation. Employing the principal components analysis on a number of 51 criteria related

to corporate governance and a sample of 5 rating agencies, the authors have identified two significant factors: (1) one related to the rights of stakeholders and the board of director and (2) the other related to the remuneration policy and the degree of convergence between the interest of stakeholders and managers.

In the field of the insurance market, Chen et al. (2008) used the principal component analysis to determine the most important variables for the risk multiplier. These variables were afterwards used to propose a new strategy for portfolio insurance, namely “dynamic proportion portfolio insurance” using “genetic programming”. This strategy proved to be more profitable than “constant proportion portfolio insurance”, according to the above mentioned study.

The same method of principal component analysis was also used by Billio et al (2012) to suggest a group of econometric indicators of connectedness in the financial and insurance sectors. With the help of this method, they estimated the number and importance of common factors that contribute to the returns of these financial institutions.

The functional analysis of principal component was used even for the car insurance market, with the goal of an optimum selection of risks for establishing a proper price policy (Sergovia-Gonzales et al., 2009).

For Romania, the principal component analysis was employed, among others, by Armeanu and Lache (2008) and Dedu et al. (2009). The first study assesses issues related to the evaluation of performance of the insurance companies, while the latter estimates the insurance market at regional level.

This method was also used a macro level. For example, Han et al. (2014) have examined the way in which governance deficit or surplus affects economic growth. For this, they used the governance indicators provided by the World Bank.

E-Government practices were also assessed with the help of principal component analysis (Shan et al., 2011).

## **METHODOLOGY AND DATA**

The first step was to apply the principal component analysis in order to standardize and compose the six governance indicators to obtain the overall governance score, which we called WGI. The analysis was validated through pre and post-estimation procedures, such as the KMO value and the Bartlett’s test of sphericity in the first group, and the Cronbach’s Alpha coefficient in the second one. The WGI was computed as:

$$WGI = \sum_{i=1}^6 a_i X_i \quad \text{eq. (1)}$$

where  $a_i$  is the coefficient obtained through the principal component analysis and  $X_i$  is each of the six governance indicators.

In the second part of this article we evaluate the influence of governance, measured through our new index, upon the development of the life insurance market in Europe. For comparison reasons and based on the characteristics of the data used, we follow the analysis line applied in a previous study (Dragos et al., 2016). That is, we apply the dynamic panel methodology described by Roodman (2009) having as dependent variable the Life insurance density and as factor the newly computed WGI. Additionally, we use approximately the same control variables as in Dragos et al. (2016). The first step was to make sure the WGI features

comply with the dynamic panel methodology. We evaluated both stationarity and autocorrelation of the variable. The WGI proved to be I(0) (see figure A1 and table A1 in Annexes) but highly autocorrelated on the level and with no autocorrelation on the first difference.

Thusly, we first estimated the model presented in eq. (2):

$$INSURANCE\_DENSITY = const. + \alpha L.INSURANCE\_DENSITY_i + \beta_1 WGI_i + \beta_2 L.WGI_i + \mu_{it}$$

Taking into account the fact that we were interested to assess differences between developed and emerging European markets, we constructed a dummy variable that divided our sample based on this criterion (we used the value 1 for emerging economies). This dummy variable was also added to eq. (2) and the influence of WGI re-evaluated. Results are presented in table 1.

Afterwards we respecified the model by introducing control variables. This was done in two steps, following the same path as for the initial model. Firstly, we estimated eq. (2) with each of the control variables introduced individually. Secondly, for each of the control factors used, we re-estimated the equation by considering the dummy, to comply with the goal of our study (see table 2a and 2b in the results part).

In all cases, estimated equations present the short-run coefficients. The long-run ones were always tested for significance using the Wald coefficient test.

All equations were specified with 29 instruments. Several validation tests are presented, such as the Wald Chi<sup>2</sup>, the Arellano-Bond test, the Hansen test, etc.

Data is given by observations related to the six World Governance Indicators provided by the World Bank (2015) and the ones related to the life insurance market and several control variables related to economic and social aspects. The sample is made up of 31 European countries that were analyzed for the 2002 – 2012 period.

The control variables used are related to economic and social aspects. We employ:

- the Gini index as a measure of income inequality,
- the age dependency ratio as a measure of socio-economic pressure,
- the percent of population enrolled in tertiary education and a measure of the countries level of education,
- the interest rate – to account for alternative saving instruments such as bank deposits,
- the inflation rate,
- the GDP per capita, also as a measure of wealth and economic development,
- the urbanization rate,
- Social incorporates the share of social protection expenditure in the GDP,
- Fiscal is the fiscal freedom indicator, measuring the tax burden of a country.

