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Performance Persistence in the Insurance Markets – Comparative Analysis of Selected Central and Eastern European Countries

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Abstract

In this paper researchers has analyse the performance persistence of the insurance companies operating in the insurance markets of the selected Eastern and Central European countries, i.e. Croatia, Slovenia, Hungary and Poland in the 1998-2011 period. In this paper persistence in performance refers to the ability of an insurance company to achieve the growth rate for two consecutive years above the median, compared to other insurance companies in the market. The contingency table approach is used to identify the number of insurance companies that are labelled as winners or losers over the consecutive periods. Several methods were used such as Malkiel's Z-test, Brown and Goetzmann Z-test, χ^2 *-statistics by Kahn and Rudd, Cochran method and Kruskal-Wallis analysis of variance. The empirical analysis shows that there is persistence in performance of insurance companies in particular periods. More specifically, depending on the tests applied, in all countries there were consecutive periods with performance persistence as well as consecutive periods with no proof of persistence in performance. The long-term analysis indicates that the longest period of maintaining the same status of either winner or loser was recorded for insurance companies in Croatia, and the shortest in Hungary. Long-term analysis didn't show any statistically significant difference in performance persistence among countries.*

Key Words: *Insurance markets, Central and Eastern European countries, Performance persistence.*

Introduction

This article deals with some important aspects of the trends in performance persistence in the insurance markets in selected Central and Eastern European countries. The area of research comprises four countries: Croatia, Poland, Hungary and Slovenia during the fourteen-year period from 1998 to 2011. Although, all four mentioned countries are now members of the European Union, they were selected for the analysis since these are the countries with similar economic and political background. The insurance business in these Central and Eastern European countries is relatively proportional to the dimensions of their markets. The potential of these countries is undeniable and it is illustrated by the rapid growth of the insurance industry (Comité Européen des Assurances, European Union Enlargement 2004). Moreover, former state monopolies still hold the leading market position, but, they are rapidly losing market share.

However, the differences between insurance markets of these countries are substantial. For example, insurance market development indicators, such as insurance density and penetration, are much higher in

Slovenia. Hungary and Poland are different from the other countries insofar they have a relatively high level of life insurance premium in total premium, i. e. life insurance represents more than 1/2 of the total insurance markets while in Croatia and Slovenia it is 27% and 29% respectively.

Besides their representativeness, these countries were chosen due to the data availability as well. The year 1998 is taken as the starting year of research due to the fact that earlier data are not comparable because of the different ways of calculating insurance premiums in Croatia. In order to avoid possible misinterpretation in period before and after the 1998th and to ensure comparability, the data in the 1998-2011 period were used.

The performance persistence is much analysed topic, but in the financial services sector it generally focuses on mutual or pension funds. Therefore, we wanted to explore the performance persistence in the insurance sector and to contribute to the existing financial literature with new empirical evidence on performance persistence of insurers. Moreover, the study improves the methodological approach by conducting comparative analysis of performance persistence between four Central and Eastern European countries.

The rest of the paper is organised as follows. The next section gives an overview of the relevant literature. Third section gives a review of the characteristics and recent developments in the insurance markets in the selected Central and eastern European countries. The fourth section describes the sample construction. The fifth section outlines methodology applied whereas the results of the empirical analysis are reported in the sixth section. The final section concludes with summary of the main points of the paper.

Literature Review

Performance persistence has intrigued many scientists over the years. Therefore, in recent decades scientists generated a large number of studies dealing with this issue. These studies differ in what type of companies, i. e. industry is the subject of analysis, the performance measure used, method applied and both geographical and time coverage.

There are a number of studies that have found strong evidence of performance persistence, but there are also a great number of studies that do not support this evidence suggesting that the use of different methodologies is one of the key reasons for the varied results found in the literature.
Although the scientists have produced many performance persistence studies there is a lack of studies dealing with performance persistence of insurers. Therefore, we will only mention here a few recent studies focusing on financial sector and briefly document their findings.
Ferruz, Sarto and Vargas (2004) have conducted a financial study of performance persistence in Spanish short-term fixed income investment funds. Performance is analysed using a novel index that is based on Sharpe's original but provides coherent rankings for the whole sample employed in the study even where the portfolio yield is negative. The study was performed on a total of 207 funds over the period from July 1994 through June 2002. The performance persistence phenomenon is analysed half yearly and yearly using two methodologies. The first is a non-parametric methodology in which the statistical tests of Malkiel, Brown and Goetzman, and Kahn and Rudd are applied to establish the robustness of the phenomenon studied, while the second is regression analysis. This study using an eight-year data base that is free of survivorship bias has found an evidence of performance persistence.