The WGI was constructed using SPSS 19, while the dynamic panel analysis was run in STATA 14.

## RESULTS

### 1. The overall governance index – WGI

The six governance indicators are scores from 1 to 100. But there is no global index to assess this issue at national level. That is why we have employed the principal component analysis to construct such an overall measure of governance. We finally named it WGI.

The pre-estimation tests validate the results. We obtained a value for the KMO of 0.9 >> 0.5, while the probability returned by the Bartlett's test is 0.000. As expected, the analysis grouped the six factors into a single component, allowing us to reach the main goal of the study. This component explains about 86% of the variance.

The WGI scores were computed based on the following equation:

$$\text{WGI} = 0.187 * \text{Voice and accountability} + 0.146 * \text{Political stability} + 0.186 * \text{Government effectiveness} + 0.181 * \text{Regulatory quality} + 0.188 * \text{Rule of law} + 0.186 * \text{Control of corruption}$$

In the post-estimation stage we conducted two types of validation procedures. First of all, we looked for outlier values, i.e. values higher than 3, in modulus. Our minimum score was -2.77, while the maximum one was 1.36. Consequently, the procedure returned no outlier values. Secondly, we computed the Cronbach's Alpha coefficient to account for the reliability of results. We obtained a value of 0.934 >> 0.7 (the reliability benchmark).

Due to the fact that the principal component analysis returned a statistically significant index, we proceeded with model estimations to account for the influence of this index upon the life insurance market and evaluate the existence of differences between developed and emerging markets.

### 2. WGI vs. development of the European life insurance market

The first step was to run eq. (2), both in the simple and the dummy form. As table 1 shows, coefficients of the WGI are highly significant for the whole sample, both on short and long term. Additionally, the long-run coefficient is positive, pointing out a direct relationship between governance and life insurance market development. When the dummy variable accounting for the level of development is introduced, both the level of significance of the WGI and the difference between the two coefficients diminish, but the short term influence remains valid. The long-run coefficient is no longer significant. This could be explained by the fact that the coefficient of the dummy variable is highly significant and it probably encompasses the effect of governance. Its negative sign is evidence that emerging economies have a less developed life insurance market (result expected).

**Table 1. WGI's influence on the life insurance market – results for eq. (2).**

Indep. Variables		
L.density	0.865*** (0.043)	0.608*** (0.091)
WGI	1.99*** (0.593)	1.515** (0.759)
L.WGI	-1.831*** (0.581)	-1.435* (0.753)
Dummy	-	-1.49*** (0.435)
Constant	0.854*** (0.25)	2.885*** (0.632)
Hansen test (prob.)	0.358	0.241
Arellano-Bond AR(2) (prob.)	0.08	0.084
Wald Chi <sup>2</sup>	4972.5	1368.86
<b>Long-run coefficient testing</b>		
Wald Chi <sup>2</sup>	19.22	0.48
Prob.	0.000	0.488

Coefficient (Robust standard errors).

\*\*\* - significant at 1%, \*\* - significant at 5%, \* - significant at 10%.

Source: own computations in STATA 14.

When control variables are introduced in the analysis and eq. (2) respecified, the dummy variable remains highly significant in all models obtained, regardless of the control factor used. Additionally, it conserves the same negative sign, showing a poorer development of the life insurance market for the emerging economies. The first lag of the dependent variable is also highly significant and positive.

Our newly computed index, the WGI is statistically significant in all models specified without the dummy variable, with its level positive and its lag, negative. From this perspective, we can say that the model obtained in eq. (2) is robust as introducing the controls did not change the relationships between the variables, nor their significance. However, the long-run coefficient is not significant in all cases. It lacks significance when the interest rate, the GDP/cap and the fiscal freedom are considered as control. In all other cases, the long term coefficient of the WGI is statistically significant in the models specified without the dummy variable. This means that when we do not discriminate based on economic development, the newly obtained governance indicator significantly influences the development of the insurance market, both on short and long-run.

Introducing the dummy variable has the same effect as in the initial model. The significance of the WGI lowers, in both forms, sometimes even disappears (in the case of age

dependency ratio and education). The long term coefficients are no longer significant. This may be explained by the fact that, usually, developed countries have a higher governance quality. Thusly, by discriminating between the two groups, we automatically subtract some features of the WGI and include them in the dummy.

In what regards the control variables, inflation is significant at the 10% level, while the interest rate and fiscal freedom are at the standard 5% one in the simple model. In the dummy models, none of the control variables are significantly influencing the development of the life insurance market.

**Table 2a. WGI's influence on the life insurance market – eq. (2) with individual control variables and dummy.**

Indep. Variables	Gini index		Age dependency		Inflation		Education	
L.density	0.857*** (0.049)	0.653*** (0.085)	0.855*** (0.057)	0.606*** (0.097)	0.818*** (0.051)	0.605*** (0.091)	0.872*** (0.046)	0.539*** (0.121)
WGI	2.232*** (0.591)	1.81** (0.777)	2.16*** (0.732)	1.548 (0.949)	2.367*** (0.629)	1.609** (0.823)	1.807*** (0.531)	1.016 (0.776)
L.WGI	-2.024*** (0.569)	-1.675** (0.75)	-1.94*** (0.71)	-1.466 (0.906)	-2.18*** (0.616)	-1.522* (0.813)	-1.675** (0.75)	-0.913 (0.773)
Control variable	0.024 (0.019)	0.012 (0.029)	0.009 (0.024)	0.002 (0.038)	-0.028* (0.016)	-0.006 (0.018)	-0.002 (0.003)	0.009 (0.007)
Dummy	-	-1.157*** (0.43)	-	-1.485*** (0.444)	-	-1.45*** (0.465)	-	-1.716*** (0.566)
Constant	0.166 (0.604)	2.15* (1.26)	0.484 (0.982)	2.777 (1.815)	1.22*** (0.323)	2.909*** (0.645)	0.908*** (0.259)	2.821*** (0.686)
Hansen test (prob.)	0.570	0.326	0.302	0.322	0.533	0.209	0.386	0.278
Arellano-Bond AR(2) (prob.)	0.128	0.11	0.09	0.104	0.16	0.09	0.091	0.134
Wald Chi <sup>2</sup>	3306.6	1864.6	3823.8	1730.4	7876.01	1732.7	5692.9	1244.54
<b>Long-run coefficient testing</b>								
Wald Chi <sup>2</sup>	22.63	1.07	14.3	0.43	13.5	0.63	24.16	0.86
Prob.	0.000	0.3	0.000	0.513	0.000	0.427	0.000	0.355

Coefficient (Robust standard errors).

\*\*\* - significant at 1%, \*\* - significant at 5%, \* - significant at 10%.

Source: own computations in STATA 14.

**Table 2b. Dynamic panel estimations – WGI and control variables.**

Indep. Variables	Interest rate		Urbanization rate		GDP		Social		Fiscal	
	L.density	0.897** * (0.04)	0.65*** (0.092)	0.848** * (0.043)	0.606** * (0.091)	0.792** * (0.117)	0.609** * (0.155)	0.819** * (0.061)	0.545** * (0.092)	0.82*** (0.041)
WGI	1.802** * (0.655)	1.456* (0.783)	1.955** * (0.64)	1.51* (0.777)	1.937** * (0.587)	1.515** (0.763)	2.125** * (0.647)	1.676** (0.805)	2.032** * (0.685)	1.541* (0.803)
L.WGI	-1.779** * (0.599)	-1.445* (0.751)	-1.788** * (0.629)	-1.426* (0.777)	-1.844** * (0.589)	-1.434* (0.755)	-1.954** * (0.637)	-1.583** (0.799)	-1.917** * (0.681)	-1.463* (0.806)
Control variable	-0.052** (0.026)	-0.029 (0.032)	-0.007 (0.008)	-0.002 (0.01)	0.257 (0.331)	-0.005 (0.5)	0.313 (0.246)	0.396 (0.332)	-0.888** (0.367)	-0.112 (0.584)
Dummy	-	1.343** * (0.403)	-	1.466** * (0.441)	-	1.492** * (0.45)	-	1.517** * (0.417)	-	-1.424** (0.628)
Constant	0.947** * (0.201)	2.737** * (0.597)	1.425** (0.678)	3.054** * (0.965)	-1.293 (2.707)	2.927 (4.413)	0.163 (0.555)	2.047** (1.042)	4.788** * (1.621)	3.291* (1.943)
Hansen test (prob.)	0.237	0.259	0.314	0.218	0.309	0.202	0.303	0.231	0.381	0.205
Arellano-Bond AR(2) (prob.)	0.049	0.058	0.081	0.086	0.072	0.083	0.074	0.072	0.116	0.086
Wald Chi <sup>2</sup>	4066.8	2157.7	3682.26	1448.5	3484.2	1684.9	5102.8	1244.91	2973	1459.73
<b>Long-run coefficient testing</b>										
Wald Chi <sup>2</sup>	0.06	0.00	11.86	0.6	0.46	0.24	11.12	0.76	2.3	0.47
Prob.	0.80	0.944	0.000	0.438	0.496	0.623	0.000	0.384	0.13	0.495

Coefficient (Robust standard errors).