Ferruz, Vicente and Andreu (2007) analysed the persistence phenomenon on the returns obtained by Spanish equity pension funds in the 1999-2006 period. Using 2x2 and 4x4 contingency tables the authors found evidence of the persistence in short run. The authors have also examined the existence of long-run performance persistence obtaining unaffirmative results, i.e. a minority of funds show a constant winning (losing) behaviour.
Eling (2008) in its paper deals with hedge fund performance persistence. The author finds different levels of performance persistence depending on the statistical methodology and the hedge fund strategy

employed. Correlation-, contingency-table-, and regression-based tests provide evidence of performance persistence, whereas the Kolmogorov-Smirnov test reveals very little persistence. In this study, performance persistence cannot be explained by the use of optionlike strategies, but it can be partially explained by survivorship and backfilling bias. Differences among hedge fund strategies might be explained by return smoothing. Finally, the author developed a rationale for choosing between different methodologies to measure performance persistence and concluded that the multi-period Kolmogorov-Smirnov test was the most useful for evaluating performance persistence of hedge funds.

Huij and Lansdorp (2012) use a comprehensive database of mutual funds and study performance persistence across different styles, regions and asset classes. The authors have found strong evidence of performance persistence for some markets, but also weak or no evidence for other markets. More specifically, they found that for all asset classes in their sample there is evidence of persistence in performance that is economically as well as statistically significant. But by comparing persistence in performance across the asset classes, they found that differences between classes can be substantial.

Characteristics and Recent Developments in Selected Central and Eastern European Countries

The size of the insurance market in a particular country is often viewed in terms of number of insurance companies operating on the market. There were 5 500 insurance companies in Europe in 2011 (Insurance Europe, Statistics N°46, European Insurance in Figures, January 2013). In terms of insurers the UK is the largest market with about 1200 insurance companies. The second and third largest markets in terms of insurance companies are Germany, with 580 insurance companies, and France, with just over 430 companies.
There is a wide variation in the number of companies conducting insurance business across the observed Central and Eastern European countries covered by the analysis. The greatest number of insurance companies is operating in Poland which is logical and proportional to its dimensions.

Table 1 Number of market operators

Year/Country	Croatia	Poland	Hungary	Slovenia
2000	25	33	18	11
2001	22	35	19	11
2002	23	74	28	14
2003	24	77	28	15
2004	24	74	28	16
2005	25	74	28	16
2006	20	72	27	17
2007	23	76	31	17
2008	25	66	30	17
2009	27	66	30	20
2010	26	63	30	20
2011	26	61	30	20

Source: Insurance Europe,
http://www.insuranceeurope.eu/uploads/Modules/StatisticalSeriesPublications/Market operators_2011_final-2.xlsx
and
http://www.insuranceeurope.eu/uploads/Modules/StatisticalSeriesPublications/Market%20operators.xls

Insurance density is a commonly recognized indicator of insurance activity. It is expressed by showing total gross written premiums per inhabitant.

Table 2 Average total premiums per capita 2000-2011(€)

Year/Country	Croatia	Poland	Hungary	Slovenia	EU27
2000	134	136	146	471	1,672
2001	153	159	160	530	1,640
2002	169	157	200	594	1,688
2003	180	148	217	639	1,708
2004	199	159	235	730	1,799
2005	223	202	274	774	1,944
2006	252	252	312	861	2,105
2007	278	304	368	942	2,257
2008	302	441	352	1004	1,999
2009	289	311	295	1019	1,996
2010	287	355	306	1023	1,878*
2011	279	357	294	988	1,828*

Source: Insurance Europe,
http://www.insuranceeurope.eu/uploads/Modules/StatisticalSeriesPublications/Total%20premiums_final.xls
http://www.insuranceeurope.eu/uploads/Modules/StatisticalSeriesPublications/Total premiums_2011_final-2.xlsx

*represents the data of the countries which are members of the European insurance and reinsurance federation accounting for around 95% of total European premium income

A well known fact is that insurance density is high in the large financial centres, i.e. in old Western European countries. In central and eastern Europe, the average amount policyholders dedicate to insurance products is substantially below the EU average. Among the observed countries, the highest insurance density in 2011 is in Slovenia with a level of €988 per capita.
Since density is a reflection of premium income, the rather significant rises reported in Slovenia are a logical consequence of the increase in insurance premiums, although insurance density had almost doubled in all observed countries.

Table 3 Total premiums to GDP ratio 2000-2011

Year/Country	Croatia	Poland	Hungary	Slovenia	EU27
2000	2.6%	2.8%	2.9%	4.4%	8.4%
2001	2.7%	2.9%	2.7%	4.6%	8.0%
2002	2.7%	2.9%	2.9%	4.8%	8.3%
2003	2.7%	2.9%	3.0%	5.0%	8.3%
2004	2.7%	3.0%	2.9%	5.4%	8.3%
2005	2.8%	3.2%	3.1%	5.4%	8.7%
2006	2.9%	3.5%	3.5%	5.6%	8.9%
2007	2.9%	3.7%	3.7%	5.5%	9.1%
2008	2.8%	4.6%	3.3%	5.4%	8.0%
2009	2.8%	3.8%	3.2%	5.9%	8.5%
2010	2.8%	3.8%	3.2%	5.9%	8.1%*
2011	2.7%	3.7%	2.9%	5.6%	7.7%*

Source: Insurance Europe,
http://www.insuranceeurope.eu/uploads/Modules/StatisticalSeriesPublications/Total%20premiums_final.xls
http://www.insuranceeurope.eu/uploads/Modules/StatisticalSeriesPublications/Total premiums_2011_final-2.xlsx

* represents the data of the countries which are members of the European insurance and reinsurance federation accounting for around 95% of total European premium income

All the countries encompassed by this analysis have insurance penetration rate rather below EU average. But, similarly to total density, among eastern countries it is in Slovenia that insurance penetration is the highest at 5.6%.

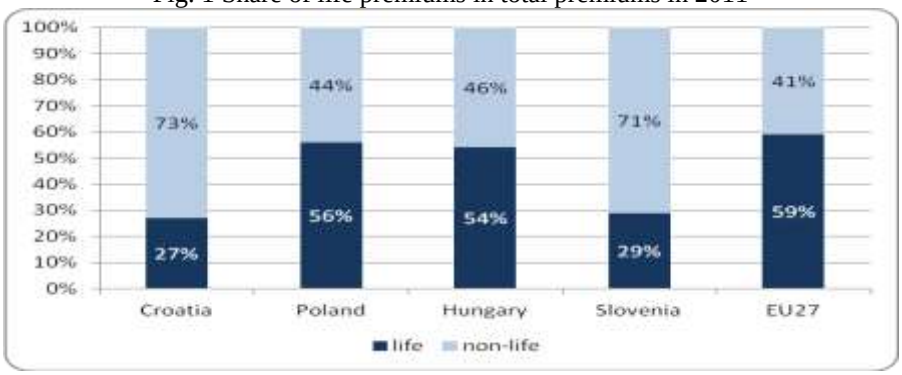
Table 4 Share of life premiums in total premiums

Year/Country	Croatia	Poland	Hungary	Slovenia	EU27
2000	17%	40%	46%	19%	65%
2002	21%	43%	41%	23%	62%*
2003	22%	45%	40%	24%	61%
2005	26%	49%	44%	30%	63%
2007	27%	58%	55%	32%	65%
2008	26%	66%	52%	32%	61%
2009	26%	59%	50%	30%	61%
2010	27%	58%	52%	31%	61%*
2011	27%	56%	54%	29%	59%*