\*\*\* - significant at 1%, \*\* - significant at 5%, \* - significant at 10%.

Source: own computations in STATA 14.



## CONCLUSIONS

The present study presents a newly constructed index that assesses governance at a global level. Using the six Worldwide Governance Indicators and the principal component analysis, we have constructed the WGI index.

Following the path in other studies, this new governance indicator was tested as influence upon the development of the life insurance market, both a global level and by dividing the sample into two groups: developed and emerging economies.

We find that the WGI strongly influences the life insurance market. Its long-run coefficient is positive, showing that improving governance on long term will lead to an increase of the life insurance market in a national economy.

However, when the level of economic development is introduced in the analysis, the significance of the governance index lowers or even disappears in the case of some control variables. Its long-run effect is no longer significant. This may be explained by the fact that economic development is linked to governance, in the sense that we expect more developed countries to have a higher level of governance. Thusly, the effect of WGI is partially taken by the dummy variable.

The fact that institutional quality helps the development of life insurance market can be used by policymakers by trying to strengthen the governance aspects mostly in developing countries. In those countries there still are problems regarding the capacity of the government to effectively formulate and implement sound policies which negatively affects the life insurance sector.

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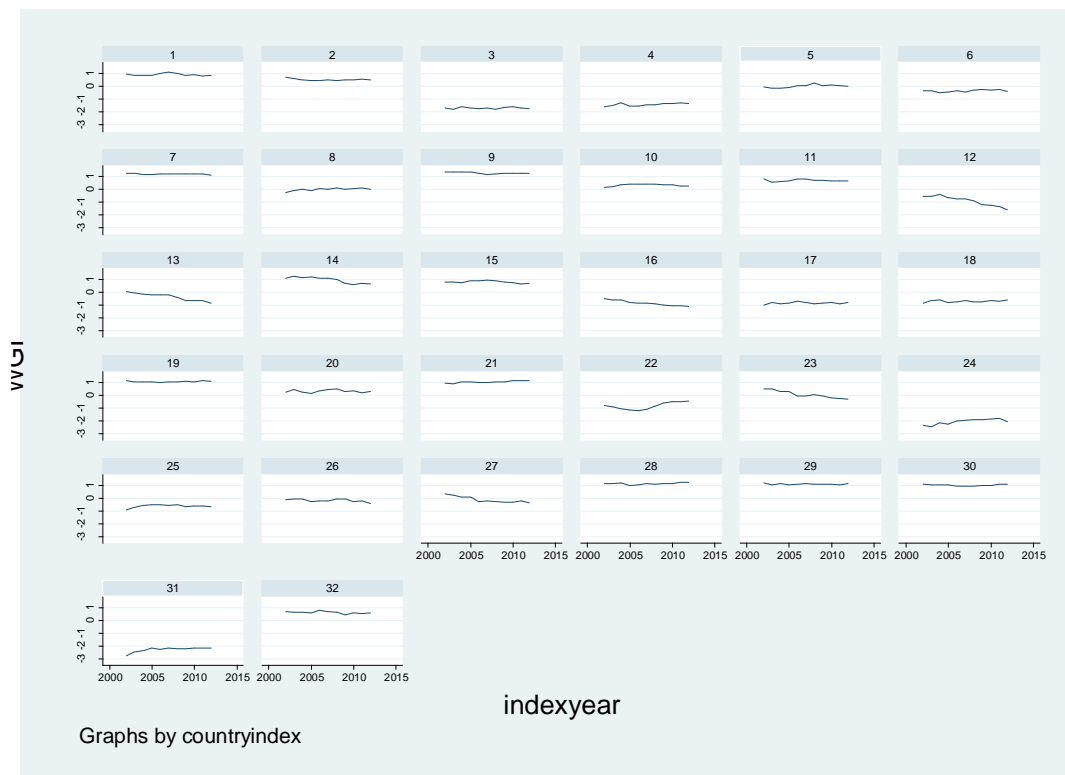
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**Annexes**

**Figure A1. WGI for the countries in the sample.**



Source: own construction.

**Table A1. Levin-Lin-Chu unit-root test for WGI**

Ho: Panels contain unit roots                      Number of panels = 32  
 Ha: Panels are stationary                         Number of periods = 11  
 AR parameter: Common                            Asymptotics:  $N/T \rightarrow 0$   
 Panel means: Included  
 Time trend: Not included  
 ADF regressions: 1 lag  
 LR variance: Bartlett kernel, 7.00 lags average (chosen by LLC)

	Statistic	p-value
Unadjusted t	-10.1279	
Adjusted t*	-5.5920	0.0000