Source: Insurance Europe,
http://www.insuranceeurope.eu/uploads/Modules/StatisticalSeriesPublications/Total%20premiums_final.xls
http://www.insuranceeurope.eu/uploads/Modules/StatisticalSeriesPublications/Total_premiums_2011_final-2.xlsx
* represents the data of the countries which are members of the European insurance and reinsurance federation accounting for around 95% of total European premium income

The level of development of insurance markets is most commonly measured by two relative indicators such as insurance density and the share of premiums in GDP. However, level of development of insurance markets can be seen from the proportion life insurance premiums take in total premiums. The premium income in Western European countries as well as in the Scandinavian countries is mostly made of life insurance premiums. The proportion of life insurance premiums in total premiums shows great disparities across countries covered by the analysis, ranging in 2011 from 27% in Croatia to 56% in Poland. The 3proportion of life insurance premiums in Poland and Hungary is 56% and 54%, respectively ranking just behind the EU average.

Fig. 1 Share of life premiums in total premiums in 2011



Source: Insurance Europe,
http://www.insuranceeurope.eu/uploads/Modules/StatisticalSeriesPublications/Total%20premiums_final.xls
http://www.insuranceeurope.eu/uploads/Modules/StatisticalSeriesPublications/Total_premiums_2011_final-2.xlsx (data for EU27 exclude Lithuania)

Data Sample

The analysis in this paper is based on the data of growth rate of all insurance companies that operated in the insurance markets in Croatia, Poland, Hungary and Slovenia in the 1998-2011 period. The growth rate was calculated on the basis of total gross premium written by all insurance companies that were conducting insurance business in the above mentioned period. These changes are calculated in nominal terms, i.e. non-inflation adjusted.

Growth rate was calculated as follows:

$$\frac{(\mathrm{GWP}_t - GWP_{t-1})}{GWP_{t-1}} \times 100$$

where GWP_t denotes gross written premium in the current year, whereas GWP_{t-1} denotes gross premium written in the previous year.

The analysis referring to the Republic of Croatia is based on the data of growth rate of all insurance companies that operated in the Croatian market in the 1998-2011 period. The growth rate was calculated on the basis of total gross premium written by life, non-life and composite insurance companies conducting insurance business in the above mentioned period. The data on gross written premium were obtained from Insurance Companies Supervisory Authority's bulletin as well as from the Annual Reports of its legal successor Croatian Financial Services Supervisory Agency (CFSSA).

The data on gross written premium achieved by Polish insurance companies (both life and non-life) that operated in the 1998-2011 period where obtained from Insurance and Pension Funds Supervisory Commission and its legal successor Polish Financial Supervision Authority.

The data on gross premium insurance income achieved by Hungarian insurance companies were obtained from different issues of market reports called Hungarian Insurance Companies' Yearbook by Association of Hungarian insurance companies.

The analysis referring to the Republic of Slovenia encompassed all insurance companies that operated in the Slovenian insurance market in the 1998-2011 period. The data on total gross premium written by individual insurers were obtained from Slovenian Insurance Association and from Annual Reports published by Slovenian Insurance Supervision Agency.

Methodology

In this paper persistence in performance refers to the ability of an insurance company to achieve the growth rate for two consecutive years above the median, compared to other insurance companies on the market. Those who attained growth rate above the median were labelled as “winners” (W) and those who didn’t as “losers” (L).

The contingency table approach is used to identify the number of insurance companies that are labelled as winners or losers over consecutive periods.

Table 5 Winner/loser contingency table

Period	t+1	
t	Winner	Loser
Winner	WW	WL
Loser	LW	LL

Insurance companies that managed to achieve growth rate above median in two consecutive periods were labelled WW. Those who were winners in first period, but failed to repeat results in the following year were labelled WL. An insurance company that shifted from being a loser to winner was defined as LW, and a company that made bad results in two consecutive periods was denoted by LL. The analysis included only those insurance companies that operated on the market in both consecutive periods. This is where a potential survivorship bias appears, because the companies entering the market or exiting the market were excluded, so there is a possibility to overstate persistence (Malkiel, 1995). However, Blitzer (1995) states that any attempt of reducing bias can create even more inaccuracy.

Different statistical criteria were applied to test the independence of results.

The first one is the Z-test applied by Malkiel (1995). If the probability *p* that a winner in one period continues to be a winner in the following period equals or is less than 0.5 it indicates no persistence.
Z-test value is defined as

$$Z = \frac{y - np}{\sqrt{np(1-p)}}$$

where *y* is the number of repeat winners (WW), *n* is the number of winners in the first period (WW + WL), *p* is probability for a winner of repeating being winner in the following period (0.5).

The second test is Z-test by Brown and Goetzmann (1995) which calculates the Odds Ratio (OR)

$$OR = \frac{WW \cdot LL}{WL \cdot LW}$$

OR is the ratio of the product of repeat winners (WW) and repeat losers (LL) divided by the product of those who shifted their position from winners to losers (WL) or losers to winners (LW). OR greater than one indicates persistence in achieving results, while OR below one indicates reversals.
Standard error is given by

$$\sigma_{\log(OR)} = \sqrt{\frac{1}{WW} + \frac{1}{WL} + \frac{1}{LW} + \frac{1}{LL}}$$

and Z-statistic is defined as

$$Z = \frac{\ln(OR)}{\sigma_{\log(OR)}}$$

The third test is the Chi-square statistic applied by Kahn and Rudd (1995), defined as

$$\chi^2 = \sum_{i=1}^{n}\sum_{j=1}^{n}\frac{(O_{ij} - E_{ij})^2}{E_{ij}}$$

Where O_{ij} is the observed frequency in the *i*th row and *j*th column in the contingency table, E_{ij} is the expected frequency in the *i*th row and the *j*th column in the contingency table and *n* is number of insurance companies.
To provide the evidence for the persistence in the whole period Cochran method (1954) is used.
Y-statistic is defined by

$$Y = \frac{\sum_{i=1}^{g} w_i \cdot d_i}{\sqrt{\sum_{i=1}^{g} w_i \cdot P_i \cdot Q_i}}$$

where

$$P_i = \frac{n_{i1}p_{i1} + n_{i2}p_{i2}}{n_{i1} + n_{i2}}$$

$$Q_i = 1 - P_i$$

$$d_i = p_{i1} - p_{i2}$$

$$w_i = \frac{n_{i1}n_{i2}}{n_{i1} + n_{i2}}$$

$$n_{i1} = WW + WL \text{ and } n_{i2} = LW + LL$$

$$p_{i1} = \frac{WW}{n_{i1}} \text{ and } p_{i2} = \frac{LW}{n_{i2}}$$

g is the number of contingency tables used.

Kruskal-Wallis one-way analysis of variance by ranks is used for comparing performance persistence among four countries in long term.

Empirical Results

Short-Term Analysis

In this chapter empirical results of annual achievements of insurance companies in Croatia, Poland, Hungary and Slovenia are presented in 4 different tables. The first column of each table is a year, for example data in row of year 2000 represent results for the year 2000 compared to results achieved in the previous year – 1999 in this case. The next four columns represent number of IC that were labelled WW, WL, LW and LL repeatedly. The last three columns show statistical results of Malkiel Z-test, Brown and Goetzmann Z-test and Chi-square statistic by Kahn and Rudd.

Table 6 Contingency table and performance persistence tests in Croatia

Year	WW	WL	LW	LL	M Z-test	B&G Z-test	χ^2 -test
2000	8	3	3	8	1.508	**2.049**	**4.545**
2001	8	2	2	9	**2.111**	**2.600**	**8.143**
2002	7	3	3	7	1.265	1.736	3.200
2003	8	3	3	7	1.508	1.891	**3.952**
2004	8	3	3	8	1.508	**2.049**	**4.545**
2005	9	2	2	8	**2.111**	**2.600**	**8.143**
2006	7	3	3	6	1.265	1.559	2.684
2007	8	2	2	8	1.897	**2.480**	**7.200**
2008	7	3	3	7	1.265	1.736	3.200
2009	9	2	2	9	**2.111**	**2.721**	**8.909**
2010	9	2	2	9	**2.111**	**2.721**	**8.909**
2011	8	4	4	8	1.155	1.601	2.667
Bold indicates statistically significant at 5%							

Malkiels Z-test, Z-test by Brown and Goetzmann as well as the Chi-square statistic applied by Kahn and Rudd, as shown in Table 6, provide evidence of significant performance persistence in two consecutive

years for the periods 2000-2001, 2004-2005, 2008-2009 and 2009-2010. Different tests provide different results for the 1999-2000, 2002-2003 and 2006-2007 periods. Although, the number of repeating (WW or LL) insurance companies is higher than the number of changing (WL or LW) companies in all periods, statistical significance is not achieved in 4 of 12 periods. This can be due to small number of insurance companies in Croatia (less than 30), especially compared to some Western European countries like UK with approximately 1,200 insurance companies.

Table 7 Contingency table and performance persistence tests in Poland

Year	WW	WL	LW	LL	M Z-test	B&G Z-test	χ^2 -test
2000	17	6	6	17	**2.294**	**3.102**	**10.52**
2001	18	6	6	18	**2.449**	**3.296**	**12.00**
2002	22	10	10	22	**2.121**	**2.924**	**9.00**
2003	25	9	8	25	**2.744**	**3.844**	**16.28**
2004	20	11	11	20	1.616	**2.252**	**5.23**
2005	24	8	8	24	**2.828**	**3.806**	**16.00**
2006	19	12	12	19	1.257	1.762	3.16
2007	18	12	12	18	1.095	1.539	2.40
2008	20	8	8	20	**2.268**	**3.098**	**10.29**
2009	17	14	14	16	0.539	0.638	0.44
2010	17	14	14	17	0.539	0.761	0.58
2011	16	14	14	15	0.365	0.388	0.19
Bold indicates statistically significant at 5%							

Table 7 shows that in the period of premium growth performance persistence is statistically significant (1999—2005), while in the periods of crisis in which no premium growth is achieved, there is no evidence of performance persistence. In the 1999-2008 period, as many as 69,2% of insurance companies repeated their status from the previous year, while in the crisis period from 2009 this was achieved by only 59% of companies. Assumption can be made that in the period of economic growth, insurance companies managed to achieve growth rates in consecutive periods, but that the crisis periods affected all companies.

Table 8 Contingency table and performance persistence tests in Hungary

Year	WW	WL	LW	LL	M Z-test	B&G Z-test	χ^2 -test
2000	5	5	4	5	0.333	0.242	0.158
2001	7	3	3	7	1.265	1.736	3.200
2002	6	4	5	6	0.302	0.664	0.524
2003	10	2	2	10	**2.309**	**2.938**	**10.667**
2004	9	3	3	9	1.732	**2.331**	**6.000**
2005	9	4	4	10	1.604	**2.048**	**4.556**
2006	11	3	2	11	**2.496**	**2.982**	**10.778**
2007	9	4	4	9	1.387	1.908	**3.846**
2008	6	7	7	5	-.577	-.607	0.440
2009	8	5	5	8	0.832	1.166	1.385
2010	8	6	6	9	0.775	0.919	0.931
2011	7	7	7	7	0.000	0.000	0.000
Bold indicates statistically significant at 5%							

Until 2002 the recorded effects in the performance persistence were not statistically significant, while in the 2003-2007 period the insurance companies that were winners or losers in one year had a greater probability of repeating the same results in the following year. This data is comparable to Poland where in the crisis period since 2008 performance persistence effects were not statistically significant.

Negative, but not significant values are found only in 2008, when more insurance companies that changed their label were noticed then the ones that repeated their position.

Table 9 Contingency table and performance persistence tests in Slovenia

Year	WW	WL	LW	LL	M Z-test	B&G Z-test	Chi-square
2000	5	1	1	4	1.342	1.914	**4.636**
2001	5	1	1	5	1.633	**2.078**	**5.333**
2002	5	1	1	5	1.633	**2.078**	**5.333**
2003	3	3	3	3	0.000	0.000	0.000
2004	4	1	1	4	1.342	1.754	3.600
2005	4	1	1	4	1.342	1.754	3.600
2006	5	1	1	3	1.000	1.701	**4.400**
2007	5	1	1	5	1.633	**2.078**	**5.333**
2008	5	2	1	5	1.633	1.832	**3.923**
2009	5	2	2	5	1.134	1.549	2.571
2010	5	2	3	4	0.378	1.063	1.429
2011	4	3	4	4	0.000	0.276	0.200
Bold indicates statistically significant at 5%							

Slovenia is a relatively small country with a population below 2 million and a small number of insurance companies, thus the statistical significance in performance persistence was difficult to prove on such a small number. Malkiel z-statistic results indicate no evidence of persistence in all periods. In contrast Z-test by Brown and Goetzmann and Chi-square statistic by Kahn and Rudd showed significant performance persistence in several periods. Comparable to Hungary and Poland, in crisis periods characterized by stagnation and premium decline, the Slovenian insurance companies do not show performance persistence.

The small sample size, especially in Slovenia and the potential for survivorship bias are some of the limitations of this research. Therefore the results require careful interpretation.
Cochran method is used to test the persistence in the entire period from 1999 to 2011. The results for countries included in the analysis are shown in Table 10.

Table 10 Y-statistics using Cochran method

Country	Cochran Y-test
Croatia	7.900
Poland	8.138
Hungary	5.004
Slovenia	5.565

As shown in Table 10, Y-statistic is greater than 1.96 which leads to the conclusion that there is performance persistence in the observed period.

Long-Term Analysis

The analysis of performance persistence in the long term is applied to insurance companies in all four countries. Analysis includes companies operating in the market for the entire period from 1999 to 2011.

During the mentioned period the measured data show how long individual companies maintained their status of either winner or loser. The results are shown in Table 11.

Table 11 Average time of maintaining the same status

Country	Average	Standard deviation	Coefficient of variation
Croatia	5.10	3.63	71%
Poland	3.26	2.50	77%
Hungary	2.42	0.89	37%
Slovenia	3.94	3.30	84%

The longest period of maintaining the same status of either winner or loser was recorded for insurance companies in Croatia, and the shortest in Hungary. Only one company in Slovenia maintained a winner status during the entire period, while two Croatian and one Polish company maintained the loser status for the entire period.

In order to establish the existence of differences in performance persistence of the four mentioned countries the Kruskal-Wallis test was conducted. The empirical level of significance is 0.122 so we can conclude that the difference in performance persistence among the countries is not statistically significant.

Conclusion

The performance persistence of insurance companies in Croatia, Poland, Hungary and Slovenia was tested using non-parametric contingency tables. Several methods were used: Malkiel's z-test, Brown and Goetzmann Z-test and χ^2 -statistics by Kahn and Rudd, Cochran method and Kruskal-Wallis analysis of variance.

Short term analysis of the performance persistence including Malkiel's z-test, Brown and Goetzmann Z-test and χ^2 -statistics by Kahn and Rudd indicates that there is evidence of performance persistence of insurance companies in individual periods in all four countries encompassed by the analysis. More specifically, all countries recorded consecutive periods in which performance persistence exists and consecutive periods in which there is no evidence of persistence in performance.

In order to test the performance persistence the Cochran method was applied which also leads to the conclusion that there is performance persistence in the observed period. The long-term analysis indicates that the longest period of maintaining the same status of either winner or loser was recorded for insurance companies in Croatia, and the shortest in Hungary. Moreover, the long-term analysis applying the Kruskal-Wallis test showed no statistically significant difference in performance persistence among countries.

The interesting finding of this analysis is that during the crisis period, in which a decline in premium was recorded, the Polish, Hungarian and Slovenian insurance companies did not show performance persistence. Out of all the countries comprising the analysed sample, only Croatian insurance market recorded performance persistence in the crisis period. The question is what has caused such differences. However, this implies further research regarding the relationship between the intensity of the crisis and premium

decline at the aggregate level as well as at the level of certain insurance classes. This is due to the fact that not all of the insurance classes were hit by the crisis equally. One of the possible reasons for existence of performance persistence in Croatia and lack of it in the other countries in the crisis period can be found in the fact that particular insurance lines started to develop significantly later in Croatia compared to the other countries. This is particularly true for life insurance business.

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